MEXICO
Introduction of Climate Friendly measures in Transport

# Project Appraisal Document

Latin America and Caribbean Region
LCSEN

**Date:** September 10, 2002
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**Project ID:** P059161
**Focal Area:** G

**Team Leader:** Walter Vergara
**Sector(s):** General transportation sector (40%), General industry and trade sector (30%), General information and communications sector (20%), Central government administration (10%)
**Theme(s):** Climate change (P) , Environmental policies and institutions (P), Pollution management and environmental health (P), Other environment and natural resources management (S)

**Project Financing Data**

**[ ] Loan** **[ ] Credit** **[X] Grant** **[ ] Guarantee** **[ ] Other:**

**For Loans/Credits/Others:**
**Amount (US$m):**

| Financing Plan (US$m): Source | Local | Foreign | Total |
|---|---|---|---|
| BORROWER/RECIPIENT | 2.40 | 0.00 | 2.40 |
| GLOBAL ENVIRONMENT FACILITY | 5.80 | 0.00 | 5.80 |
| LOCAL SOURCES OF BORROWING COUNTRY | 3.00 | 0.00 | 3.00 |
| SHELL FOUNDATION | 1.00 | 0.00 | 1.00 |
| **Total:** | 12.20 | 0.00 | 12.20 |

**Borrower/Recipient:** BCO NAL DE OBRAS Y SERV PUBLICOS, SNC
Cofinancing will be provided by the Shell Foundation and World Resources Institute (US$1 million, annex 5) and local sources of recipient country. The local private sources include bus manufacturers and fuel suppliers which have made the necessary commitments.
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**Estimated Disbursements ( Bank FY/US$m):**

| FY | 2003 | 2004 | 2005 | 2006 | 2007 | | | |
|---|---|---|---|---|---|---|---|---|
| **Annual** | 1.59 | 2.86 | 1.00 | 0.14 | 0.21 | | | |
| **Cumulative** | 1.59 | 4.45 | 5.45 | 5.59 | 5.80 | | | |

**Project implementation period:** 2002-2007

OCS PAD Form: Rev. March, 2000

## A. Project Development Objective

### 1. Project development objective: (see Annex 1)

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)[1].

### 2. Key performance indicators: (see Annex 1)

To ascertain, whether or not the project has achieved its development objective, and as broad performance indicators, the following actions would have been carried out: (more specific performance indicators are included in Annex 1)
(a) the harmonization of sector planning in the environment, transport and urban development as it relates to air quality measures;
(b) the adoption and initiation of a Metropolitan Climate Change Action Plan in transport and associated measures;
(c) the adoption of organizational and barrier removal measures to facilitate the implementation of sustainable climate friendly transport strategies;
(d) 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;
(e) the incorporation of climate change issues in MCMA transport projects in their design and operation;
(f) 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 technologies; and
(g) an effective project management.

## B. Strategic Context

### 1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)

**Document number:** 19289 **Date of latest CAS discussion:** 05/21/2001

The project is part of a 10 year multi-sector program by the metropolitan authorities (State and City), outlined in the AQM-III; 2002-2010 that seeks 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 focuses 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 has been shown to be a large contributor. The GEF proposal makes 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 effort supported by the proposed GEF operation will promote the introduction of climate-friendly measures and technologies that would contribute to the sustainability of the transport sector.

***The Problem of Air Pollution in the Mexico City Metropolitan Area***

Air pollution in the MCMA is a serious health and environmental concern. The MCMA constitutes one of the largest metropolitan areas in the world[2]. There are 19 million inhabitants living in the MCMA[3],

equivalent to about 19% of the country's entire population, which are being exposed to high levels of ozone and particulate matter. The MCMA produces more than a third of the national gross domestic product (GDP) and generates, in the process, 4 million tons of solid waste per year, and several million tons of atmospheric pollutants. Thus, it constitutes the largest area-source of pollutants in the country and it is one of the largest in the Americas. Current projections indicate that population will continue to grow at an annual rate of 1.9% in the short term. Demand for services and energy however, are expected to increase at even higher rates. This will result, unless controlled, in higher pollution loads to already burdened air and watersheds.

Air pollution in the MCMA is mostly due to (a) a high concentration of ozone, produced by the reaction of volatile organic compounds (VOCs) and nitrogen oxides in the presence of sunlight, (b) carbon monoxide, nitrogen oxides, sulfur dioxide and hydrocarbons emitted by vehicles fueled with gasoline and diesel, (c) sulfur dioxide emitted by industrial processes and commercial services using liquid industrial fuels, and (d) particulate matter (PM) in the form of particles smaller than 10 microns (PM10) emitted by several sources using diesel and other fuels as well as stationary and natural sources.

***Third Air Quality Management Plan (Programa para Mejorar la Calidad del Aire ZMVM 2002-2010)***

In response to the current challenge, the Mexican authorities have been working on air quality improvements for several years and the results of previous work have produced important, albeit not yet sufficient progress. In 2001, the Mexican authorities decided to continue the work already initiated, first and foremost through the formulation, design and implementation of the third Air Quality Management in the MCMA (2002-2010). Multi-disciplinary teams were organized that include some of the top government authorities in each field (e. g.; Secretaries of Transport, Urban Development and Environment). The thrust of the effort was: "to improve health indicators through reductions in exposure of populations to airborne pollutants". The AQM-III was published on February 11, 2002.

The AQM-III provides the strategic framework to guide necessary immediate interventions, and to further define, the goals and priorities, while identifying barriers and required reforms. The plan coalesces a significant amount of disperse information on air quality issues in Mexico City. These valuable materials have been integrated into a comprehensive assessment providing the basis for a long-term strategy to address air quality in the MCMA. Priority under the AQM-III is given to efforts to reduce particulates and ozone, both of which have been shown to have unsustainable impacts on health and the environment. While the linkage between particulates and mortality has been clearly established, the magnitude of the ozone issue (320 days exceeding the norms in the MCMA) and its documented impacts on health require that both criteria pollutants be given priority. The plan identifies the transport sector as a priority area for efforts to curb air pollution.

The Bank has assisted the formulation of the plan 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). This effort was undertaken during 1999-2001 as part of sector work that would provide the basis for specific interventions that could be funded through the Bank as a continuation of the First Air Quality and Transport Project. This first project has been completed in a satisfactory manner.

***Health Costs of Air Pollution***

While previous efforts in air quality management have yielded dramatic reductions in lead concentration,

emissions of CO and sulfur dioxide, ozone concentrations have remained high, often exceeding acceptable levels. PM levels are also high along heavily congested zones and in areas under the direct influence of wind erosion of denuded land. Abatement of these contaminants remains a first priority for subsequent efforts since they have been directly linked to respiratory illnesses and mortality.

A health impacts study, recently completed with Bank support as part of the assistance to the formulation of the air quality management plan, is an economic valuation of benefits from reducing pollution in the MCMA. For purposes of the study, the main economic rationale for controlling emissions was the welfare gain from improvements in air quality. The health hazards associated with ozone and PM10 were reviewed because these substances are the most important in terms of violating pollution standards. Their concentration levels depend on the amount and location of emitted pollutants, geographical characteristics, meteorological conditions, and atmospheric chemistry and transport. The chemistry of ozone formation is complicated and nonlinear: under certain conditions, an increase in NOx emissions could reduce ozone concentrations. On the other hand, PM10 pollution stems mainly from direct emissions of particles, and from reactions of NOx, and SO2 with other substances in the atmosphere. Principal emission sources are construction activities, transport vehicles, forest fires, open-air refuse burning, some manufacturing industries, and re-suspension of road dust.

The study concludes 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 (AQS1) offers benefits of approximately $2 billion per year, with high and low estimates of benefits of some $4 billion and $400 million, respectively. These results highlight the urgency of dealing with the air quality issue in the MCMA (For additional details please see "Improving Air Quality in Metropolitan Mexico City. An Economic Valuation". World Bank, February 2002).

***Linkage to the Air Quality and Transport Project and Timing of the GEF Project***

A proposed Bank loan ("Second Air Quality and Transport Project") is being prepared as part of the program of assistance from the Bank in support of the goals of the AQM-III. Its project development objective is to reduce the pollution load into the air shed of the MCMA contributed by the transport sector (both passenger and cargo), while improving the safety and efficiency of urban transport management at the metropolitan level. This will be sought through enhancing the use of high capacity transport modes, including the inter-modal substitution from small to high capacity vehicles and strengthening the control of emissions from cargo transport. The project will focus on the development of passenger transport corridors. These passenger transport corridors would consist of exclusive busways, transfer stations and a strengthened linkage to the metro in the metropolitan area (Metropolitan Transport Corridors). However, there are a number of policies and measures that need to be enacted and options to be examined to make viable the long-term modal shift intended for the transport system and that would be supported by the Bank. This long-term modal shift is also central to the goals of the Integrated Transport and Road Plan (2002-2006) (Plan Integral de Transporte y Vialidad (2002-2006)). However, the loan can not proceed without the removal of barriers. This is one of the specific objectives of the GEF project. Commitment to the objectives of the proposed loan remains strong but it requires the removal of barriers and also the completion of the studies that design the physical infrastructure for the corridors including any safeguard issues.

This GEF project, which would be processed before the loan, would assist in this process by facilitating the adoption of policies and measures needed to achieve the loan’s objectives. During the project, options will be identified and analyzed, and reforms on regulatory issues will be formulated with the goal of removing barriers for the effective implementation of the proposed corridors. In this context the GEF

project is also a platform for policy dialogue on sustainable transport. From a climate change perspective, efforts to promote a modal shift are anticipated to result in reductions of greenhouse gas emissions per passenger-km; also support for non-motorized transport and for the use of climate friendly vehicles (high efficiency, high occupancy) would result, when utilized in further reductions in emissions of greenhouse gases.

The GEF project however would stand on its own even if the loan does not materialize, as it will contribute to the development of background data, studies and review of policy options required for the reform process and would contribute to the acquisition of data of global value. The authorities have a strong commitment to implement the Metropolitan Transport Corridors even in the absence of Bank funding. In any event, the proposed activities under the loan could not be initiated before these preparatory activities take place, addressing regulatory and market barriers. Hence the timing of the GEF project, which primarily addresses the removal of these barriers. Also, the earlier implementation of the GEF project is expected to maintain the momentum achieved during the sector work in the formulation of the AQM-III and continue to yield policy developments that are necessary for the proposed loan to be effective. The continuum of the GEF project and the proposed loan is further described in Annex 4.

Preparatory activities for the loan are being supported through a recently approved PHRD grant for US$1.3 million, which is intended to finance the design of two metropolitan corridors, the design of a bus priority scheme within Mexico City and the design of the air quality monitoring network (RAMA). The identification of alternatives for metropolitan corridors is being financed through a German Trust Fund for US$76 thousand. The PHRD grant is in the process of being launched and together with decisions being taken by the Government authorities, will constitute the basis for the loan. As part of the preparation activities for the loan, the analysis of impacts of the corridors on job generation and any potential safeguard issues will be addressed.

***Linkage to Country Assistance Strategy (CAS)***

The CAS identifies three core themes for World Bank Group Assistance to Mexico – social sustainability, removing obstacles to sustainable growth, and effective public governance. The CAS also includes, as part of the environmental agenda, promotion of institutional development, decentralization of environmental management, and mainstreaming of global issues in order to comply with international agreements. The CAS confirms that some progress was made in improving air quality in metropolitan Mexico City area through the finalization of a third Air Quality Management Plan and it is also the base to set the stage of new support programs in this region that affects the health of some 15 million people.

The CAS specifically identifies climate change as an issue of relevance in Mexico due to: (a) the impacts and needs to adapt to these changes (vulnerability to climate change and adaptation needs), and (b) the opportunities for Mexico to participate in Carbon Finance and eventually the Clean Development Mechanism (CDM) as a tool to promote sustainable development. Mexico has already signed the Kyoto Protocol, which deals with climate change and the control of anthropogenic emissions of greenhouse gases, including methane. The proposed project supports all of the above sector goals. It will above all, contribute to the goals of sustainable development by supporting sustainable transport strategies, improving service delivery in the transport sector, supporting development of an efficient transport sector and contributing to institutional strengthening efforts.

**1a. Global Operational strategy/Program objective addressed by the project:**

The project is consistent with the objectives of GEF Operational Program 11: Promoting Environmentally Sustainable Transport (OP 11). Under the OP, 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. A second approach of this strategy is to reduce costs of prospective technologies that are not yet commercially viable, to enhance their commercial viability. Under this component, GEF attempts to enhance the viability of new emerging sustainable transport measures by supporting demonstrations of measures where the primary market is in recipient countries. Support under this component is important for solutions to transport problems in large metropolis. 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 will be integral to widespread successful examples to raise the acceptance of climate friendly transport options.

The global objective of the program is to reduce the emission of GHG from passenger ground transport systems in large metropolitan areas. The introduction of policies and measures supported through the project in the MCMA, will contribute to reductions in the emissions per vehicle of GHGs. In the longer term, the project is intended to promote a shift to a sustainable, cleaner, less GHG emitting ground transport system for the MCMA. This shift complemented with long-term promotion of public transportation is expected to result in substantial global impacts. The results of the field test of bus technologies will have global application.

***Climate Change Related Policies and Institutions in Mexico***

Mexico has played an important role in the Climate Change Convention and the subsidiary meetings. It is the first country in Latin America to submit the Second Communication. Mexico is also one of the two largest emitters of GHG in the region and also a country that has shown substantial vulnerabilities to the impacts from Climate Change.

The preparation of the Second National Communication of Mexico on Climate Change began in 2000 and was officially issued at COP8 in Morocco (2002). The document includes the updating of the National Greenhouse Gas Inventory for the period 1994-1998, scenarios of future emissions, assessment of mitigation policies, scientific and technical research, Activities Implemented Jointly (AIJ), the Inventory for land use and land use change for 1998 (annex to the communication), the process of validation of the National Forest Inventory and, International Cooperation. In this framework, the development of projects on local and global pollution in Mexico City are of great importance for climate change, given the relationship between improving air quality and the necessary reduction of the burning of fossil fuels in the Metropolitan Area of the Valley of Mexico and the significant contribution that the Metropolitan Area makes in terms of total emissions of GHGs.

Parallel to the communications to the convention, Mexico has launched an effort to strengthen its institutional capacity through the development of a Climate Change Office and the organization of a Climate Change Inter-secretarial Committee. The Office has been supported through an IDF (Institutional Development Fund) grant that enabled the completion of baselines for the energy, forestry and industrial sectors. The IDF also supported the identification of economic instruments for the internalization of climate change concerns in economic planning. This work is being used as the basis for a proposed National Strategic Study on the optimal use of the Clean Development Mechanism in Mexico. The Federal government published the Climate Change National Strategy in April 2000, nevertheless it is not considered a regulatory or legislative tool. The Environmental and Natural Resources Secretariat (SEMARNAT) internal regulation code specifies the climate change duties of the National Institute of Ecology (INE) regarding the studies and research, as well as the National

Communications.

In April 1997 Mexico established the Climate Change Intersecretarial Committee, integrated by different state secretariats (e.g Energy, Environment and Natural Resources, Social Development, Foreign Affairs etc.). Among the committee's principal duties are: (a) The elaboration and presentation of the climate change national policy to the Executive, (b) the elaboration of the national strategies and supervision of its implementation, (c) updating and developing the legal framework of policy regarding climate change, and (d) the promotion and implementation of climate change laws. These duties are expected to transform this committee into a climate change commission.

At the local level, the SMA is responsible for the implementation of Climate Change policy of the city in coordination with federal authorities. In fact, the authorities are proposing to develop a Climate Change Action Plan for the metropolitan area. The Metropolitan Climate Change Action Plan has been highlighted by the current administration to underscore the relevance of climate change issues which had traditionally been ignored and to facilitate the allocation of resources for this purpose. The MCCAP will be an institutional and regulatory basis enabling the decision making process on climate change related projects undertaken by the Mexican government, such as the establishment of metropolitan transport corridors.

## 2. Main sector issues and Government strategy:

### 2.1 Sector issues

### *Need for a better harmonization of sector policies on the issue of Air Quality and on Climate Change*

The metropolitan authorities have adopted comprehensive sector policies that already identify priority areas in transport, air quality and urban development. These are: Integrated Transport Program (2002-2006) (Programa Integral de Transporte y Vialidad), the General Urban Development Program (2002-2006) (Programa General de Desarrollo Urbano) and the Environmental Program (2002-2006) (Programa de Medio Ambiente) of the City. The corresponding Plans of the State of Mexico are: the Institutional Program of Medium Term (2000-2005) (Programa Institucional de Mediano Plazo) that integrates all the specific transport programs, the Sectorial Urban Development Program (1999-2005) (Programa Sectorial de Desarrollo Urbano), and the Environmental Protection Program (1999-2005) (Programa de Protección al Ambiente). However, there is a need for the sector authorities to harmonize the different programs as these relate to the issues of transport, air quality and land use. Also, even though awareness and activism in international fora have increased, climate change issues have not been fully integrated into the sector planning and decision-making. Successful incorporation of climate-friendly policies and measures will depend on the extent to which sector planning recognizes the harmonization potential between climate change and sector policies, and on the realization of local co-benefits from actions on climate change concerns.

Lack of coordination between the air quality, transport and urban planning strategies may result in failure to capture gains in efficiencies or may result in sectorial actions that would be counterproductive for the goals of the other sectors. Transport planning strategies that are coordinated with the air quality management plan would ensure that the efforts and allocation of resources of the metropolitan area may result in higher levels of emissions of local and global pollutants are avoided. Harmonization with urban planning would ensure that land use and transport planning are also examined from an air quality perspective. The overall intended benefit from harmonizing these strategies is that the efforts in the

environmental front are coordinated with similar efforts in transport and land use. The harmonization of the sector strategies and plans would result in several action plans (fiscal, institutional, legal etc.). Implementation of this framework would necessitate the promotion of measures that will facilitate a modal shift in the transport sector of the metropolitan area (from one based on an increasing share of small, gasoline-based vehicles to a system based on high capacity, fuel efficient and low carbon emitting vehicles, running along transport corridors and linked and integrated with the metro system).

To this effect, there is a need to identify and promote the adoption of an enabling policy and regulatory environment that will permit the development of transport corridors, as a key element of the modal shift. Transport corridors are expected to lead to a more efficient, less polluting public transport sector.

Likewise, the contamination caused by the transport sector is a problem of metropolitan dimension. Mexico City and the State of Mexico have each their own independent institutional organizations. Even though there is substantial across-the-board technical and institutional capacity, the coordination between them is limited. Due to the fact that the Mexico City and the State of Mexico share an atmospheric basin the problem is of metropolitan nature and needs to be addressed by both administrations in a coordinated manner.

### *Transport Sector and Air Quality Issues*

#### i) Lack of a sustainable business environment for public transport

The business structure of bus services in the Mexico City Metropolitan Area (MCMA) has led to highly inefficient operations, resulting in a costly, unsafe and environmentally unsustainable public transport system. The key issues are: (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 are significant and require of substantial efforts at the policy and regulatory levels.

The experience of Bogota's innovative bus corridor system (see Annex 12)- as well as the achievements of the Curitiba busways– demonstrates that the creation of the right business environment is vital for achieving sustainable public transport services by improving their commercial viability. The Bogota reforms included, in addition to such physical works as busways, terminals and on-line bus stations: (a) a regulatory framework encouraging management structures that facilitate commercially efficient bus operations, thereby providing adequate incentives for investors, (b) a payment system that provides the adequate incentives for investors, (c) a client-friendly fare structure that is attractive to bus passengers, and (d) transparent oversight and enforcement mechanisms. These aspects can be improved in Mexico and would be addressed as part of the reform to the regulatory system, envisioned as the key output of the GEF project. The Transmilenio program has resulted after one year of operation in a daily ridership of 680,000 passengers along transport corridors of very high capacity vehicles. This is a significant modal shift.

#### ii) 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 is

attempting 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 nature of the bus sector for the MCMA is of a very fragmented supply, which also results in a somewhat chaotic provision of services. Likewise, the increasing number of private cars exacerbates traffic congestion, which contributes to productivity losses, and higher level of emissions of criteria pollutants. According to the recently released emission inventory and the AQM-III (2002-2010), the mobile sources account for a majority of NOx emissions, 40% of HC emissions and about 36% of particulate emissions.

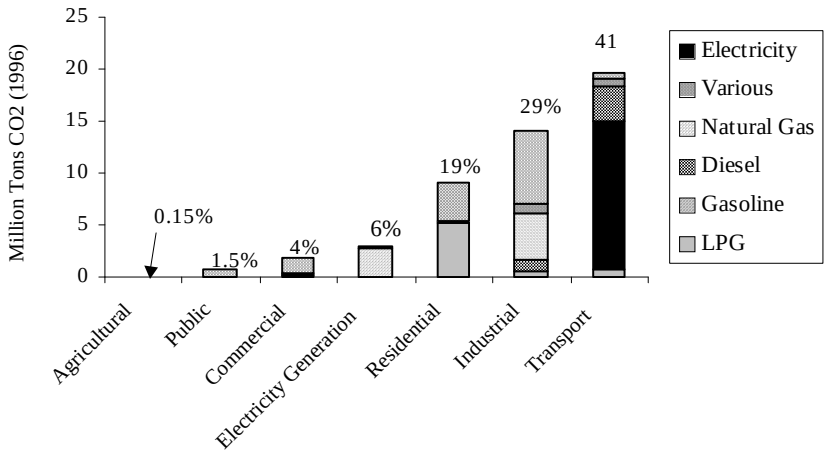
**Table 1. Emission Inventory in the MCMA 1998 (percentage)**

| SECTOR | $PM_{10}$ | $SO_2$ | CO | NOx | HC |
|---|---|---|---|---|---|
| Stationary sources | 16 | 55 | 0.5 | 13 | 5 |
| Area sources | 8 | 24 | 1.5 | 5 | 52 |
| Soils and vegetation | 40 | N/A | N/A | 2 | 3 |
| Mobile sources | 36 | 21 | 98 | 80 | 40 |
| **Total %** | **100** | **100** | **100** | **100** | **100** |

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 (see Figure 1). Mexico, is the largest contributor of C02 emissions (2.1%) in the Latin America region. The recently concluded COP-8, in Marrakesh, Morocco, has again emphasized the need for urgent action to reduce anthropogenic emissions of greenhouse gases and took actions to promote carbon finance between Annex 1 nations (developed) and developing countries. The Kyoto Protocol has now been endorsed by a majority of the community of nations. The carbon trade has thus been reaffirmed and emissions trading of about 700-1000 millions tons of carbon dioxide equivalent is expected on an annual basis for the first commitment period (2008-2012).

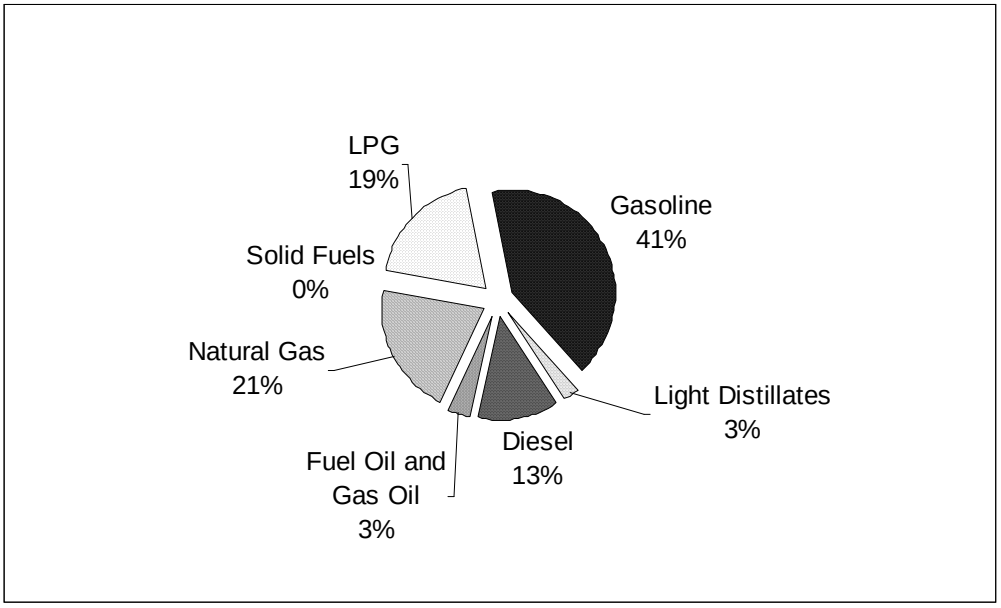
The 1998 energy balance for the MCMA has been calculated using the methodology and format utilized by OLADE[4]. The estimates show that the MCMA consumes 592 PJ annually, for which it requires a gross supply of 648 PJ (56 PJ are used in the transformation process). The largest user is the transport sector, accounting for 49% of the total (292 PJ), an overwhelming fraction of which is provided through the combustion of gasoline in motor vehicles (190 PJ)[5]. A GHG emission inventory was calculated on the basis of the energy balance, following the IPCC methodology. The study estimates emissions of 44.6 million tons of CO2 equivalent into the atmosphere during 1996[6] as a result of energy consumption. Of those, 34.9 million tons of CO2[7] equivalent were released as a result of fuel emissions in all sectors, while 10.7 million tons represent emissions associated with the generation of electricity[8] used in the MCMA. This volume of GHG represents 10.3 % of the total national emissions for that year[9]. The largest sector in terms of greenhouse gas emissions is transport with 18 million tons of CO2 equivalent in 1996 and 19.6 million tons of CO2 in 1998.

**Figure 1. CO2 emissions by sector and source in the MCMA (1996)**




The transport sector is also the largest source of methane (CH4) and volatile organic compounds. Methane emissions have a large radiative effect in the atmosphere, while VOCs contribute to the generation of Ozone. Ozone itself has a warming effect of about one quarter that of CO2 on a molecular basis. As the transport sector is also the largest source of local criteria pollutants, opportunities for harmonization of local/global pollution problems in the transport sector would have significant impacts in both areas of concerns.

**Figure 2. Direct CO2 Emissions by Fuel in the MCMA (1996)**




Does not take into account associated fugitive emissions or leaks.

**iii) Congestion and low productivity in the transport sector**

Traffic congestion affects public transport efficiency and, in addition, imposes direct and indirect costs

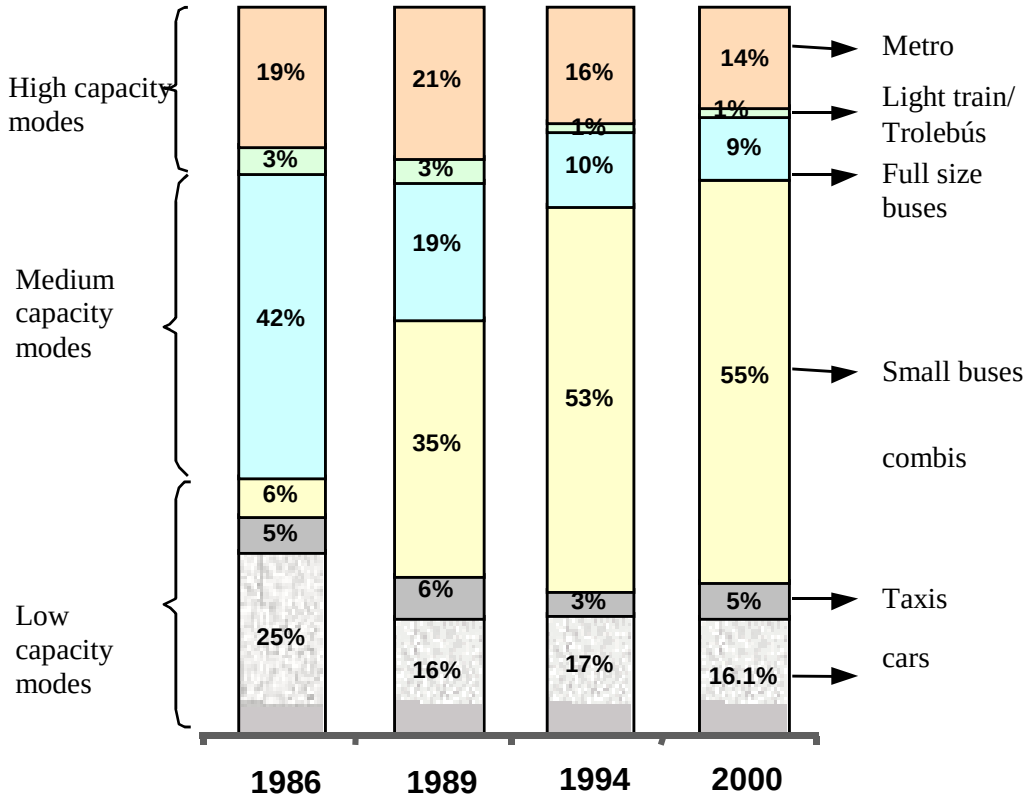
on the urban economy. Time lost in traffic can add up to a substantial share of a city's output as it reduces the size of the effective labor market, imposes the need for higher inventory and more generally affects individual productivity. In Mexico, between 1990 and 2000, the number of motor vehicles on the road grew by 42%. At the same time, the population of Mexico's medium and large cities 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, contribute significantly to the congestion problem. Commercial transport of freight is affected by congestion in central business districts, poorly maintained road surfaces and inadequate terminal facilities. In addition, in many cities, the aging fleet of highly polluting diesel buses will soon require replacement if air quality is to be managed effectively. The municipal governments are poorly equipped to manage theses challenges. This results in limited coordination in intermodal services. Second, Mexican municipalities have limited land use planning powers. Third, the allocation of responsibilities between states and municipalities is inefficient, which makes long-range land use planning difficult. Finally, municipalities have limited resources with which to fund investment in transport infrastructure. The MCMA typifies the difficulties mentioned.

**iv) Gradual carbonization (increase of greenhouse gas emissions per passenger-km) of the transport sector: need for a modal shift to reduce emission of criteria pollutants and greenhouse gases**

The energy and greenhouse gas inventories for the MCMA indicate a gradual increase in its energy intensity. This finding is evident in the analysis of the modal evolution in the public transport system in the MCMA during the period 1986-2000 ( Fig. 3) which shows that both the metro system and the bus have lost share of the total public transport market, having been displaced by smaller vehicles. The gradual shift away from large capacity vehicles is, in part, an unintended effect of the atomization of services in the transport sector and the relatively poor regulatory system. This is an unwelcome development, especially in such a congested and polluted region as the Mexico City Metropolitan Area, where it has generated inefficiencies from a transport and environment perspective by adding to traffic congestion and reducing public transport productivity. It has resulted in higher emissions and exposure to criteria pollutants (and associated health impacts), caused increased releases of greenhouse gases, and has been linked to increasing accident rates. Finally, it has contributed to the inability of the rail mass transit system (essentially the metro) to attract passengers to its installed infrastructure. The Mexican authorities want to reverse this trend and promote measures that will aid the modal shift from small vehicles to large buses and the metro.

However, shifting passengers from private cars to public transportation facilities – or convincing new car owners to continue using public transportation -- is not an easy task. Bus and metro riding is often uncomfortable and has an unattractive image with many residents of the MCMA, as evidenced by the declining metro ridership over the last decade. Lack of parking places at metro stations, and particularly the lack of efficient links between bus and metro routes pose additional difficulties, while the extension of the metro lines is very expensive and would not provide for full coverage of the needs in the MCMA.

**Fig 3. Evolution of Modal Share in the Public Transport System of the MCMA**




Source: SMA 2002

## 2.2 Government Strategy

***Transport Sector Strategy in the MCMA***

The Comprehensive Transport Plan of the City (2002 - 2006) calls 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.

The first objective supports the development of a sustainable business environment for the public transport sector. The authorities have started the reduction of subsidies in real terms but these still represent an important fraction of total operation costs for the bus and metro operations. On the other hand, the Government receives substantial income from taxes on fuel consumption some of which are

channeled to environmental objectives in the city.

The control of emissions by the transport sector into the air shed of the MCMA has been initiated through adoption of more stringent emission and vehicle standards and through the definition of measures that would promote the integration of urban development plans and transport plans. However, these plans are still in the early phase of development. Measures to control the number of vehicles in areas of high congestion and traffic management measures to alleviate gridlock and the creation of pedestrian zones in downtown areas are also being considered. Also the government intends to promote the introduction of low emission vehicles and promote a higher level of utilization of the metro. A study to restructure the system of bus route concessions was completed in 1999 but its recommendations have not yet been implemented for a lack of resources.

Promotion of a modal shift is a central part of the government's strategy. The key measure under consideration is the development of transport corridors on which high capacity, low polluting vehicles would operate. These corridors are 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 is 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 will be the intended introduction of low emission, low carbon emitting vehicles. This is being achieved through attracting ridership to the metro and the light train line, and through plans for the introduction of novel bus technologies. New-technology buses may also be specified for the busway corridors, but first there is a need to obtain solid information on which to base the decision.

The government of the City conceives the air quality and transport policy as the conjunction of various complementary elements that should facilitate the improvement of transport conditions in the City.

***Environment Sector: Formulation of a long term, multi-sector, strategic framework***

The AQM-III (2002-2010) consists of a multi-sector, metropolitan, long-term effort to address air quality issues in the MCMA and constitutes the official government strategy for air quality in the metropolitan area. The plan recognizes the pivotal role that the transport sector can provide in solving the air quality issues and identifies 47 out of a total 108 measures as linking transport sector and improvements in air quality. A key measure identified in the plan is the adoption of transport corridors as a means to promote a modal shift. The thrust of the effort is very clear: "to improve health indicators through reductions in exposure of populations to airborne pollutants".

The plan which has been issued jointly by the Government of Mexico City, the Government of the Estado de Mexico and the Federal Government summarizes prior work on air quality management and provides an updated description of the situation in the Valley in terms of air quality. It concludes that while significant progress has been made, there are major challenges facing the goal of improved air quality. These are linked to the expected continuous growth in demand for services and economic activity and the difficult nature of the many dispersed sources of pollution in the area. Transport sector is identified as a key sector for immediate action. The plan also summarizes information available on the impacts on health from air pollution (drawing from the reports prepared with Bank and GEF PDF-B assistance).

The plan updates the emissions inventory (also prepared with Bank assistance) and establishes goals for

the 10 year duration of the program. These goals are provided in quantitative form and summarized are:

- A substantial reduction in ozone concentrations and exposure (eliminating any concentrations above 200 IMECA points) and reducing average concentrations significantly;
- Reduce the concentration of PM10 and 2.5;
- Eliminate violations to the norm on CO concentrations;
- Reduce average concentrations of SO2.

To achieve these goals, the plan establishes a 10 year program consisting of 108 measures. Key parts of the program are:

- Reductions of emissions generated by the transport sector;
- Reduction of emissions from industry and service;
- Conservation of natural resources and forest cover in the Metropolitan Area;
- Integration of policies and plans in air quality, transport and urban planning;
- Reduction of exposures to high concentrations of pollutants;
- Promotion of environmental education and awareness and technology development;
- Harmonization of plans to address air quality and control of emissions of greenhouse gases.

## 3. Sector issues to be addressed by the project and strategic choices:

### 3.1 Sector Issues to be addressed by the project

The project would address the major sector issues in the following manner:

- The need for a **better harmonization of sector policies** on the issue of air quality and climate change will be addressed through the 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** will be addressed through the creation of a technical committee for the implementation of the project. The different institutions will have a representative by jurisdiction (State, City, Federation) at the committee. It is going to be chaired by the SMA. The institutions that will participate are the following: Secretary of Transport (Secretaría de Transporte y Vialidad) (SETRAVI), Secretary of Urban Development and Housing (Secretaría de Desarrollo Urbano y Vivienda) (SEDUVI), Electric Surface Transport System (Sistema de Transportes Eléctricos) (STE), Bus Network (Red de Transporte de Pasajeros del DF) (RTP), and the Metro System (Sistema de Transporte Colectivo) (STC), of the City .The Secretary of Ecology (Secretaría de Ecología)(SE) and Secretary of Communications and Transport (Secretaría de Comunicaciones y Transportes) (SCT) of the State of Mexico as well as the National Institute of Ecology (Instituto Nacional de Ecología ) (INE) of the federal government. The World Resources Institute (WRI) will participate also.

- **Lack of a sustainable business environment for public transport** will be addressed through the support to studies and measures to strengthen the sustainability of the public transport sector, including the adoption of business practices, organizational measures and incentives that would promote the transport corridors. A number of measures are being considered that would facilitate the modal shift from small vehicles to larger, energy efficient, low polluting vehicles and transport systems, with the ultimate goal of increasing the share in passenger transport of efficient, low polluting means of transport. This modal shift would result in a less carbon-intensive transport system and is intended to divert passengers from small inefficient vehicles toward the metro and full-size buses.

- **The Large contribution of the transport sector to the problem of air quality** will be addressed in the long term through measures that will enable a significant modal shift as discussed in the previous point. The intended modal shift will 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.** While these efforts are underway, there is a need to 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. An alternative is the hybrid system which allows for improved combustion efficiency [10] in particular when heavy traffic is present, as is the case in urban environments. In this context, OP-11 emphasizes location as well as technology. The MCMA, given its size, location and character of its air pollution problem, constitutes a prime candidate to assess and promote the commercial viability of cleaner transport systems. Complemented with long-term modal shifts to public transportation, the global climate impacts could be significant. The GEF funding would support the incremental costs associated with a comparative field test of bus technologies, which could be used to substantiate relative advantages and emission performances, under real traffic situations in a large metropolitan area.

  Mexico City is an appropriate venue for this test given: (a) the magnitude of the air quality problem, (b) the just 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. In particular, the test results will greatly benefit from the availability of the Multiscale Climate and Chemistry Model, recently adopted by the metropolitan authorities to simulate the impact on air quality and human exposures to specific air quality measures, developed during the assistance to the formulation of the air quality management plan. The field test will enable decision making on use of alternative bus technologies. In this respect it is similar to the GEF funded fuel cell test. The results of this test will be of value to other high altitude cities, such as Bogota and Quito in the region and is being developed in close coordination with a similar test under design in Santiago de Chile, with GEF support. The test protocol will be ready by CEO endorsement.

  Clean technologies are adopted when they offer a high benefit (emissions reduction) to cost ratio. Calculating a carbon offset cost (in dollars per ton) requires knowledge of the operating costs per mile (along with other fixed costs), which can only be measured through the long term field testing of the vehicle in real world (revenue) operation. Measuring these costs are essential to comparing the cost effectiveness of these technologies and to helping other cities estimate their own environmental cost-benefits. The field test will yield data on emissions information for the different types of buses and also provide data on bus operation and maintenance. These will be useful to compare with the operating costs from other bus field tests in other cities (New York, Santiago and Copenhagen). The results of these field tests will help people around the world assess how different technologies might fit into their cities long term bus fleet planning.

**Table 2. Alternative bus technologies (see Annex 17) (**).**

| Technology-Based Strategy | Capital Cost | Total Cost | % CO2 Equivalent Reduction | Cost ($/ton) of Carbon Equivalent Reductions | Relative Impact on local criteria pollutants |
|---|---|---|---|---|---|
| LPG Vehicles (*) | Low | Minimal to negative due to lower fuel cost | ~ At least 15% for gasoline and diesel replacement | Minimal to negative for diesel and gasoline | Moderate |
| Natural Gas Vehicles | Conversion-$1500 to $4000; New-20-40% higher than diesel buses | Minimal to negative due to lower fuel cost (gasoline); high for diesel | ~15%-20% for gasoline replacement; ~low for diesel replacement (1) | Minimal to negative for gasoline; high for diesel | Zero emissions of non-methane HC or PM10 |
| Hybrid Electric Vehicles | ~50%-150% higher than Diesel at low volumes; may be equivalent costs once in commercial production | Operating costs should be lower, total costs may be comparable to Diesel | At least 15%; potentially higher (30%) depending on driving cycles | Good at present to potentially very good | Lower emissions of PM10, VOCs and NOx |
| Fuel Cells (*) | 1000% or more than diesel | High | Modest at present; could exceed 70-80% in future depending on source of H2 | Very high at present to potentially very good in future | Zero for the vehicles |
| Diesel | low | low | Baseline | low | Baseline |

(*) Field test of LPG and Fuel Cell buses is not supported by this project; however, the field test under component c) will be coordinated with the fuel cell test, is being organized by the same agency (STE) with support under a GEF project, implemented through UNDP.
(1) However, recent test from Australia indicate a reduction of 17%-25% for diesel replacement; in addition, substantial noise reduction has been achieved in diesel displacement by CNG.
The information regarding Table 2 comes from the final report produced by the State and Territorial Air Pollution Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO), titled "Reducing Greenhouse Gases and Air Pollution. A Menu of Harmonized Options", of October 1999.
(**) The findings of the ALAPCO study have been questioned and should be used with caution.

### 3.2 Strategic Choices.

- **Implementation of modal shift versus investing in additional throughways.** The project assists the development of the concept of public transport corridors as a tool to improve the efficiency of existing infrastructure (modified to conform to the corridor concept) as opposed to the continuation of the current trends (with gradual gains in the use of low capacity vehicles). This choice is at the root of a vision of development for metropolitan area, that places emphasis on people instead of vehicles.

- **Transport corridors versus expansion of metro.** The project also supports the concept of expansion of the reach of the metro system instead of its actual physical expansion, through integrated corridors as this choice is anticipated to cost about one tenth of the equivalent, were the metro system be expanded.

## C. Project Description Summary

**1. Project components** (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

The project includes six components. The components provide an architecture to the project, going from a cross sectorial linkage (component a), to the definition of an enabling environment for the transport sector (component b), to actions in the field that would complement regulatory activities with information on technology options (component c). This is complemented with technical assistance to

strengthen existing capacity for the execution of the project (component d) and an effort to disseminate results achieved (component e).

***a) 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 will 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 area; 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. It is anticipated the plan will be adopted under the project by the end of PY2. The project will finance consultancy studies and equipment.

***b) 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 will support a review of management and business organization measures that may be required to promote the adoption, design and use of corridor infrastructure, including a system of business organization, the concessions for specific bus line operations and the structuring of integrated fares. The component will also fund 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. This component will support the reform of public transport regulations for the proposed corridors. In addition, an institutional framework for the corridors will be defined including the integration with the metro and measures to promote metro rider-ship will be identified. This component will also finance an assessment of organizational measures proposed by the Mexico City Authorities to improve air quality and public transport efficiency. The studies will have a metropolitan character and would be commissioned after endorsement by the SMA, SETRAVI and the Secretary of Communications and Transport of the State of Mexico.

This component will also support an action plan for non-motorized transport (promotion of bicycle use). The objective of this action plan is to promote the use of bicycles as a mode of transport and aims at diverting commuters from motorized modes, especially private cars. Emphasis would be placed on campaigns to (a) expand bicycle use by improving its image and explaining its advantages, (b) raise traffic safety awareness, and (c) provide incentives to schools, employers, building managers, car park operators, and the Metro to provide bicycle parking on their premises. In addition options will be considered to provide improved infrastructure for non-motorized transport such as bikeways and traffic calming schemes, and a regulatory regime will be prepared to improve the traffic safety and personal security for the uses of non-motorized transport. The action plan will be designed based on the large body of experiences (Europe, Bogota, Lima, Santiago, others) and literature to ensure that the resources available will be used as effectively as possible. An estimate of the potential impacts on GHG emissions associated with the concept of the corridors is included as Annex 4 (Incremental Costs and Global Environmental Benefits).

The project will finance consultancy services and technical assistance. The outputs of this component will facilitate the adoption of measures required to implement the corridors which would be funded under the proposed Second Air Quality and Transport Project. The outputs however are important even if the loan does not materialize.

***c) Field Test of Climate-Friendly High Capacity Vehicles ($4.8 million with a GEF grant of $1.6 million).***

This component will 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 will 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 will be operating on normal conditions, and their emissions would be regularly measured under a scientifically designed and statistically representative test protocol (the test protocol, including sample size, has been 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, (Annex 16)).

This field test will 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 (Annex 9) with assistance from an ad-hoc high level steering committee with significant experience from institutions such as MIT.

The test is 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 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 is 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 includes the provision of an essential framework for evaluation of alternative vehicle options. The project will fund the cost of the testing and monitoring protocols including the buses and the operation and maintenance costs.

***d) 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 will finance technical assistance and capacity building in order to incorporate climate and environmental considerations in the design of transport projects. Technical assistance, capacity building and training will be provided in the following aspects (the project will finance the costs of consultancies):

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 will include the comparative cleaner bus test and the metropolitan transport corridors. The benefits and costs of these measures will 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
e) Review and development of emission standards and transport regulations proposals to be applied in the Metropolitan Area.

The outcomes of this component will be used also for the establishment of the corridors.

***e) Public Awareness and Dissemination ($0.3 million, $0.165 million GEF grant).***

This component will 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 will also support the dissemination of technical information produced by the project and will promote and finance workshops and stakeholder meetings.

***f) Project Management ($ 0.7 million, $0.335 million GEF grant).***

This component will support the management of the project activities, including monitoring and evaluation. The project will finance management costs in the form of consultancy services and travel. The implementation agency will be the SMA of the City.

| Component | Indicative Costs (US$M) | % of Total | Bank financing (US$M) | % of Bank financing | GEF financing (US$M) | % of GEF financing |
|---|---|---|---|---|---|---|
| Harmonization of sector strategies and Integrated Climate Action Plan (CAP) for the MCMA | 0.80 | 6.6 | 0.00 | 0.0 | 0.40 | 6.9 |
| Enabling environment to facilitate the implementation of sustainable transport strategies | 4.80 | 39.3 | 0.00 | 0.0 | 2.90 | 50.0 |
| Field Test of Climate-Friendly High Capacity Vehicles and action plan for non-motorized transport | 4.80 | 39.3 | 0.00 | 0.0 | 1.50 | 25.9 |
| Incorporation of climate change and air quality considerations in the design and analysis of transport startegies | 0.80 | 6.6 | 0.00 | 0.0 | 0.40 | 6.9 |
| Public Awareness and Dissemination | 0.30 | 2.5 | 0.00 | 0.0 | 0.17 | 2.9 |
| Project Management | 0.70 | 5.7 | 0.00 | 0.0 | 0.43 | 7.4 |
| **Total Project Costs** | 12.20 | 100.0 | 0.00 | 0.0 | 5.80 | 100.0 |
| **Total Financing Required** | 12.20 | 100.0 | 0.00 | 0.0 | 5.80 | 100.0 |

***Replicability***

The proposed project has a significant replication potential. Specifically, Mexico City will be the first Latin American city establishing a Metropolitan Climate Change Action Plan and has in that sense a pioneer and exemplary function which can be replicated, especially in cities with comparable problems of pollution caused by an inefficient transport system. The replication strategy would be based on the following:

(i) Several Latin American cities are interested in urban transport reforms along the lines in Bogota and the experience in Mexico will serve to confirm the applicability in metropolitan areas of the concept of transport corridors. The Mexico Project will provide a practical example on how to reduce pollution, address climate change and improve accessibility and sustainability to the transport system.
(ii) Component B will lay the basis for a sustainable transport strategy focusing on structural reforms of public transport supply. Modal shift to large capacity vehicles is an objective of various medium and large size cities which also face the problem of an increasing amount of private cars. The size of Mexico City and the metropolitan zone and the dimension of the transport problem gives it a special status and would find replication in megacitites through the world, especially the integration of high-capacity busways and bus services feeding into existing rail systems.
(iii) The successful adoption of an action plan for non-motorized transport allows further replication, once the barriers are identified and incentives established. It will provide a very strong example due to the fact that a consciousness concerning non-motorized transport is missing at the moment. It will be possible to introduce it more easily in cities of smaller size. A successful field test will provide information on less polluting, climate friendly transport alternatives on which decisions on alternative transport can be based. The provision of the resulting information by the field test to other Latin American cities will make this kind of test feasible in other cities facing similar issues and conditions. Moreover, the altitude of Mexico City influencing the field test is comparable to some other Latin American cities such as Bogota and La Paz. The test protocol will make an effort to isolate the altitude effects. This will be done by comparing results with those of similar vehicles tested at different altitudes as well as through an analysis of the theoretical effects on the test including an assessment of how the results would vary if the test had been conducted at sea level.
(iv) The completion of technical assistance, capacity building and training activities will lead to the incorporation of climate and environmental considerations in the design of transport projects and to the support of the field test of climate friendly transport systems. As these technical and training aspects are necessary once a city wants to introduce or strengthen environmental considerations in its transport system, the completion of this component will provide guiding assistance towards this objective.
(v) The successful design of a public campaign and of dissemination of related technical information will lead in the long term to an increased use of high capacity vehicles, non-motorized modes of transport as well as increased public awareness of transport corridors and climate friendly technologies. This component will demonstrate how to disseminate these kind of information and how to increase the public awareness in a city of the size and with the conditions of Mexico City and the metropolitan zone. In that sense it will provide guiding assistance for cities facing the same issues and which find themselves at the beginning of their environmental engagement.

***Monitoring and Evaluation (M&E)***

The metropolitan character of traffic-generated pollution requires a coordinated monitoring approach which is made difficult by the fragmentation of institutional responsibilities. The technical committee that includes the SMA, SETRAVI, STE and the State of Mexico authorities will provide a wider forum for coordination and communication between the different project activities and will have responsibility for their monitoring and evaluation. The implementation letter from the recipient and the DF to the Bank contains the indicators to be used in monitoring and evaluating the implementation of the project. Specific M&E activities are outlined in Annex 1. Reporting on the indicators of each component will be monitored by the World Bank through Supervision missions and by the involved agencies through Project Progress Reports.

The purpose of the intention letter, which is being signed by representatives of the lead institutions from each administration (City, State and Federation) is to adopt a coherent metropolitan vision that would enable the development of a proper institutional and policy framework for the corridors. The extent of

these common goals such as the integration with the metro, institutional reform, tariffs integration and corridors selection will be monitored and evaluated by the Bank's missions and will be part of the key performance indicators of the project.

Monitoring and evaluation of the field test will cover the costs of operation, including fuel and other consumables, labor, maintenance and repair, as well as the measuring of pollutant emissions of each vehicle at various points during the testing period. An assessment will be made of the challenges of operating larger fleets of advanced technology vehicles. The test protocol will present its results in two parts: the field tests and the laboratory tests. Logs will be kept for each vehicle to monitor its economic and environmental performance.[11]

***Incremental Cost***

The concept of the incremental cost derives from the fact that, in order to maintain global sustainability, additional national action beyond what is required for national development is needed. Such additional action imposes additional (or "incremental") costs on countries beyond the costs that are strictly necessary for achieving their own development goals, but nevertheless generates additional benefits that the world as a whole can share. To calculate incremental cost, the expenditure of the GEF activity and the cost saving on activities that, as a result of the GEF activity, will no longer be needed, must be estimated. The latter refers to the "baseline" of future activities for sustainable national development that does not explicitly take global considerations into account and that occurs in the absence of the project.

The proposed GEF Project assumes as a baseline scenario a business as usual operation of the transport sector without consideration for transport corridors. The considered baseline includes also the already completed Sector Work as a background to the purchase and operation of diesel buses. The Sector work was also a basis for the development of the AQM-III:2000-2010. The total costs of the baseline amount to US $ 4.1 million.

The proposed GEF project is complementary to the baseline scenario in that it will reduce GHG emissions along with local emissions. With exception of the already completed Sector Work and the purchase and operation of diesel buses the project is incremental. The following activities wouldn't be carried out without the project, at least in the short run, which makes them additional ("incremental"): (a) Metropolitan Climate Change Action Plan, (b) definition of an enabling environment to facilitate the implementation of sustainable transport strategies and an action plan for non-motorized transport, (c) Field Test of Climate Friendly High Capacity vehicles, (d) technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies, (e) public awareness and dissemination and finally the (f) management of the project.

The GEF alternative would entail costs estimated at US $ 12.20 million. The resulting incremental cost (by subtracting the costs of the baseline from the costs of the alternative) amount to US $ 8.1 million. The required GEF funding is US$ 5.8 million.

## 2. Key policy and institutional reforms supported by the project:

***a) Integration of planning strategies.*** The project seeks a commitment to pursue the integration of strategies across the MCMA, through the identification of common issues and the definition of multi-sector approaches, thereby providing the basis for a harmonized approach to issues of air quality and transport and a coordinated climate action plan.

***b) Consolidation and rationalization of bus services.*** The SETRAVI, in coordination with the

Metropolitan Commission of Transport and Roads (COMETRAVI) (Comisión Metropolitana de Transporte y Vialidad) intends to consolidate and rationalize the bus services in the City. To this effect, the SETRAVI has proposed, and the Assembly has approved, the new Transport Law for the City (1999). The main objectives of the Law are: (a) to improve governance in the issuing of permits for bus services, (b) to strengthen and better define the legal instruments that regulate service providers, and (c) better enforce existing regulations. Under the project, steps will be taken to improve the consolidation and rationalization of the bus service in the City.

Discussions are ongoing with the SETRAVI to take the following steps:

(a) Achieve coordination between the authorities of the City and the State to address all aspects of the future integration of transport services in the MCMA;
(b) Implement the current policy of phasing-out the old and obsolete public transport fleet, including the gradual retirement of microbuses;
(c) Gradually privatize emission testing requirements for the STE fleet;
(d) Address governance issues through the modernization and professionalization of vehicle inspections;
(e) Complete the studies to improve STE's tariff system; and
(f) Define measures to improve the management and business environment, with the objective of promoting the professionalization of public transport services (see policy matrix).

***c) Modal shift from small and medium-sized vehicles to large public transport units***. During project preparation, discussions are being held with the Transport Authorities, to design measures that would support the long-term modal shift towards an efficient public transport system (bus-metro). Measures that would be initiated include:

(a) Create an enabling regulatory and institutional framework (policy environment) that would facilitate the implementation of public transport corridors integrated with metro lines (component b of the project). (See policy matrix);
(b) Review measures to further restrict cars in the downtown area;
(c) Improve the enforcement of emissions testing;
(d) Develop new parking regulations, including an effective pricing regime;
(e) Identify transport demand management measures;
(f) Formulate a long-term land-use planning strategy, encouraging densification, mixed use, and transit-oriented development. The City authorities are developing plans to guide the urban expansion in its jurisdiction, through densification plans.

Specific time-bound plans for the adoption of these measures, in addition to the timetable included in the regulatory reform matrix, are being adopted by SETRAVI. Their implementation will be further pursued as part of the studies sponsored under the project and the preparation activities for the proposed loan. The GDF as well as the State of Mexico will prior to Board approval of the GEF project, have signed an intention letter confirming the will to undertake necessary actions to formulate and enabling environment for the corridors.

**Policy Matrix for GEF project**

| Issue | Action needed | Impact | Timing in the GEF project cycle |
|---|---|---|---|
| Regional character of public transport corridors, and coordination between | Formulation of an intention letter, confirming the metropolitan nature of | Improved coordination of actions by administrations of the State and the City. | Intention letter is already signed. |

| | | | |
|---|---|---|---|
| the City and State authorities. | the proposed corridors and their integration with the metro. | | |
| Business environment which hinders the development of an efficient public transport system. | Creation of the an enabling regulatory framework that is conducive to efficient public transport operations. | Development of an environmentally and financially sustainable public transport system. | By Py03 |
| Lack of an institutional framework to manage public transport services along the corridors | Development of an institutional framework that fosters efficient public transport operation along the corridors | Efficient public transport services along the corridors, raising their attractiveness to the traveling public. | Intention letter is already signed. The details of the organizational reform will result from the study of options financed by the GEF project. |
| Fare structure does not meet efficiency criteria and discourages intermodal transfers. | Development of an integrated fare strategy for metro and bus services along the corridors. | Modal shift toward large public transport vehicles generating relatively low levels of air pollution. | Intention letter is already signed. The actual fare structure would result from the fare study financed by the GEF project |
| The current structure of bus operations is inefficient and results in unsafe, polluting and unattractive public transport services. | Introduction of modern bidding criteria for bus operation in the corridors; individual operators would be encouraged to join professionally managed consortiums. | Professionally operated bus services, generating economies of scale. The efficiency gains achieved may obviate the need for fare increases. This will strengthen the case for replication in the MCMA. | The actual bidding process will be agreed prior to Board approval of the loan. |
| Suitability of initial public transport corridors. | Identification of best, most replicable corridors to demonstrate effectiveness of concept. | Ensures replicability of pilot corridors. | Initial selection of pilot corridors is already made. |
| Environmental and social impacts of public transport corridors. | Action plans to address any potential environmental and social issues associated with the corridors. | Ensures environmental and social sustainability of the corridors to be built under the loan. | The detailed action plans will be agreed prior to Board approval of the loan |

## 3. Benefits and target population:

***Benefits***

The project is intended to yield the following benefits:

- An improved and more coordinated approach in addressing climate change issues associated to transport and air quality management through a Metropolitan Climate Change Action Plan;
- Adoption of organizational and barrier removal measures to facilitate the implementation of sustainable, climate-friendly transport strategies and implementation of an action plan for non-motorized transport promoting and facilitating their use;
- A comparative field test that demonstrates less polluting, climate friendly transport alternatives. The data from the field test which is anticipated to be of global value for decision making on alternative

transport measures;

- MCMA transport projects incorporate climate change issues in design and operation;
- Increased use 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; and
- Effective project management of climate friendly transport projects.

***Target Population***

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 will result in improvements in health indicators that will benefit the population at large and the most vulnerable groups (children and the elderly).

***Coordination with other implementing agencies***

The proposed project is being coordinated with similar projects under development in Santiago and Lima, through the World Bank and with the GEF-funded (under UNDP), Strategy for Development of Fuel Cell Buses for the developing world. UNDP, New York, 2001. While there are substantial differences between the proposed project and the UNDP executed project, both include a bus test of new technologies and need to be coordinated. This is being done through the STE, which is also the executing agency for the UNDP project.

## 4. Institutional and implementation arrangements:

***Executing Agency***. The executing agency is the SMA.

***Technical Committee.*** SMA will create a Technical Committee, for the purposes of the GEF Project, with the representation of four members: the agencies of GDF, represented by Secretary of SMA and SETRAVI, the State of Mexico, the Federal Government, and the World Resources Institute, which, through the Center for Sustainable Transport will assist in the planning and coordination of the execution of the GEF project. The Technical Committee will meet at least two times per year. The Technical Committee will be in operation by CEO presentation.

The Technical Committee will:

- Guide and support the Project Implementation Unit in the implementation of the Project,
- Support the coordination of the project's activities and of the inputs of the involved agencies,
- Ensure the metropolitan scope of the Project, including inputs, activities and results, as appropriate;
- Advise and facilitate the regulatory adjustments that might be necessary for the implementation of the Project,
- Consider the views of stakeholder and partners concerns and demands,
- Facilitate the supervision activities of the Bank and review the implementation plan and annual report of the project.

The Technical Committee will at all times be equipped and have sufficient resources to carry out its

task. It will be composed by members with experience and qualifications satisfactory to the Bank including one representative of SMA, one representative of SETRAVI, two representatives of Edomex, one representative of UMS, and one representative of Institute of World Environment and Resources Studies. The Technical Committee will make decisions by consensus, whenever possible. In the event of a lack of consensus, SMA will take the decisions, documenting the differences in views and explaining the reasons behind its decision.

***Advisory Board.*** The Technical Committee will be advised by an ad-honorem Advisory Board on technical, scientific and social matters. This Board will be at all times equipped and have sufficient resources to carry out its tasks as proposed by the Technical Committee and in a manner satisfactory to the Bank. It will be composed by members with experience and qualifications as proposed by the Technical Committee and satisfactory to the Bank. The constitution of the Board will be defined by the SMA prior to CEO endorsement.

***Project Implementation Unit.*** The set-up of a Project Implementation Unit (PIU) has already been made. The PIU will work for and report to the SMA and will be the responsible unit within SMA for the implementation of the GEF Project and its requirements. The Project Implementation Unit will coordinate and supervise the implementation of all project activities, report on progress and ensure compliance with all fiduciary requirements. The PIU will at all times be equipped and have sufficient resources to carry out its task and be conformed by members and staffed with personnel in numbers and with experience and qualifications proposed by the Technical Committee and satisfactory to the Bank. Lead institutions for the implementation of each component have been identified (Annex 20). The PIU will benefit from the advice and assistance of the Center for Sustainable Transport.

***Advisory Panel for the Test Protocol.*** An Advisory Panel will be organized to advise the Technical Committee on technical, scientific and social matters related to Part C of the Project, especifically related to the Test Protocol. This panel will be constituted by Board presentation. Such panel will be at all times equipped and have sufficient resources to carry out its tasks as proposed by the Technical Committee and in a manner satisfactory to the Bank. The costs of the panel will be covered under the test protocol. This committee would include world-renowned international and Mexican experts as proposed by the Technical Committee and satisfactory to the Bank. The ultimate responsibility for the execution of the test protocol is with STE.

**Institutional Arrangements** In order to be in full compliance with Bank requirements per OP/BP 10.02, a certified specialist carried out the financial management assessment of the SMA as implementing agency, supported by a technical committee and an administrative unit, which will be responsible as project implementing unit PIU. The institutional capacity of SMA is acceptable to the Bank. The financial agency, Banco Nacional de Obras y Servicios Públicos (BANOBRAS), will provide support to the PIU to ensure timely project readiness. Considering existing FM arrangements, BANOBRAS' experience on financial management and that the procurement assessment reflected that SMA satisfies Bank/GEF requirements on procurement (according annex 6 section A) this project can be presented to the Board.

SMA is taking actions to have a management information system, MIS, which will produce quarterly Financial Monitoring Reports, FMRs, for project management and eventually allow for FMRs-based disbursements. Traditional disbursement methods (SOEs, special commitments and direct payments) will be used until SMA is ready to adopt the new FMS disbursement system.

The financial management assessment, FMA, was based on applicable Bank guidelines focusing on

project's accounting system, internal control, planning, budget and financial reporting system, auditing arrangements and content/format of the new FMRs. The following will be required as effectiveness condition (i) the fully implementation/operation of satisfactory project MIS and reporting readiness (ii) the project manual (iii) a fully operational PIU and (iv) the implementation agreement between BANOBRAS and SMA. These conditions are needed to bring FM to the required level.

**Project Coordination and Management.** BANOBRAS will be the recipient of the grant resources, under a GEF grant agreement. SMA will be the executing agency. The project will be coordinated through a technical committee made up of four members (the City, The State of Mexico, The Federal Government and the WRI). Overall implementation programming and progress will be assigned to the committee, supported by the project PIU, directly, the project coordinator. In addition, the financial administration of SMA and other relevant SMA's areas will provide support as needed. The SMA will house the PIU and disburse resources from a Special Account to be set up at the Central Bank for administration of the grant money.

The Bank and SMA agreed on the format and content of the quarterly FMRs. SMA shall carry out a time-bound action plan acceptable to the Bank for the improvement of its existing systems in order to enable the preparation of those quarterly FMRs before project effectiveness.

SEMARNAT will represent the Federal Government in the Coordination Committee and will also play a role in securing the confirmation of arrangements to involve the Commission of Environmental Cooperation in the financing of the project.

**Disbursement and flow of funds (Special Account):** A Special Account (SA) in US dollars with an initial deposit of US $ 560.000 would be established at the local central bank Banco de México and managed by the financial agency BANOBRAS. This SA will be monthly replenished and will be used for all transactions with a value of less than 20% of the amount advanced to it. Traditional full documentation requirements apply for direct payments, special commitments and statements of expenditures (SOEs). SMA in coordination with BANOBRAS would prepare the necessary documentation for prompt disbursements.

SOEs-based disbursements methodology will be used. SMA will be responsible for overall flow of funds from the SA and through its standard budget. SMA will coordinate all project payments and its records and accounts. BANOBRAS will provide support on Bank financial management procedures to ensure compliance with all agreements and requirements. A complete section on project disbursement and flow of funds will be included in project manual. The SMA will establish a project account in local currency to be used only for project implementation and following SMA's requirements for its standard budget. This account will be managed in line with existing policies, procedures and controls.

**Auditing**. SMA will maintain the records, accounts, files and project documentation, and will produce standard financial statements according to International Accounting Standards (IAS). Project operations will be audited on annually basis in accordance with generally accepted auditing standards (compatible with International Standards on Auditing ISAs and satisfactory to the Bank) and procedures consistently applied, by an independent and qualified auditor (based on applicable Bank guidelines and TOR for auditing). The audit and financial statements will be submitted to the Bank four months after the end of the fiscal year. After one year of operation of the Project, said date for submission of audit and financial statements will be reviewed and reexamined on the basis of the experience. The Contraloría General del Gobierno del Distrito Federal and SMA's internal auditor will coordinate with implementing agency SMA and BANOBRAS the annual audits. A section providing details on auditing will be included in

project manual.

Frequency of financial management supervision missions proposed. Financial management reviews of project arrangement will be carried out to evaluate needed adjustments in project implementation arrangements. Frequency as required by the project but at least once a year starting second implementation year. First implementation year one supervision mission every six months will be carried out by the Financial Management Specialist in coordination with project team.

***Progress to Date in Project Preparation***

The objectives to be achieved by the project have been identified as priorities in the Air Quality Management Program for MCMA (AQM-III) (2002-2010), the Integrated Transport Program (2002-2006), the General Urban Development Program (2002-2006) and finally the Environmental Program (2002-2006).

SMA, SETRAVI and STE, which have been involved from the beginning in the process of preparing and supervising the implementation of the PDF-B studies, have expressed their commitment to allocate enough resources in the next fiscal year to ensure the funding of the project baseline. The Grant will be channelled through BANOBRAS, which in turn will, under the terms of a subsidiary agreement, pass on the resources to the SMA.

The project was prepared by SMA. Results of the relevant studies funded through a PDF-B grant and a PHRD grant have been integrated into the project design.

The PDF-B supported two types of studies:

a) assessment of the global nature of the air quality issues in the MCMA; and

b) assessment of specific alternatives 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. 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 modernization of the transport sector and the introduction of new technologies. For the activities under the energy rubric (solar water heaters, energy efficiency) the studies revealed that these measures are economically competitive today and that barriers impeding further progress are related to those common to introduction of new measures (perception of risks, lack of information). Still, the authorities have decided to focus on the transport sector which is by far the largest contributor of GHG as the studies have confirmed and where a modal shift has the largest potential for significant reductions.

The Shell Foundation through the World Resources Institute and the Center for Sustainable Transport have confirmed their technical and financial assistance and their support to facilitate private sector participation. In addition, the project has the support of the federal government.

A key element of this program is the active participation of the private sector manufactures of vehicles and fuels. These will be used to test both new fuels and vehicles, both for emissions and overall acceptability by passengers, drivers, and operating companies. Major vehicle companies -- Volvo, Scania, International, and Freightliner (Mercedes, i.e., Daimler Benz) have agreed to provide test buses. These agreements will be documented by SMA. The private companies will also be active participants in the analysis and stakeholder dialogues related to policy development and implementation. Since this is the first program designed to integrate transport and air pollution strategies over the long term, such companies must play an active role in developing successful strategies.

## D. Project Rationale

### 1. Project alternatives considered and reasons for rejection:

An alternative considered but not pursued consisted of the GEF project being a component of the proposed loan. This was not a viable alternative on account of the need for the GEF funded studies to take place well before the loan could be processed. The GEF-funded studies facilitate the review of options to enable the environment conducive to the adoption of the proposed transport corridors. Without this phasing, it would not be possible to pursue the corridors option at the time the loan would be in place.

Bus technologies considered for inclusion in the test, involved many options. However, at the end only the Diesel, CNG, and Hybrid options were considered because: (a) diesel constitutes the baseline (option that would be in place without GEF funding), (b) CNG constitutes an option with strong political approval and some field experience, (c) hybrid-diesel constitutes a robust option in terms of potential reductions in emissions of greenhouse gases. Options discarded included: LPG because of decisions to control fugitive emissions from LPG in the MCMA.

There are different approaches for reductions in GHG emissions from the transport sector such as: reducing fuel usage per passenger-vehicle, shifting to lower-carbon energy sources, shift people to lower-emitting modes and to reduce travel altogether. The proposed project supports measures and policies to promote a modal shift in the transport sector of the Metropolitan area (from one based on an increasing share of small, gasoline-based vehicles to a system based on high capacity, fuel efficient and low carbon emitting vehicles, running along transport corridors and linked and integrated with the Metro system).

However, to make these gains possible, it is necessary to ensure that an enabling environment is adopted (climate friendly policies and measures as part of the sector policies). First, the project seeks the integration of urban planning, air quality management and sustainable transport planning strategies into the development, evaluation and monitoring of a Metropolitan Climate Change Action Plan. Second, the project aims at facilitating the implementation of sustainable transport strategies (i.e. corridors) through the definition of economic incentives, the improvement of the regulatory system and finally the support of the removal of barriers and organizational measures. Third, from a global perspective there is a need to provide field data on the new vehicles and compare it with performance information for baseline alternatives. The project fills this need through the undertaking of a comparative field test between the hybrid vehicle, CNG and modern diesel buses. Fourth, the project provides technical assistance, capacity building and training to incorporate climate and environmental considerations in the design of transport projects and to support the mentioned field test. Finally, a public campaign will be designed outlining the advantages and objectives of transport corridors as well as the benefits from the use of

high capacity vehicles and non-motorized modes of transport and the related technical information will be disseminated.

**2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).**

| Sector Issue | Project | Latest Supervision (PSR) Ratings (Bank-financed projects only) | |
|---|---|---|---|
| | | Implementation Progress (IP) | Development Objective (DO) |
| **Bank-financed** | | | |
| Environmental protection and natural resource management, strengthening institutional and policy framework | Mexico Environmental Project | S | S |
| Environmental investments, strengthening institutional capacity on the state and municipal level | Mexico Northern Border | S | S |
| Conservation and natural resource management of protected areas | Mexico Protected Areas (GEF) | | |
| Regulatory framework and institutional strengthening | Mexico Air Quality I | S | S |
| Strengthening institutional, technical, administrative and regulatory capacity and improving solid waste services | Mexico Solid Waste Management II | S | S |
| Municipal infrastructure and capacity building | Mexico Water and Sanitation II | S | S |
| Small scale municipal infrastructure, institutional strengthening | Mexico Decentralization & Rural Development (DRD II) | S | S |
| Institutional Strengthening | Mexico: PROMAD | | |
| Environmental Sustainable transport | Santiago's Air Quality and Transport Project (Chile - GEF) | | |
| Urban transport and institutional strengthening | Bogota Urban Transport Project | HS | HS |
| Urban transport and institutional strengthening | Lima Urban Transport | | |
| Urban transport | Urban Transport Medium Cities (Mexico) | | |
| Urban Transport | Venezuela Urban Transport | | |
| **Other development agencies** | | | |
| United Nations Development Program UNDP-GEF | Demonstration Project of Hydrogen Fuel Cell Buses and an Associated System for Hydrogen Supply in Mexico City | | |
| Inter-American Development Bank (IDB) | Water supply and Management in ZMVM (in preparation) | | |
| Inter-American Development Bank (IDB) | Water and Sanitation in Rural Areas (in preparation) | | |

| | | | |
|---|---|---|---|
| German Cooperation (GTZ) | Decentralization of Solid Waste in Mexico DF | | |
| German Cooperation (GTZ) | Industrial Waste and Hazardous Waste in Mexico DF | | |
| German Cooperation (GTZ) | Environmental Technology for Small-sized Industry | | |
| German Cooperation (GTZ) | Air Quality Mexico DF | | |
| Japan OECF | Water supply and Sewerage in Guadalajara | | |
| Japan OECF | Mexico DF Sanitation Project | | |
| Japan OECF | Mexico City Sulfur dioxide Emission Reduction | | |

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

## 3. Lessons learned and reflected in the project design:

The Bank has a long-standing involvement in the sector of Air Quality Management. The first project in the MCMA was approved in 1992. The objective of this project (just closed) was to support a comprehensive program to reduce transport generated air pollution in the MCMA. This project was followed by the provision of technical assistance in the formulation of the AQM-III. The implementation of the first quality project offers a valuable experience on which to base the proposed GEF-funded operation. The project was satisfactorily completed and an ICR (Implementation Completion Report) has been issued. Some of the lessons learned during its implementation, that have been incorporated in the project design, include:

***Air pollution is a long-term problem that requires a long-term response***

The Mexican Government has recognized the need for a long term strategy to address the issues caused by air pollution (PICCA and PROAIRE see acronyms table) and accordingly has 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 needs 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 need to be set, to guide removal of barriers and promote short-term measures.

***Planning for the long-term, however, requires flexibility***

Previous experience has shown that, despite the best planning efforts in the preparatory stage, required adjustments in air quality management activities will only become evident during their implementation.

***Wide participatory approach to air quality management***

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. To accomplish this, it is necessary to gain public confidence and support for the program activities. There is also a need to build consensus among all stakeholders over the identification of priority measures. The effectiveness in carrying out and monitoring the agreed priority measures needs to be determined in a participatory approach, with the input of all stakeholders. Commitment from the Mexican government to publish environmental audits annually to promote the achievements of the clean air programs, as well as to improve institutional transparency is vital. Such audits could help promote local ownership and full support from the highest levels of Government.

***The Bank's involvement should continue to be used for its catalytic effect***
The World Bank should continue to catalyze the involvement and the participation of development banks and agencies, the private sector, NGO's and foundations and research and training centers. The Bank should work to mobilize technical and financial support from international environmental agencies and to organize study tours to cities with experience in modern transport strategies. The project will support a dissemination effort 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. In the recently closed Bogota Urban Transport Project (1996-2002), the Bank was closely improved in the design and implementation of the successful transmilenio bus system. Important aspects of this experience could be replicated in and adapted to the MCMA transport system.

### 4. Indications of borrower and recipient commitment and ownership:

SMA and STE helped identify the project at the beginning of 1999, and has actively participated in the preparation and supervision of the on-going preparatory study, funded by a GEF PDF-B grant. SETRAVI, the city executive agency in charge of transport, has stated its interest and high level of priority attached to the project. The federal, state and city authorities under CAM support the project. The project document has been drafted with the participation and clearance of the SMA, SETRAVI and STE and the log frame was developed during a two day session with all the implementing agencies.

### 5. Value added of Bank and Global support in this project:

Test: The Bank involvement brings a global experience with air pollution and transport issues and its linkage with global concerns. The policy dialogue with the environmental authorities banks on extensive expertise at the Bank on the subject. The involvement of the Bank/GEF in the proposed project provides an opportunity to support a critical effort by the Government of Mexico to (a) improve the environmental performance of the transport sector, (b) improve global environmental quality through the reduction of greenhouse gases, and (c) partly reduce dependence on high-carbon fuel-generated energy. Bank involvement has made possible the sharing of its broad experience in air quality and transport and adapting it to Mexican conditions. GEF involvement is critical to catalyzing local willingness to test and demonstrate hybrid bus technology.

## E. Summary Project Analysis (Detailed assessments are in the project file, see Annex 8)

### 1. Economic (see Annex 4):

○ Cost benefit NPV=US$ million; ERR = % (see Annex 4)
○ Cost effectiveness
● Incremental Cost
○ Other (specify)

For the incremental costs of the project see Annex 4

### 2. Financial (see Annex 4 and Annex 5):

NPV=US$ million; FRR = % (see Annex 4)

As the project focuses on studies and policy reforms to remove barriers for instituting a modal shift and provide better information for decision making, most of the financial analysis will be done as part of the

project. This will include a financial analysis of options for a business structure for the integration of the bus corridors including factors such as the system of business organization, the concessions for specific bus line operations and the structuring of integrated fares. In addition, a financial analysis will be done to determine the viability of the different bus technology options in light of the operational performance and cost information provided by the field test.

Fiscal Impact:

No tangible fiscal impact is anticipated.

**3. Technical:**

- Corridors: The initial selection of the corridors has been done as part of project preparation and before board approval. The design of the two selected metropolitan corridors will be done as part of project preparation for the proposed loan, under a PHRD grant. The outcome of this transport corridor study will be the identification of low pollution alternatives for integrated public transport, the estimate of transport demand and the modelling of associated environmental impacts, the estimate of costs of a proposed transport corridor, the environmental and social assessment, the economic analysis, the safety audit, the business framework, the implementation action plan and the preparation of bidding documents. It will be timed so as to allow the activities of the GEF project to be coordinated with the design.

  To sum up, the preparation activities by source of funding are as follows:

  a) German Trust Fund: Identification of Corridors;
  b) PHRD: Design of corridors;
  c) GEF project: Definition of the enabling environment for corridor operation; and
  d) IBRD loan: Implementation of corridors

- Field Test: As part of project preparation the protocol for the field test will be prepared before negotiations. Among the issues to be addressed are: *Fleet size:* A statistical assessment was performed, estimating that it would take 3-4 buses per technology option to provide a robust test that can be used for decision making. *Testing protocols:* The protocols for testing the emissions and monitoring the operational performance will be determined as part of the feasibility studies. These will be completed in consultation with the private sector parties involved in the field test.

**4. Institutional:**

SMA and STE, formulated the current structure of the project in early 2002, based on the results of the work sponsored under the PDF-B.

4.1 Executing agencies:

Secretaría de Medio Ambiente (SMA) under terms of a subsidiary agreement with BANOBRAS.

4.2 Project management:

4.3 Procurement issues:

4.4 Financial management issues:

None

**5. Environmental:** Environmental Category: C (Not Required)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including

consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

The project will focus on climate change-related policy and regulatory reform and the development of a Metropolitan Climate Change Action Plan. In addition, there will be a comparative field test of buses. The field test will involve established routes, will not require any new works and therefore will not involve resettlement and the only environmental issues are related to standard maintenance of the vehicles, such as disposal of waste oil. Therefore no safeguard policies are triggered. In order to ensure that the environmental benefits of the project are maximized in the short and long term, the policy reform and field test, including the chosen routes for the field test and transport corridors, will be based on an extensive characterization of the airshed of the Mexico City Metropolitan Area and assessment of environmental impact of transport policy options done under the WB environment sector work.

5.2 What are the main features of the EMP and are they adequate?

Not required.

5.3 For Category A and B projects, timeline and status of EA:
Date of receipt of final draft:

5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?

5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

Yes. The Test Protocol will be the indicator.

**6. Social:**

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

6.2 Participatory Approach: How are key stakeholders participating in the project?

During project preparation and as part of the activities sponsored through the PDF-B, the Government organized a transport group with participation of transport companies, users, vehicle and fuel manufacturers as well as regulatory agencies and transport and environment institutions. The output of these consultations were fed into the processing of the AQM-III and resulted in the formulation of transport priorities under the Air Quality Management Plan. A key priority identified by the transport working group and later validated by the CAM was the suggested transport corridors. In addition, the transport companies have played an important role in the formulation of the project, they are being consulted regarding the development of a business model for the operation of the corridors and they will participate actively in the review of the results. These agencies and groups have participated in discussions leading to the conceptualization of the project.

The Center for Sustainable Transport (CST) constitutes a highly visible opportunity for further involvement of stakeholders in Mexico. The CST was launched on June 1, 2002 with participation of key stakeholders in air quality management, climate change and transport.

Other important stakeholders, such as the secretaries of finance, technical and planning agencies, citizen groups and others will be engaged through meetings and discussions during preparation of the project.

The transport operators and users are being consulted in each action taken for development of the corridors. A public awareness campaign is being developed through the CST. Transport operators and bus manufacturers have been contacted and are part of the consultations strategy for implementation of the corridors. Through the technical committee, the different institutional stakeholders as well as the transport operators and users will be consulted. Their views will be considered and incorporated during project implementation.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

See Annex 14

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

6.5 How will the project monitor performance in terms of social development outcomes?

Performance will be we monitor through the project performance report and Bank supervision as described in Annex 1

**7. Safeguard Policies:**

7.1 Do any of the following safeguard policies apply to the project?

| Policy | Applicability |
|---|---|
| **Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)** | ○ Yes ● No |
| **Natural Habitats (OP 4.04, BP 4.04, GP 4.04)** | ○ Yes ● No |
| **Forestry (OP 4.36, GP 4.36)** | ○ Yes ● No |
| **Pest Management (OP 4.09)** | ○ Yes ● No |
| **Cultural Property (OPN 11.03)** | ○ Yes ● No |
| **Indigenous Peoples (OD 4.20)** | ○ Yes ● No |
| **Involuntary Resettlement (OP/BP 4.12)** | ○ Yes ● No |
| **Safety of Dams (OP 4.37, BP 4.37)** | ○ Yes ● No |
| **Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)** | ○ Yes ● No |
| **Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)*** | ○ Yes ● No |

7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

## F. Sustainability and Risks

### 1. Sustainability:

Successful adoption of an integrated Metropolitan Climate Change Action Plan for the transport sector, harmonized with Air Quality, Transport and Urban Plans facilitates the sustainability of the climate change agenda in the MCMA in the long-term and commits agencies involved in the Metropolitan Climate Change Action Plan after the project. Successful adoption of organizational and barrier removal measures facilitates the implementation of sustainable, climate-friendly transport strategies and creates a sustainable institutional and technical framework. Successful implementation of an Action Plan for non-motorized transport -to promote the bicycle use- increases the attractiveness and the safety of the use of non-motorized transport. Successful field test demonstrates less polluting, climate friendly transport alternatives and makes it feasible to provide this information to other Latin American cities. Completion of technical assistance, capacity building and training activities leads to incorporation of climate and environmental considerations in the design of transport projects and to support of the field test of climate friendly transport systems. Successful design of public campaign and of dissemination of related technical information leads to increased use of high capacity vehicles, non-motorized modes of transport as well as increased public awareness of transport corridors and climate friendly technologies. The strong commitment from State and City Authorities and the integral character of the proposals as part of the Air Quality Management Plan provide the required wide support to ensure sustainability.

While the development of an enabling environment for the adoption of transport corridors and promotion of a modal shift is a very local issue (depending on local conditions), the process to be followed will be of interest to other large metropolitan areas. In this context, the project has a value added. Also, the test for the alternative bus technologies will be designed and implemented in a manner that will allow for wide-use of the information.

### 2. Critical Risks (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

The table below includes the risk that the World Bank loan supporting the construction of the corridors may not materialize. It is clear, however, that the City is financially capable of investing in an infrastructure project of this magnitude, and that it could build the corridor without the future involvement of the Bank. Actions to initiate the design have already started, sponsored by the Bank through German and PHRD grants and counterpart resources.

There is a strong Government commitment to implement the corridors, and these have been incorporated as part of the key measures to be carried out under the recently approved transport and environmental plans. The environmental metropolitan authorities (State and City), as well as the federal government (SEMARNAT and the Health Secretary) have confirmed their commitment to the implementation of the corridors under the Third Air Quality Management Program for the MCMA (AQM-III 2002-2010). In addition, the Transport Secretariat strongly expressed its interest in the strategic corridors, within the framework of the Comprehensive Transport Plan (2002 – 2006). Both programs have been developed in a coordinated manner by the agencies involved.

The AQM-III indicates that the implementation of public transport corridors aims to promote a modal shift to high capacity vehicles by facilitating the integration of new busways with the metro system. A typical corridor project includes three components: a) at least one busway and the restructuring of road-based public transport in the corridor; b) the upgrading of transfer terminal(s) between metro and bus; and c) improvements to the metro line. The intended benefits include shorter travel times for passengers, better performance and reduced operating costs of public transport providers, and less pollution – to be achieved through increased metro use, restructured road-based public transport, and

improved administrative and legal arrangements.

Both programs guarantee that the corridor-related studies financed by the GEF project will be followed up by the authorities concerned.

| Risk | Risk Rating | Risk Mitigation Measure |
|---|---|---|
| **From Outputs to Objective** | | |
| 1.- Political support for the Metropolitan Climate Change Action Plan | M | Sector work has focused on development of an integrated plan. Under the project, technical assistance and policy dialogue will be continued. |
| 2.- Institutional commitment to framework | S | Key measures have been identified under the Air Quality Plan. Plan has been endorsed by key stakeholders in government. |
| 3.- Political and public acceptance of field test results | M | Protocols and technical assistance. Participation of the advisory board (MIT, U of Berkeley, U of Toronto and UWV) will ensure scientific support and credibility. |
| 4.- Technical support from the responsible agencies | M | Sector agencies have been and will continue to be involved in the design of the project. The private sector has expressed its interest to participate. |
| 5.- Public acceptance of promoted measures | S | Activities under public awareness and dissemination. Through a public campaign design, the stakeholders are going to be provided with the technical information and the project progress report. |
| 6.- World Bank loan does not materialize | M | The City and the State could finance corridors from other international funding sources, and the dialogue with the Bank would continue under the GEF project. |
| 7.- Effective collaboration between the City and the State | S | Continued involvement of outside agencies, including the Bank and the World Resources Institute, will help the coordination by the two jurisdictions. |
| 8.- New investments in infrastructure that are not integrated with the development of the corridors | M | Policy dialogue with transport agencies and priority being assigned to the corridors. |
| 9.- Agreement with the private sector on bus and fuel specifications is not promptly secure | M | Private sector is being involved in the design of the protocol. Negotiations are well advanced. |
| **From Components to Outputs** | | |
| Cooperation of involved agencies and availability of counterpart funds | M | Sector and technical agencies have indicated their willingness to participate. |
| Willingness of private sector to participate | M | The private sector has expressed support for the project. |
| Effective project management | N | The involved agencies have expressed their commitment to work in coordination. |

| | | |
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| | | |
| **Overall Risk Rating** | M | |

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

**3. Possible Controversial Aspects:**

## G. Main Conditions

### 1. Effectiveness Condition

The following activities are specified as additional conditions to the effectiveness of the GEF Trust Fund Grant:
(a) Operational Manual has been issued and put into effect;
(b) PIU, Technical Committee, Advisory Board and Advisory Test Protocol Panel have been established and are operational;
(c) Subsidiary Agreement has been entered into by the Recipient and DF;
(d) DF's financial management system is fully operational as stated in the Bank's financial management assessment of DF's financial management system dated July 22, 2002;
(e) Terms of Reference (satisfactory to the Bank) for the auditors referred to in Grant Agreement have been prepared by the Recipient through the DF;
(f) (i) UMS has furnished to the Bank a legal opinion satisfactory to the Bank, of SEMARNAT counsel acceptable to the Bank, showing that, on behalf of UMS, the Grant Agreement has been duly authorized or ratified by, and executed and delivered on behalf of, UMS and is legally binding upon UMS in accordance with its terms; and (ii) DF and the Recipient have each furnished to the Bank a separate legal opinion satisfactory to the Bank, of counsel acceptable to the Bank, showing that, on behalf of DF and the Recipient, respectively the Subsidiary Agreement has been duly authorized or ratified by, and executed and delivered on behalf of, DF and the Recipient, respectively, and is legally binding upon DF and the Recipient, respectively, in accordance with its terms.

**2. Other** [classify according to covenant types used in the Legal Agreements.]

## H. Readiness for Implementation

☐ 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.
☒ 1. b) Not applicable.

☒ 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.
☒ 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.

☐ 4. The following items are lacking and are discussed under loan conditions (Section G):

## I. Compliance with Bank Policies

☒ 1. This project complies with all applicable Bank policies.
☐ 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

| | | |
|---|---|---|
| Walter Vergara | John Redwood | Olivier Lafourcade |
| **Team Leader** | **Sector Director** | **Country Manager/Director** |

## Annex 1: Project Design Summary

## MEXICO: Introduction of Climate Friendly measures in Transport

| Hierarchy of Objectives | Key Performance Indicators | Data Collection Strategy | Critical Assumptions |
|---|---|---|---|
| **Sector-related CAS Goal:** | **Sector Indicators:** | **Sector/ country reports:** | **(from Goal to Bank Mission)** |
| Environmental agenda: Promotion of institutional development, | -Improved capacity of local and national institutions. | Sector Work (World Bank) | Macroeconomic stability |
| decentralization of environmental management, | -Increase in number of environmental projects initiated by local institutions. | Sector Work (World Bank) | Political acceptance |
| mainstreaming of global issues, climate change. | -Increase in number of government policies that incorporate climate change issues. | Sector Work (World Bank) | |

| | | | |
|---|---|---|---|
| **GEF Operational Program:**<br><br>**OP 11**<br>Promoting environmentally sustainable transport<br>Specific objective: reduce GHG emissions from urban and surface transport sources in recipient countries by facilitating recipient countries' commitment to adopt sustainable low-GHG transport measures, and disengagement from unsustainable measures common in many parts of the world. | **Outcome / Impact Indicators:**<br>- Identification of low-GHG transport measures.<br><br>- Improved sustainability of the transport sector. | Transport sector reports<br><br>Greenhouse gas emission inventories | Government remains committed to promoting the adoption of low-GHG emitting transport options. |
| **Global Objective:**<br><br>**Project Development Objective:**<br>The project development objective is to contribute to the adoption of policies and measures that will assist in a long-term modal shift to climate-friendly, more efficient and less polluting, less carbon intensive transport in the MCMA. | **Outcome / Impact Indicators:**<br>Comp. 1. Urban, transport and air quality plans and planning processes harmonized. Adoption and initiation of Metropolitan Climate Change Action Plan and associated measures by the end of PY2.<br><br>Comp. 2. Identification of organizational and barrier removal measures (enabling environment) to facilitate the implementation of sustainable, climate friendly transport strategies by the end of PY2 and Design of an Action Plan for non-motorized transport by mid PY2.<br><br>Comp. 3. Field test demonstrates less polluting, | **Project reports:**<br>1. Supervision Reports, Agency Reports by Key agencies, Project Progress Report. Metropolitan Climate Change Action Plan<br><br>2. Project Progress Reports (SETRAVI)<br>Action Plan for non-motorized transport<br><br>3. MCMA Transport Project Reports (STE), Project Progress Report, Supervision Report, | **(from Objective to Goal)**<br>Commitments of agencies involved in CAP continue after the project<br><br>Sustainability of institutional and technical framework<br><br>Continuity of incorporation of climate change issues into transport projects<br><br>Continuity of public awareness campaign and dissemination<br><br>Climate friendly measures for transport sector are institutionally, technically and financially feasible in other Latin American cities<br><br>Measures lead to modal shift to low GHG emitting transport |

| | | | |
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| | climate friendly transport alternatives; Decisions made on alternative transport based on data from field tests by the end of PY3.<br><br>Comp. 4. MCMA transport projects incorporate climate change issues in design and operation by the end of PY4.<br><br>Comp. 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 by the end of PY5.<br><br>Comp. 6. Effective Project Management team established adequate for use in future operations. | Evaluation Report Action Plan on Use of the Information from the Test.<br><br>4. Supervision Report, Project Progress Report (SETRAVI/SMA)<br><br>5. Supervision Report, Project Progress Report and Public Awareness Survey | |
| **Output from each Component:** | **Output Indicators:** | **Project reports:** | **(from Outputs to Objective)** |
| Component 1:<br>-Harmonization of sector strategies on air quality issues and Integrated Climate Action Plan (CAP) for the MCMA | 1.1. Calibration of urban development models linked to the process of transport and air quality planning and review on Air Quality, Urban and Transport Plan including gaps and overlaps analysis as basis for their harmonization completed by mid PY2. Review of the Land Use and travel forecasting models in use in MCMA and of model | -Review report on Air Quality, Urban and Transport Plan including gaps and overlaps analysis<br>- Metropolitan Climate Change Action Plan | Political support for CAP |

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| | interactions of transport activity with land use by mid PY2.<br><br>1.2. Harmonization of Air Quality, Urban and Transport Plans completed by the end of PY1.<br><br>1.3. Metropolitan Climate Change Action Plan completed by the end of PY2 and be updated routinely during the duration of the project. | | |
| Component 2:<br>Definition of an enabling environment to facilitate the implementation of sustainable transport strategies | 2.1. Definition of an institutional framework for the corridors including the integration of the metro and the bus transport by the end of PY1. Design of an Origin/Destination Survey by the end of PY2.<br><br>2.2. Initiation of a reform of bus regulations in the corridors by the end of PY1.<br><br>2.3. Definition of business and management structures for operating the bus corridors by the end of PY1.<br><br>2.4. Identification of measures to promote metro rider-ship by the end PY1.<br><br>2.5. Action Plan for non-motorized options by the end of PY2. | -Institutional Framework<br>-Origin/Destination Survey Design<br>- Business structure report<br>- Report on metro rider-ship promotion measures<br>- Action Plan for non-motorized transport | Institutional commitment to framework |
| Component 3:<br>Field Test of Climate-Friendly high capacity vehicles | 3.1. Protocol Manual by the end of PY1.<br>Field test produces statistically robust results that can be used for decision making by end of | -Protocol manual<br>- Framework for evaluation for alternative vehicle options | Field test results have political and public acceptance |

| | | | |
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| | PY3. Framework for evaluation of alternative vehicle options (ASIF) developed and applied by the end of PY2. | | |
| Component 4: Incorporation of climate change and air quality considerations in the design and analysis of transport strategies | 4.1. Completion of legal review for SETRAVI by the end of PY2.<br><br>4.2. Perform analyses of benefits, costs (additionalities), of sustainable transport project completed by the end of PY3.<br><br>4.3. Perform analysis of environmental impacts of sustainable transport project completed by the end of PY3.<br><br>4.4. Perform analysis of climate impact assessments of sustainable transport project completed by the end of PY3.<br><br>4.5. Development of methodologies for measurement and verifications of emissions from public ground transport and its competitors by the end of PY1.<br><br>4.6. Provision of training to bus operators, mechanics, and maintenance staff to ensure that the testing vehicles are well operated and maintained completed by the end of PY1.<br><br>4.7. Review and development of standards | - Project supervision Report<br>- Project Progress Report | Availability of supporting technical infrastructure |

| | | | |
|---|---|---|---|
| | and regulations proposals to be applied in the Metropolitan Area by the end of PY2.<br><br>4.8. Provision of training and support to SETRAVI's staff for contracting and coordinating market studies on the technology required for buses completed by the end of PY2.<br><br>4.9. Training of officials and staff of UMS, Edomex, DF, companies that manufacture the buses and transport operators, academics and NGO's on the climate action plan completed by the end of PY4. | | |
| Component 5:<br>Public awareness and dissemination | 5.1. Technical information produced by the project collected and integrated till the end of the project<br><br>5.2. Public Campaign designed by the end of PY3<br><br>5.3. Dissemination Plan on the basis of the technical information produced by the project by the end of the project<br><br>5.4. Promotion and Financing of workshops and stakeholder meetings by the end of the project | -Technical information material<br>- Dissemination Plan<br>- Public campaign design<br>- Project Progress Report | Public acceptance of promoted measures<br>Provision of technical information of the project |
| Component 6:<br>Project Management | 6.1. Project implementation unit in operation in the first quarter of PY1.<br><br>6.2. Completion of project activities.<br><br>6.3. Evaluation of results of the project by the end of | -Supervision Reports<br>-Project Progress Reports | Effective Project Management |

| | | | |
|---|---|---|---|
| | the project. | | |
| **Project Components / Sub-components:** | **Inputs: (budget for each component)** | **Project reports:** | **(from Components to Outputs)** |
| 1.0: Harmonization of sector strategies on air quality issues and Integrated Climate Action Plan<br>1.1: Calibration of Plans<br>1.2: Harmonization of Plans 1.3: Metropolitan Climate Change Action Plan<br><br>2.0: Definition of an enabling environment to facilitate the implementation of sustainable transport strategies<br>2.1:Institutional framework including integration of metro and bus transport<br>2.2: Reform of bus regulations in the corridors<br>2.3: Business and managing structure for operating the bus corridors<br>2.4: Measures to promote metro rider-ship<br>2.5 Action Plan for non-motorized options<br><br>3.0: Field test of Climate-Friendly High Capacity Vehicles<br>3.1: Comparative Field Test for alternative bus and fuel technologies<br><br>4.0: Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies | 1.0: US$ 0.8 million (with US$ 0.4 million GEF grant)<br><br>1.1: US$0.185 (A*: US$0.065; B*:US$0.05)<br>1.2: US$0.045 (A: US$0.015; B:US$0.002)<br>1.3.: US$0.57 (A: US$0.32; B: US$0.013)<br>2.0: US$ 4.8 million (with US$ 2.9 million GEF grant)<br>2.1: US$ 1.86 million (A: US$1.33; B: US$0.14)<br>2.2: US$ 0.56 million (A: US$0.29)<br>2.3: US$ 1.6 million (A:US$1.15;B:US$0.27)<br>2.4: US$ 0.25 million (A:US$0.1)<br>2.5: US$ 0.53 million (A: US$0.03; B: US$0.23)<br><br>3.0: US$ 4.8 million (with US$ 1.6 million GEF grant)<br>3.1: US$ 4.8 (A: US$1.5; B: US$0.045; C: US$0.1)<br><br>4.0: US$ 0.8 million (with US$ 0.4 million GEF grant)<br><br>(A: US$ 0.4; C*: US$0.17) | Progress, disbursement, audit and supervision reports | Cooperation of involved agencies<br><br>Willingness of private sector to participate<br><br>Availability of counterpart funds<br><br>Effective project management |

| | | | |
|---|---|---|---|
| 5.0: Public Awareness and Dissemination<br>5.1: Collection and integration of produced information by the project<br>5.2: Design of public campaign outlining the advantages and objectives of transport corridors as well as the benefits from the use of high capacity vehicles and non-mototized modes of transport<br>5.3: Dissemination of technical information produced by project<br>5.4: Promotion and financing of workshops and stakeholder meeting | 5.0: US$ 0.3 million (with US$ 0.165 million GEF grant)<br>5.1: US$ 0.07 million (A: US$0.06)<br>5.2: US$ 0.05 million (A:US$ 0.01; C: US$ 0.02)<br>5.3: US$ 0.15 million (A: US$ 0.085; B: US$0.01; C: US$ 0.045)<br>5.4: US$ 0.03 million (A: US$0.01; C: US$0.005) | | |
| 6.0: Project Management<br>6.1: Implementation of the project<br>6.2: Operation of activities<br>6.3: Final evaluation | 6.0 US$ 0.7 million (with US$ 0.435 million GEF grant)<br>6.1: US$0.15 million (A: US$0.1; B: US$0.025)<br>6.2: US$ 0.4 million (A: US$0.235; B:US$0.125) 6.3: US$ 0.15 million<br>(A: US$0.1; B: US$0.03) | | |

# Annex 2: Detailed Project Description

# MEXICO: Introduction of Climate Friendly measures in Transport

## By Component:

### Project Component 1 - US$0.80 million

### GEF Contribution: US$0.4 million

| Comp. | Description | Specific objectives | Activities | Total Cost total (USD) | GEF (USD) | GDF (USD) | WRI | Others |
|---|---|---|---|---|---|---|---|---|
| 1 | Harmonization of sector strategies on air quality issues and Integrated Metropolitan Climate Change Action Plan for Transport in the MCMA | 1.1 Calibration of Plans | 1.1.1 Review of plans | $60,000.00 | $40,000.00 | $20,000.00 | | |
| | | | 1.1.2 Calibration of plans | $125,000.00 | $25,000.00 | $50,000.00 | $50,000.00 | |
| | | 1.2 Harmonization of Plans | 1.2.1 Workshop (Integration and Harmonization of plans) | $45,000.00 | $15,000.00 | $28,000.00 | $2,000.00 | |
| | | 1.3 Metropolitan Climate Change Action Plan | 1.3.1 Design of Metropolitan Climate Change Action Plan | $160,000.00 | $100,000.00 | $60,000.00 | | |
| | | | 1.3.2 Consultation to key stakeholders | $30,000.00 | $5,000.00 | $22,000.00 | $3,000.00 | |
| | | | 1.3.3 Public consultation | $30,000.00 | $5,000.00 | $15,000.00 | $10,000.00 | |
| | | | 1.3.4 Final presentation of Metropolitan Climate Change Action Plan to key | $20,000.00 | $0.00 | $20,000.00 | | |
| | | | 1.3.5 Monitoring (Actualization) of Metropolitan Climate Change Action | $330,000.00 | $210,000.00 | $120,000.00 | | |
| **Total** | | | | $800,000.00 | $400,000.00 | $335,000.00 | $65,000.00 | $0.00 |

### Project Component 2 - US$4.80 million

### GEF Contribution: US$2.9 million

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | Definition of an enabling environment to facilitate the implementation of sustainable transport strategies | 2.1 Institutional Framework including integration of metro and bus transport | 2.1.1 Analysis of institutional and commercial barriers | $130,000.00 | $100,000.00 | $30,000.00 | | |
| | | | 2.1.2 Definition of institutional framework for the operation of the corridors | $150,000.00 | $60,000.00 | $90,000.00 | | |
| | | | 2.1.3 Elaboration of a program proposal for the corridors | $1,180,000.00 | $1,010,000.00 | $170,000.00 | | |
| | | | 2.1.4 Design of an Origin/Destination Survey | $400,000.00 | $160,000.00 | $100,000.00 | $140,000.00 | |
| | | 2.2 Reform of bus regulations in the corridors | 2.2.1 Analysis of regulatory framework including system of quality control of the corridors | $560,000.00 | $290,000.00 | $270,000.00 | | |
| | | 2.3 Business and management structure for operating the corridors | 2.3.1 Analysis of business options for the operation of the corridors (including analysis of incentives and barriers) | $800,000.00 | $460,000.00 | $70,000.00 | $270,000.00 | |
| | | | 2.3.2 Economic and financial assessment of the proposed business | $800,000.00 | $690,000.00 | $110,000.00 | | |
| | | 2.4 Measures to promote metro rider-ship | 2.4.1 Design of promotion for increasing metro rider-ship | $250,000.00 | $100,000.00 | $150,000.00 | | |
| | | 2.5 Action Plan for non-motorized transport | 2.5.1 Analysis of options and conditions for cycle-lanes | $60,000.00 | $0.00 | $20,000.00 | $40,000.00 | |
| | | | 2.5.2 Proposal for a regulatory framework for the security in the use of non-motorized transport | $60,000.00 | $0.00 | $20,000.00 | $40,000.00 | |
| | | | 2.5.3 Identification and evaluation of incentives for the use of non-motorized transport | $60,000.00 | $30,000.00 | $10,000.00 | $20,000.00 | |
| | | | 2.5.4 Diagnosis and analysis of the infrastructure for the transference of motorized to non-motorized transport | $60,000.00 | $0.00 | $20,000.00 | $40,000.00 | |
| | | | 2.5.5 Evaluation of the studies for the application of an action plan for non-motorized transport | $20,000.00 | $0.00 | $0.00 | $20,000.00 | |
| | | | 2.5.6 Design of promotion campaign for non-motorized transport | $270,000.00 | $0.00 | $200,000.00 | $70,000.00 | |
| **Total** | | | | $4,800,000.00 | $2,900,000.00 | $1,260,000.00 | $640,000.00 | $0.00 |

### Project Component 3 - US$ 4.80 million

### GEF Contribution: US$1.6 million

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | Field Test of Climate-Friendly High Capacity Vehicles | 3.1 Comparative Field Test for alternative bus and fuel technologies | 3.1.1 Elaboration of Field Test Protocol | $50,000 | $40,000 | $10,000 | | |
| | | | 3.1.2 Acquisition of goods | $2,400,000 | $0 | $0 | | $2,400,000 |
| | | | 3.1.3 Training | $100,000 | $80,000 | $20,000 | | |
| | | | 3.1.4 Field test | $1,340,000 | $970,000 | $170,000 | | $100,000 |
| | | | 3.1.5 Develop and apply framework for evaluation of alternative vehicle options | $900,000 | $410,000 | $145,000 | $45,000 | $300,000 |
| | | | 3.1.6 Final Report | $10,000 | $0 | $10,000 | | |
| **Total** | | | | $4,800,000 | $1,500,000 | $355,000 | $45,000 | $2,800,000 |

## Project Component 4 - US$0.80 million

## GEF Contribution: US$0.4 million

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies | 4.1 Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies | 4.1 Carrying out of a review of the transport planning regulations of SETRAVI | $20,000 | $5,000 | $15,000 | | |
| | | | 4.2 Analysis of costs - benefits of sustainable transport projects | $240,000 | $140,000 | $100,000 | | |
| | | | 4.3 Analysis of environmental impacts of sustainable transport projects | $150,000 | $65,000 | $15,000 | | $70,000 |
| | | | 4.4 Analysis of climate change impact assessments of sustainable transport projects | $100,000 | $70,000 | $30,000 | | |
| | | | 4.5 Development of methodologies for measurement and verification of emissions from public ground transport | $150,000 | $50,000 | $15,000 | | $85,000 |
| | | | 4.6 Training to bus operators, mechanics, and maintenance staff | $20,000 | $10,000 | $10,000 | | |
| | | | 4.7 Review and development of emission standards and transport regulations proposals to be applied in Metropolitan Area | $50,000 | $15,000 | $20,000 | | $15,000 |
| | | | 4.8 Training and support for contracting and coordinating market studies | $10,000 | $5,000 | $5,000 | | |
| | | | 4.9 Training of officials and staff of UMS, Edomex, DF, bus companies, transport operators, academics, NGO's on climate change action plan | $60,000 | $40,000 | $20,000 | | |
| **Total** | | | | $800,000 | $400,000 | $230,000 | $0 | $170,000 |

## Project Component 5 - US$0.30 million

## GEF Contribution: US$0.165 million

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | Public awareness and dissemination | 5.1 Collection and integration of information produced by the project | 5.1.1 Collection and integration of information produced by the project | $70,000.00 | $60,000.00 | $10,000.00 | | |
| | | 5.2 Design of Public campaign | 5.2.1 Design of public campaign outlining th advantages and objectives as well as the benefits form the use of hihg capacity vehicles and non-motorized modes of transport | $50,000.00 | $10,000.00 | $10,000.00 | $20,000.00 | $10,000.00 |
| | | 5.3 Dissemination of technical information produced by the project | 5.3.1 Area wide dissemination of technical information | $150,000.00 | $85,000.00 | $10,000.00 | $45,000.00 | $10,000.00 |
| | | 5.4 Promotion and financing of workshops and stakeholders meetings | 5.4.1 Workshops to increase the participation of key stakeholders | $30,000.00 | $10,000.00 | $5,000.00 | $5,000.00 | $10,000.00 |
| **Total** | | | | $300,000.00 | $165,000.00 | $35,000.00 | $70,000.00 | $30,000.00 |

## Project Component 6 - US$0.70 million

## GEF Contribution: US$0.335 million

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | Project Management | 6.1 Implementation of project | 6.1.1 Implementation of project | $150,000 | $100,000 | $25,000 | $25,000 | |
| | | 6.2 Operation of project activities | 6.2.1 Operation of project activities and Information Management System | $400,000 | $235,000 | $140,000 | $125,000 | |
| | | 6.3 Final evaluation | 6.3.1 Integration and evaluation of the project results | $150,000 | $100,000 | $20,000 | $30,000 | |
| **Total** | | | | **$700,000** | **$435,000** | **$185,000** | **$180,000** | **$0** |

## Annex 3: Estimated Project Costs

## MEXICO: Introduction of Climate Friendly measures in Transport

| Project Cost By Component | Local US $million | Foreign US $million | Total US $million |
|---|---|---|---|
| Harmonization of sector strategies and CAP | 0.78 | 0.00 | 0.78 |
| Enabling Environment for sustainable transport strategies | 4.66 | 0.00 | 4.66 |
| Field Test | 3.16 | 1.50 | 4.66 |
| Technical assistance and training | 0.78 | 0.00 | 0.78 |
| Public awareness and dissemination | 0.29 | 0.00 | 0.29 |
| Project Management | 0.68 | 0.00 | 0.68 |
| **Total Baseline Cost** | 10.35 | 1.50 | 11.85 |
| **Physical Contingencies** | 0.00 | 0.00 | 0.00 |
| **Price Contingencies** | 0.30 | 0.05 | 0.35 |
| **Total Project Costs**[1] | 10.65 | 1.55 | 12.20 |
| **Total Financing Required** | 10.65 | 1.55 | 12.20 |

| Project Cost By Category | Local US $million | Foreign US $million | Total US $million |
|---|---|---|---|
| **Goods** | 1.61 | 1.55 | 3.16 |
| | | | 0.00 |
| | | | 0.00 |
| | | | 0.00 |
| **Consultant Services** | 9.04 | | 9.04 |
| **Total Project Costs**[1] | 10.65 | 1.55 | 12.20 |
| **Total Financing Required** | 10.65 | 1.55 | 12.20 |

[1] Identifiable taxes and duties are 0 (US$m) and the total project cost, net of taxes, is 12.2 (US$m). Therefore, the project cost sharing ratio is 47.54% of total project cost net of taxes.

## Annex 4: Incremental Cost and Global Environmental Benefits

## MEXICO: Introduction of Climate Friendly measures in Transport

**Incremental costs**

**Overview**

The proposed GEF project seeks to contribute to the adoption 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 implementation of the recently completed Air Quality Management Plan (2002-2010) which are consistent with the GEF operational program on sustainable transport (OP-11) and the Metropolitan Climate Change Action Plan.

**Context and Broad Development Goals**

The MCMA constitutes one of the three largest metropolitan areas in the world. It has 18 million inhabitants, equivalent to about 19% of the country's entire population, who are being exposed to high levels of ozone and particulate matter. The MCMA also produces more than a third of the national GDP and generates, in the process, several million tons of atmospheric pollutants.

Air pollution in MCMA is mostly due to: (i) a high concentration of ozone, produced by the reaction of volatile organic compounds and nitrogen oxides in the presence of the sunlight; (ii) carbon monoxide, nitrogen oxides, sulfur dioxide and hydrocarbons emitted by vehicles fueled with gasoline and diesel; (iii) sulfur dioxide emitted by industrial processes and commercial services using liquid industrial fuels; and (iv) particulate matter (PM) in the form of particles smaller than 10 microns (PM10) emitted by several sources using diesel and other fuels.

In reaction to the aforementioned problems the Mexican authorities have been working on air quality improvements for several years. They have reduced the emissions of lead, SOx and CO. On the other hand, ozone concentrations have remained high, often exceeding acceptable levels. Particulate matter (PM) levels are also high along heavily congested zones and in areas under the direct influence of wind erosion and denuded land.

Early last year the Mexican authorities decided to continue this work, through the formulation, design and implementation of the next stage of Air Quality Management in the MCMA (AQM-III:2000-2010). Its development is based on World Bank sector work that includes studies on: (i) an emissions inventory; (ii) a health impacts study; (iii) study to harmonize measures to address local and GHG pollution; (iii) modeling of air quality and impact of courses of action; and (iv) assessment of the economic impact of courses of action.

As part of the program of Bank assistance, a Bank loan (Second Air Quality and Transport Project) is being prepared with the objective of reducing the pollution load in from the transport sector, while improving the safety and efficiency of urban transport management at the metropolitan level. This will be sought through enhancement of the use of space-efficient and low-polluting transport modes, including the inter-modal shift from small to high capacity vehicles and strengthening the control of emissions from cargo transport. The GEF project will help lay the foundation for the implementation of the loan and also provide a link between the sector work and the work to be initiated through the loan.

**Scope of the analysis**

The analysis of physical investments is limited to the single pilot project in the MCMA where Compressed Natural Gas buses (CNG), Hybrid Diesel Electric buses, and Clean and Standard Diesel buses will be provided, operated and their performance evaluated. The analysis of the integration of air quality management and transport planning strategies into a Metropolitan Climate Change Action Plan, economic incentives, regulatory system reforms, removal of barriers, technical assistance, capacity building, training and dissemination activities will focus on the situation in the MCMA in the context of the sector work already completed and the current GEF project.

**Baseline Scenario**

The baseline scenario assumes the continued investment and operation of diesel buses. The emphasis under the baseline would be on reducing local emissions in the most cost effective way, with little attention devoted to GHG that would be released. The baseline includes the Sector Work already completed as background to the ongoing work and the purchase and operation of diesel buses.

The results from implementing the baseline scenario would be positive. The main outcomes would be the reduction of local pollutants, provision of the bus service and provision of background studies to develop a plan to reduce air quality in MCMA. However, without the GEF project, GHG emissions abatement would not be a priority investment in the short term.

**GEF Alternative**

Due to the nature of Mexico's unbinding commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, the national efforts to mitigate the current emissions of GHG will be undertaken based on a gradual and voluntary participation of stakeholders, and supported by available international funding mechanisms to cover the associated incremental costs. As part of the strategies to mitigate climate change included in the National Communication, Mexico gives priority to the implementation of programs to improve air quality in the main four metropolitan and industrial areas. Measures concentrate in five principal areas: cleaner industry, non-polluting vehicles, efficient transportation, urban planning and environmental recovery. The project is fully consistent with these federal climate change strategies.

There are two main approaches for reductions in GHG from the transport sector: reducing fuel usage per passenger-vehicle and shifting to lower-carbon energy sources. The proposed project combines both by supporting measures and policies to promote the use of high capacity vehicles, more efficient operation (more passengers per vehicle kilometer) and non-motorized transport. In order to make these gains possible it is necessary to ensure that climate friendly policies and measures are seen as part of the sector policies.

The proposed project is complementary to the baseline scenario in that it will reduce GHG emissions along with local emissions and will lay the framework for similar benefits under the future WB loan. The total expenditures for the GEF alternative are estimated in the table below.

**Global benefits**

Global benefits will be achieved by the GEF project in form of (i) development of a plan for addressing climate change in the transport sector that is consistent with other MCMA plans; (ii) reduction in GHG emissions through the introduction of a fleet of low carbon emitting buses and encouragement of bicycle use; (iii) providing field performance data useful in assessing the best options for investment in low carbon emitting vehicles and enabling the institutional, technical and financial replication in other Latin American Cities; (iv) increased capacity, reduced barriers and provided incentives for facilitating the implementation of sustainable, climate friendly transport strategies in the future and for incorporating climate specific and environmental considerations in the design and analysis of transport options; and (v) increased public awareness and dissemination of the advantages of transport corridors and climate friendly technologies leading in the long run to an increased use of high capacity vehicles and non-motorized modes of transport;

**Incremental Aspects of the GEF Project**

The GEF Project is with exception of the already completed Sector Work and of the purchase and operation of diesel buses incremental.

**1. Harmonization of Sector Plans and Metropolitan Climate Change Action Plan**

The baseline for this component includes the already completed Sector Work in support of the formulation of the Air Quality Management Plan. A Metropolitan Climate Change Action Plan wouldn't be adopted in the short run without the GEF Project which will be integrating plans on air quality, transport and urban development into a Metropolitan Climate Change Action Plan. The costs associated with this component are except for the Sector Work incremental.

**2. Enabling environment for Sustainable Transport (Barrier Removal and Organizational Measures)**

The associated baseline includes like in the first component only the Sector Work. This component wouldn't be carried out without the GEF project. It refers to facilitating the implementation of sustainable, climate friendly transport strategies with special focus on the preparation of the implementation of corridors. It also includes an action plan for non-motorized transport enabled through the project. The preparatory work for the corridors, which will be implemented through the Bank Loan, represents a mayor part of the GEF Project which makes the associated costs incremental except for the costs of the Sector Work.

**3. Field Test**

The field test for high capacity vehicles for the demonstration of less polluting, climate friendly transport alternatives are made possible through the project. The incremental costs of this component result from subtracting the costs of the baseline scenario, which is assumed as the purchase and operation of diesel buses and as occurring without the project, from the costs of the field test which includes beside the cost of the field test and the associated training cost the investment, maintenance and operation costs of diesel, CNG, and hybrid buses whereas only the associated costs of hybrid buses are considered incremental.

**4. Incorporation of climate and environmental considerations in the design and analysis of transport strategies**

The costs for this component are abstracting from the Sector Work purely incremental as they refer

mainly to sustainable transport projects enabled through the GEF project and further on through the Bank Loan. This component provides the technical assistance, the capacity building and the training required for incorporating climate and environmental considerations in the design and analysis of transport options as well as for the support of the field test only occurring through the GEF Project.

**5. Public Awareness and Dissemination**

The costs of the baseline of this component are fully incremental due to the fact that the Public Awareness Campaign and the Dissemination are completely connected to the result and the objectives of the GEF project. The emphasis here is to promote the advantages and objectives of corridors as well as the benefits of high capacity and non-motorized transport. In addition, the technical information produced by the project will be disseminated and the continuity of public awareness will be supported through workshops and stakeholder meeting in order to deepen the awareness about the importance of sustainable transport. All these aspects are a result of the project. As this component wouldn't take place without the GEF project, it is considered incremental.

**6. Project Management**

Due to the fact that the Project Management relates fully to the GEF Project the associated costs are completely incremental. This component includes the implementation of the project, the operational integration of the activities and finally the evaluation of the project's results.

**Incremental Cost of the GEF Project**

The implementation of the Baseline scenario would entail costs estimated at US$4.1 million, while the GEF alternative would incur costs estimated at US$12.2 million. The additional costs associated with the implementation of project are estimated at US$8.1 million. The GEF will fund US$5.8 million of this as part of the project. Other cofinancing sources will fund the balance.

**Incremental Cost Matrix (all figures in US$ million)**
Revenues from collection of fares were not considered as the revenues would be the same under the baseline and the alternative.

| **Cost Categories** | **Baseline** Current situation | **Alternative Enabling environment, removal of barriers and field test** | **Incremental Costs** | **Domestic Benefits** | **Global Benefits** |
|---|---|---|---|---|---|
| **1.** Harmonization of Sector Plans & Metropolitan Climate Change Action Plan | 0.4 | 0.8 | 0.4 | | Basis for action in transport sector |
| **2.** Enabling Environment (Barrier Removal | 1.5 | 4.8 | 3.3 | Facilitate implementation of sustainable | Facilitate implementation of sustainable, |

| | | | | | |
|---|---|---|---|---|---|
| and Organizational Measures) | | | | transport | climate friendly transport |
| **3.** Field Test | | | | | |
| Fixed Costs of Buses (buses, fueling facilities, drivers) | 1.3 | 1.9 | 0.6 | Reduction of local pollutants, fuel savings | Reduction of GHG emissions |
| Variable Costs of Buses (fuel and maintenance) | 0.5 | 0.7 | 0.2 | Buses can serve the needs of consumers and reduce local pollution as designed | Buses can reduce GHG emissions as designed |
| Field Test (including test protocol emission testing, reports, training, framework for evaluation of alternative vehicle options) | 0 | 2.2 | 2.2 | Field data for assessing best options for investments in low emitting vehicles and for replication in other cities | Field data for assessing best options for investments in low carbon emitting vehicles and for replication in other cities |
| **4.** Incorporation of climate and environmental considerations in the design and analysis of transport options | 0.4 | 0.8 | 0.4 | | Form basis for expansion of program of low carbon emitting vehicles |
| **5.** Public Awareness and Dissemination | 0 | 0.3 | 0.3 | Increased public image of public transport | Increased awareness of role of transport in climate change. More political and public support for CC agenda |
| **6.** Project Management | 0 | 0.7 | 0.7 | Improved efficiency and managerial knowledge | Effective implementation of global climate change aspects of project |
| Total Costs | 4.1 | 12.2 | 8.1 | | |

## Emission's Model of Mobil Sources in the Metropolitan Region

Using the Mode!:
The model works by changing the numbers of vehicles in circulation, or their daily mileage, in order to change the total vehicle-kms by vehicle type. This number is then multiplied by emissions factors (grams/km) which are calculated for the age and mileage distribution of the ZMVA - shown in the sheets labeled accordingly for each pollutant (but it is not necessary to look at this to run the model).
The *input* sheet is where the user inputs data for two scenarios, A and B, which are compared at the bottom.
The alternative modes are available for the user to input modes for which the emissions factors are different than the categories available. The two alternative modes' emissions factors are input by the user on the *alternatives* sheet. In the *input* and *alternatives* sheet, all user changes will be made in YELLOW blocks.
1. Input the fraction of all travel which is in congested conditions, labeled *Peak Share*
2. Change vehicle numbers, or daily mileage, by type
3. Add or change alternatives' emissions factors, and vehicle numbers or daily mileage.

Scenario Summaries:

| | | # Veh. | Km/dia | CO2 (kgs) | HC | CO | NOx | PM-10 | SOx |
|---|---|---|---|---|---|---|---|---|---|
| **A** | Autos (trips) | 9,000,000 | 9 | 17,681,344 | 136,168,434 | 1,205,212,834 | 100,478,829 | 2,065,549 | 6,210,000 |
| | Taxis | 100,000 | 200 | 4,270,856 | 32,890,926 | 291,114,211 | 24,270,249 | 498,925 | 1,500,000 |
| | Pickup | 500,000 | 75 | 9,976,602 | 133,276,599 | 1,110,498,460 | 57,796,397 | 934,174 | 3,593,750 |
| | Micros | 50,000 | 150 | 2,070,958 | 71,677,500 | 589,500,000 | 19,280,266 | 190,150 | 1,250,000 |
| | Autobuses | 10,000 | 150 | 2,214,221 | 7,326,780 | 13,890,000 | 23,616,120 | 1,909,625 | 312,500 |
| | Garga (pesada) | 200,000 | 100 | 29,522,942 | 97,690,400 | 185,200,000 | 314,881,600 | 25,461,667 | 4,166,667 |
| | Alternative1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Alternative2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | total grams: | | 65,736,922 | 479,030,638 | 3,395,415,505 | 540,323,460 | 31,060,089 | 17,032,917 |

*Peak Share* = 0.50

| | | | | | | |
|---|---|---|---|---|---|---|
| **ton/day** | **65,737** | **479** | **3,395** | **540** | **31** | **17** |
| **ton/year** | **23,993,977** | **174,846** | **1,239,327** | **197,218** | **11,337** | **6,217** |

| | # Veh. | Km/dia | CO2 (kgs) | HC | CO | NOx | PM-10 | SOx |
|---|---|---|---|---|---|---|---|---|
| Autos (trips) | 8,500,000 | 9 | 16,336,024 | 125,807,792 | 1,113,511,857 | 92,833,701 | 1,908,387 | 5,737,500 |
| Taxis | 75,000 | 200 | 3,203,142 | 24,668,194 | 218,335,658 | 18,202,686 | 374,194 | 1,125,000 |
| Pickup | 500,000 | 75 | 9,976,602 | 133,276,599 | 1,110,498,460 | 57,796,397 | 934,174 | 3,593,750 |
| Micros | 40,000 | 150 | 1,656,767 | 57,342,000 | 471,600,000 | 15,424,213 | 152,120 | 1,000,000 |
| Autobuses | 8,500 | 150 | 1,882,088 | 6,227,763 | 11,806,500 | 20,073,702 | 1,623,181 | 265,625 |
| Garga (pesada) | 200,000 | 100 | 29,522,942 | 97,690,400 | 185,200,000 | 314,881,600 | 25,461,667 | 4,166,667 |
| Alternative1 | 1,500 | 200 | 300,000 | 240,000 | 750,000 | 1,500,000 | 60,000 | 39,000 |
| Alternative2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | total grams: | | 62,877,564 | 445,252,748 | 3,111,702,476 | 520,712,299 | 30,513,723 | 15,927,542 |

Gas-Leve = personal cars, and taxis
Gas-Med = light trucks
Gas-Grnde = Micros
Diesel-Grnde = Heavy Trucks

fonte = "Inventario…"

| | Gas-Leve | Gas-Med | Gas-Grnde | Diesel-Grnde |
|---|---|---|---|---|
| 1000 vehicles | | | | |
| 1998 | 200 | 40 | 0 | 16 |
| 1997 | 175 | 35 | 0 | 14 |
| 1996 | 150 | 30 | 0 | 12 |
| 1995 | 230 | 46 | 0 | 18.4 |
| 1994 | 260 | 52 | 1 | 20.8 |
| 1993 | 250 | 50 | 2 | 20 |
| 1992 | 230 | 46 | 14 | 18.4 |
| 1991 | 200 | 40 | 15 | 16 |
| 1990 | 180 | 36 | 9 | 14.4 |
| 85/89 | 250 | 50 | 9 | 20 |
| 80/84 | 200 | 40 | 0 | 16 |
| 75/79 | 175 | 35 | 0 | 14 |
| **sum** | **2500** | **500** | **50** | **200** |

| 1000 vehicle*kms/day | | | | |
|---|---|---|---|---|
| 1998 | 11506.85 | 2739.726 | 0 | 960 |
| 1997 | 9589.041 | 2205.479 | 0 | 840 |
| 1996 | 7808.219 | 1808.219 | 0 | 720 |
| 1995 | 11342.47 | 2520.548 | 0 | 1104 |
| 1994 | 12109.59 | 2706.849 | 200 | 1248 |
| 1993 | 10958.9 | 2397.26 | 400 | 1200 |
| 1992 | 9452.055 | 2079.452 | 2800 | 1104 |
| 1991 | 7671.233 | 1676.712 | 3000 | 960 |
| 1990 | 6657.534 | 1410.411 | 1800 | 864 |
| 85/89 | 7534.247 | 1438.356 | 1800 | 1200 |
| 80/84 | 4931.507 | 876.7123 | 0 | 960 |
| 75/79 | 3547.945 | 652.0548 | 0 | 840 |
| total: | 103109.6 | 22511.78 | 10000 | 12000 |
| **average kms/day** | **41.24384** | **45.02356** | **200** | **60** |

share of total vehicle kms in each vehicle age group:(this is used to multiply through the emissions factors)

| | Gas-Leve | | Gas-Grnde | Diesel-Grnde |
|---|---|---|---|---|
| km/day | | km/day | | |
| 1998 | 58 | 68 | 200 | 60 |
| 1997 | 55 | 63 | 200 | 60 |
| 1996 | 52 | 60 | 200 | 60 |
| 1995 | 49 | 55 | 200 | 60 |
| 1994 | 47 | 52 | 200 | 60 |
| 1993 | 44 | 48 | 200 | 60 |
| 1992 | 41 | 45 | 200 | 60 |
| 1991 | 38 | 42 | 200 | 60 |
| 1990 | 37 | 39 | 200 | 60 |
| 85/89 | 30 | 29 | 200 | 60 |
| 80/84 | 25 | 22 | 200 | 60 |
| 75/79 | 20 | 19 | 200 | 60 |

| | Gas-Leve | Gas-Med | Gas-Grnde | Diesel-Grnde |
|---|---|---|---|---|
| 1000*km/year | | | | |
| 1998 | 21 | 25 | 60 | 18 |
| 1997 | 20 | 23 | 60 | 18 |
| 1996 | 19 | 22 | 60 | 18 |
| 1995 | 18 | 20 | 60 | 18 |
| 1994 | 17 | 19 | 60 | 18 |
| 1993 | 16 | 17.5 | 60 | 18 |
| 1992 | 15 | 16.5 | 60 | 18 |
| 1991 | 14 | 15.3 | 60 | 18 |
| 1990 | 13.5 | 14.3 | 60 | 18 |
| 85/89 | 11 | 10.5 | 60 | 18 |
| 80/84 | 9 | 8 | 60 | 18 |
| 75/79 | 7.4 | 6.8 | 60 | 18 |

## Annex 5: Financial Summary

## MEXICO: Introduction of Climate Friendly measures in Transport

**Years Ending**
**2002- 2007**

| | IMPLEMENTATION PERIOD | | | | | | |
|---|---|---|---|---|---|---|---|
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 |
| **Total Financing Required** | | | | | | | |
| **Project Costs** | | | | | | | |
| Investment Costs | 7.1 | 3.0 | 1.4 | 0.3 | 0.4 | 0.0 | 0.0 |
| Recurrent Costs | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Project Costs** | 7.1 | 3.0 | 1.4 | 0.3 | 0.4 | 0.0 | 0.0 |
| **Total Financing** | 7.1 | 3.0 | 1.4 | 0.3 | 0.4 | 0.0 | 0.0 |
| **Financing** | | | | | | | |
| IBRD/IDA | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Government | 1.7 | 0.1 | 0.2 | 0.2 | 0.2 | 0.0 | 0.0 |
| Central | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Provincial | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Co-financiers(Shell Foundation, and private local sources including bus manufacturers) | 3.7 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| GEF | 1.7 | 2.7 | 1.1 | 0.1 | 0.2 | 0.0 | 0.0 |
| **Total Project Financing** | 7.1 | 3.0 | 1.4 | 0.3 | 0.4 | 0.0 | 0.0 |

| | OPERATIONAL PERIOD | | | | | | |
|---|---|---|---|---|---|---|---|
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 |
| **Total Financing Required** | | | | | | | |
| **Project Costs** | | | | | | | |
| Investment Costs | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recurrent Costs | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Project Costs** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Financing** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Financing** | | | | | | | |
| IBRD/IDA | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Government | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Central | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Provincial | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Co-financiers(Shell Foundation, and private local sources including bus manufacturers) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GEF | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total Project Financing** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Main assumptions:**

# Procurement and Disbursement Arrangements

## Section I. Procurement of Goods

### Part A: General

Goods shall be procured in accordance with the provisions of Section I of the "Guidelines for Procurement under IBRD Loans and IDA Credits" published by the Bank in January 1995 and revised in January and August 1996, September 1997 and January 1999 (the Guidelines) and the following provisions of Section I of this Schedule.

### Part B: International Competitive Bidding

1. Exept as otherwise provided in part C of this section, goods shall be procured under contracts awarded in accordance with the provisions of Section II of the Guidelines and paragraph 5 of Appendix 1 thereto.
2. The following provisions shall apply to goods to be procured under contracts awarded in accordance with the provisions of paragraph 1 of this Part B.

**(a) Grouping of contracts** To the extend practicable, contracts for goods shall be grouped in bid packages estimated to cost US$100,000 equivalent or more each.

**(b) Preference for domestically manufactured goods and domestic contractors** The provisions of paragraphs 2.54 and 2.55 of the Guidelines and Appendix 2 thereto shall apply to goods manufactured in the territory of the UMS.

**(c) Notification and advertising** The General Procurement Notice to be published in the *Development Business*, shall be updated annually for outstanding procurement. All invitation to bid shall be published in the UMS' public electronic advertising and bidding system (COMPRANET) and in the UMS' Official Gazette *(Diario Oficial de la Federación).* To obtain expressions of interest for large consultant assignments (contracts expected to cost more that US$200,000 equivalent) a specific procurement notice shall be also published in *Development Business.*

### Part C: Other Procurement Procedures

**1. International and National Shopping** Goods estimated to cost less than $100,000 equivalent per contract, up to an aggregate amount not to exceed $400,000 equivalent, may be procured under contracts awarded on the basis of shopping procedures in accordance with the provisions of paragraphs 3.5 and 3.6 of the Guidelines.

## Part D: Review by the Bank of Procurement Decisions

**1. Procurement Planning** Prior to issuance of any invitations to prequalify for bidding or to bid for contracts, the proposed procurement plan for the Project shall be furnished to the Bank for its review and approval, in accordance with the provisions of paragraph 1 of Appendix 1 to the Guidelines. Procurement of all goods and works shall be undertaken in accordance with such procurement plan as shall have been approved by the Bank, and with the provisions of said paragraph 1.

**2. Prior Review** With respect to each contract for goods procured following the procedures under Parts B of this Section, the procedures set forth in paragraphs 2 and 3 of Appendix 1 to the Guidelines shall apply.

**3. Post Review** With respect to each contract not governed by paragraph 2 of this Part, the procedures set forth in paragraph 4 of Appendix 1 to the Guidelines shall apply.

## Project Specific Procurement Methods

The methods to be used for the procurement under this project are described below, and the estimated amounts for each method, are summarized in Table A. The threshold contract values for the use of each method are fixed in Table B.

## Procurement of Goods

Goods procured under this project will consist of purchasing of equipment, inputs, software, totaling US$3.16 million equivalent of which the GEF will finance US$0.34 million equivalent. Contracts for these goods will be procured following International Shopping Procedures (ISP). Because the Recipient wishes to reserve the procurement of buses, costing about US$2.0 million equivalent, for one specific brand, this reserve procurement will not be financed by the Bank and a co-financier will finance this procurement.

## Section II Employment of Consultants

## Part A: General

Consultant services shall be procured in accordance with the provisions of Sections I and IV of the "Guidelines: Selection and Employment of Consultants by World Bank Recipients" published by the Bank in January 1997 and revised in September 1997, January 1999 and May 2002 (the Consultant Guidelines), paragraph 1of Appendix 1 thereto, Appendix 2 thereto and the following provisions of Section II of this Schedule.

## Part B: Quality- and Cost-based Selection

1. Except as otherwise provided in Part C of this Section, consultants' services shall be procured under contracts awarded in accordance with the provisions of Section II of the Consultant Guidelines and

the provisions of paragraphs 3.13 through 3.18 thereof applicable to quality- and cost-based selection of consultants.

2. The following provision shall apply to consultants' services to be procured under contracts awarded in accordance with the provisions of the preceding paragraph: the short list of consultants, for services estimated to cost less than $200,000 equivalent per contract, may comprise entirely national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

## Part C: Other Procedures for the Selection of Consultants

**1. Least-cost Selection** Services estimated to cost less than $200,000 equivalent per contract up to an aggregate amount of $1,780,000 equivalent may be procured under contracts awarded in accordance with the provisions of paragraphs 3.1 and 3.6 of the Consultant Guidelines.

**2. Individual Consultants** Services of individual consultants for tasks that meet the requirements set forth in paragraph 5.1 of the Consultant Guidelines estimated to cost less than $50,000 equivalent per contract and up to an aggregate amount of $2,360,000 shall be procured under contracts awarded in accordance with the provisions of paragraphs 5.1 through 5.3 of the Consultant Guidelines.

## Part D: Review by the Bank of the Selection of Consultants

**1. Selection Planning** A plan for the selection of consultants, which shall include contract cost estimates, contract packaging, and applicable selection criteria and procedures, shall be furnished to the Bank for its review and approval prior to the issuance to consultants of any requests for proposals. Such plan shall be updated every 12 months during the execution of the Project, and each such updating shall be furnished to the Bank for its review and approval. Selection of all consultants' services shall be undertaken in accordance with such selection plan (as updated from time to time) as shall have been approved by the Bank.

**2. Prior Review** (a) With respect to each contract for the employment of consulting firms estimated to cost the equivalent of $100,000 or more, the procedures set forth in paragraphs 2, 3 and 5 of Appendix 1 to the Consultant Guidelines shall apply.

(b) With respect to each contract for the employment of individual consultants estimated to cost the equivalent of $50,000 or more, the report on the comparison of the qualifications and experience of candidates, terms of reference and terms of employment of the consultants shall be furnished to the Bank for its prior review and approval. The contract shall be awarded only after the said approval shall have been given. The provisions of paragraph 3 of Appendix 1 to the Consultant Guidelines shall also apply to such contracts.

**3. Post Review** With respect to each contract not governed by paragraph 2 of this Part, the procedures set forth in paragraph 4 of Appendix 1 to the Consultant Guidelines shall apply.

## Project Specific Procurement Methods

Services will be contracted under this project in the following areas consultants, training, dissemination, public campaign and buses maintenance. These services are estimated to cost US$9.04 million equivalent and would be procured using World Bank Standard Request of

Proposals, non-consultant services costing about US$1.78 million will be selected on LCS procedures.

**Firms**. All contracts for firms would be procured using QCBS procedures except for small contracts for assignments of standard or routing nature and estimated to cost less than US$100,000 equivalent that would be procured using LCS up to an aggregate amount of US$ 1.78 million. Single-Source Selection only will be acceptable, previous Bank Non Objection, to assignments when only one firm is qualified or has experience of exceptional worth.

**Individuals**. Specialized advisory services would be provided by individuals consultants selected by comparison of qualifications of at least three candidates and hired in accordance with the provisions of paragraph 5.1 to 5.4 of the Consultant Guidelines, up to an aggregated amount of US$2.36 million equivalent.

**Prior review**: The prior review arrangements are presented in Table B.

**Procurement plan**. The Procurement Plan is attached and satisfactory. Each November, the Recipient would update the procurement schedule for the following year, including the ICB procedures, the smaller procurement, the consultancy and non-consultant services to be financed under the proposed Grant following the model procurement plan.

**Section III-Procurement Responsibilities and Capacity**

A procurement capacity assessment for the project was carried out by Ms. Lea Braslavsky, Country Procurement Specialist, LCOPR, and approved by RPA on July 5, 2002. The National Development Bank (BANOBRAS), one of the three financial intermediary institutions of the Mexican Government will be responsible for: (i) reviewing all procurement procedures and bid evaluation reports submitted by SAT, (ii) give the no-objection for the award of contracts below the agreed threshold for Bank prior review; and (iii) maintaining all the corresponding records. BANOBRAS' performance under previous Bank financing projects was satisfactory. The Bank's Implementation Unit in Mexico will provide procurement advice to the executing agency *Secretaría del Medio Ambiente* (SMA) and BANOBRAS as required, and carried out the Bank's fiduciary functions delegated to it.

To ensure SMA's staff knowledge of World Bank procurement Guidelines and procedures, a special procurement seminar will be given by the Mexico Resident Mission to SMA's staff.

During project preparation, BANOBRAS and SMA have confirmed their will for ethical behavior and have expressed their commitment to adhere to competitive selection and transparency in all activities. The Operational Manual will include a chapter call "Code of Ethic" Based on the above procurement risk for the project is rated as "average".

**Section IV: Procurement Monitoring**

The SMA will prepare annually a Procurement Plan satisfactory to the World Bank and establish procedures for monitoring project execution and impact, procurement implementation, including

monitoring of contracts. The SMA as well as BANOBRAS will maintain detailed records of procurement activities.

**Review by the Bank**. The proposed threshold for prior review by the World Bank are based on the procurement assessment of the project executing agency and are summarized in Table B. In addition to this review of individual procurement actions, the annual procurement plan will be reviewed and approved by the Bank, as well as procurement audits to be carried out during the life of the project.

**Frequency of Procurement Supervision**. Based on the overall risk assessment (average) the post-review mission for the project shall be completed every 6 months and shall cover not less than 1 in 20 contracts signed.

**Procurement methods (Table A)**

**Table A: Project Costs by Procurement Arrangements**
(US$ million equivalent)

| Expenditure Category | Procurement Method[1] | | | | Total Cost |
|---|---|---|---|---|---|
| | ICB | NCB | Other[2] | N.B.F. | |
| **1. Works** | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) |
| **2. Goods**<br>Equipment, Inputs, Maintenance, Software, Fuel, Buses, Fueling Facilities | 0.00<br>(0.00) | 0.00<br>(0.00) | 1.16<br>(0.34) | 2.00<br>(0.00) | 3.16<br>(0.34) |
| **3. Services**<br>Consultants | 0.00<br>(0.00) | 0.00<br>(0.00) | 7.26<br>(4.81) | 0.00<br>(0.00) | 7.26<br>(4.81) |
| Services | 0.00<br>(0.00) | 0.00<br>(0.00) | 1.78<br>(0.65) | 0.00<br>(0.00) | 1.78<br>(0.65) |
| **Total** | 0.00<br>(0.00) | 0.00<br>(0.00) | 10.20<br>(5.80) | 2.00<br>(0.00) | 12.20<br>(5.80) |

[1/] Figures in parenthesis are the amounts to be financed by the Bank Grant. All costs include contingencies.

[2/] Includes goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services.

**Table A1: Consultant Selection Arrangements (optional)**
(US$ million equivalent)

| Consultant Services Expenditure Category | Selection Method | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | QCBS | QBS | SFB | LCS | CQ | Other | N.B.F. | Total Cost[1] |
| **A. Firms** | 4.90<br>(3.30) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 4.90<br>(3.30) |
| **B. Individuals** | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 2.36<br>(1.51) | 0.00<br>(0.00) | 0.00<br>(0.00) | 2.36<br>(1.51) |
| **C. Non-Consultant Services** | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 1.78<br>(0.65) | 0.00<br>(0.00) | 0.00<br>(0.00) | 0.00<br>(0.00) | 1.78<br>(0.65) |
| **Total** | 6.00<br>(4.24) | 0.00<br>(0.00) | 0.00<br>(0.00) | 1.78<br>(0.65) | 1.26<br>(0.57) | 0.00<br>(0.00) | 0.00<br>(0.00) | 9.04<br>(5.46) |

1\ Including contingencies

Note: QCBS = Quality- and Cost-Based Selection
QBS = Quality-based Selection
SFB = Selection under a Fixed Budget
LCS = Least-Cost Selection
CQ = Selection Based on Consultants' Qualifications
Other = Selection of individual consultants (per Section V of Consultants Guidelines), Commercial Practices, etc.
N.B.F. = Not Bank-financed
Figures in parenthesis are the amounts to be financed by the Bank Grant.

**Prior review thresholds (Table B)**

**Table B: Thresholds for Procurement Methods and Prior Review**[1]

| Expenditure Category | Contract Value Threshold (US$ thousands) | Procurement Method | Contracts Subject to Prior Review (US$ millions) |
|---|---|---|---|
| **1. Works** | | | |
| **2. Goods** | >100,000 | International Competitive Bidding (ICB) | All |
| | <100,000 | Shopping at least 3 suppliers | None |
| **3. Services** Consulting Services Firms | >200,000 | QCBS-Short List International | All |
| | <200,000 | QCBS-Short List may comprise Only National Consultants | All |
| | <200,000 | LCS | TORs |
| Individuals | >50,000 | Consultant Qualifications | All |
| | <50,000 | Consultant Qualifications | TORs |

**Total value of contracts subject to prior review:**

**Overall Procurement Risk Assessment**:

**Frequency of procurement supervision missions proposed:** One every six months (includes special procurement supervision for post-review/audits)

[1] Thresholds generally differ by country and project. Consult "Assessment of Agency's Capacity to Implement Procurement" and contact the Regional Procurement Adviser for guidance.

## Annex 6(B) Financial Management and Disbursement Arrangements
## MEXICO: Introduction of Climate Friendly measures in Transport

**Financial Management**

### 1. Summary of the Financial Management Assessment

Following OP/BP 10.02 a certified Financial Management Specialist carried out an assessment of the institutional capacity of the project coordinator unit at the SMA. This evaluation was carried out during project appraisal.

### 2. Audit Arrangements

Project will be annually audited satisfactory to the Bank, based on (i) applicable Bank guidelines and procedures, (ii) Technical Memorandum of Understanding on auditing agreed between the GOM and the Bank, and (iii) TOR annually agreed between implementing entity and the Bank.

### 3. Disbursement Arrangements

Project arrangements were agreed during appraisal.

**Allocation of grant proceeds (Table C)**

**Table C: Allocation of Grant Proceeds**

| Expenditure Category | Amount in US$million | Financing Percentage |
|---|---|---|
| Goods | 0.34 | 86 |
| Consultants' Services | 5.46 | 83 of local expenditures and 100 of foreign expenditures |
| | | |
| **Total Project Costs** | 5.80 | |
| **Total** | 5.80 | |

**Use of statements of expenditures (SOEs):**

Use of traditional disbursement procedures or the new Financial Monitoring Reports (FMR) was agreed during appraisal.

**Special account:**

The authorized allocation, initial deposit and aggregated accounts will be defined during appraisal. The special account will be established in the Central bank (Banco de México) and will be managed by the local development bank (Banco Nacional de Obras y Servicios Públicos).

Disbursement categories and amounts are indicated in Table C. The project is expected to be disbursed over a eight-year period.

The financial management assessment was carried out by an specialist. This review was based on applicable Bank's guidelines, and focused on the assessment of the project's accounting system, internal control, planning, budgeting and financial reporting system, selection of an auditor as well as the format and contents of the Financial Monitoring Report (FMR) to be quarterly submitted by SMA (with support of BANOBRAS). The assessment conclusion is that SMA does not have in place an adequate project financial management system that can provide, with reasonable assurance, accurate and timely information in the format of FMRs as required by the Bank, however, SMA existing system satisfies the Bank's minimum financial management requirements for project implementation. SMA, with the support of BANOBRAS, is taking actions to adjust its existing systems to be in compliance with all Bank

requirements for similar projects.

It is planed that traditional disbursement methods (SOEs, special commitments and direct payments) will be used.

A Special Account (SA) in US dollars with an initial deposit of US $0.560 million would be established at the local central bank (Banco de México). This SA will be replenished and will be used for all transactions with a value of less than 20% of the amount advanced to it. Traditional full documentation apply for direct payments, special commitments and SOEs. If project is converted to FMR-based disbursements, procedures must be agreed between the GOM and the Bank and must be satisfactory to Bank before migration.

SMA in coordination with BANOBRAS will prepare the necessary documentation for prompt disbursements. Considering the size of the contracts, all goods, operating costs and subprojects, and most of the consultant services, are expected to be disbursed via SOEs (all contracts for goods, consultant firm contracts below US $100,000.00, individual consultant contracts below US $50,000.00, all expenditures for subprojects, training and operating costs).

SMA will maintain separate project records and accounts, which reflect, in accordance with sound accounting practices compatible with International Accounting Standards (IAS), the operations, resources and expenditures of each project activity. The unit will be audited on annual basis by independent auditors in line with International Standards on Auditing (ISA) or compatible standards satisfactory to the Bank and on TOR acceptable to the Bank as well. The audit report will be prepared based in a similar document to the existing Memorandum of Technical Understanding on Auditing (MET) and on applicable Bank's guidelines. The audit report will be submitted to the Bank within the four months after the end of each audited fiscal year.

**Action Plan (critical activities)**

This activities, which will be reflected as effectiveness conditions, will be agreed during Negotiations and must be implemented to ensure satisfactory project financial management.

- Existing Financial Management Systems must be adjusted to adequately handle project implementation (including preparation of FMRs). SMA will be responsible of this activity and must coordinate it with Banobras. This activity must be completed before project effectiveness.
- Preparation of satisfactory TOR for the first audit and preselection of the external audit firm (in coordination with the Contraloría General del Gobierno del Distrito Federal and SMA's internal audit department). SMA will be responsible of this activity in coordination with concerned agencies. This activity must be completed before project effectiveness.
- The Financial Management section of the Project Manual (which will specify procedures and requirements on implementing entity project operation, funds flow, staffing, accounting policies and procedures, internal audit, external audit, reporting and monitoring –including format and contents of the FMRs- and (viii) information systems. SMA will be responsible of this activity, which must be completed before project effectiveness.

**Risk Analysis.** Overall risk is Moderate tending to substantial.

| *Risk* | *Risk Rating* | *Risk Mitigation Measures* |
|---|---|---|
| Inherent Risk | Moderate | |
| Control Risk | Moderate tending to substantial | |

Inherent risk is the susceptibility of the project financial management system to factors arising from the environment in which it operates, such as country rules and regulations and entity working environment. Control risk is the risk that the project's accounting and internal control framework are inadequate to ensure project funds are used economically and efficiently and for the purpose intended, and that the use of funds is properly reported. The rating for this specific project is the following:

- *Inherent risks*: (i) country-negligible/low (ii) entity-moderate and (iii) project-moderate.

Finally, the operation also draws upon the near complete, Mexico Country Financial Accountability Assessment (CFAA), which covers public financial accountability arrangements at the federal level: budget management, accounting and reporting, Treasury, Management Information System (SIAFF), internal controls and external audit. Based on the diagnostic work performed to date, the CFAA Task Team is of the opinion that, at the federal government level, Mexico has adequate public financial management capacity and reliable information systems, and that there is a considerable degree of external transparency. Although Mexico continues to improve its public financial management framework, procedures and systems, the mere volume of transactions calls for expediting and incorporating a more efficient and effective approach to the administrative aspects of public finances management - including accounting and financial reporting - and for making internal and external audit functions more systematic and risk-based. The CFAA report will offer detailed analyses, conclusions and recommendations on these areas.

- *Control risk*: (i) implementing entity-moderate (ii) funds flow-moderate (iii) staffing-substantial (iv) accounting policies and procedures-negligible/low (v) internal audit-negligible/low (vi) external audit-moderate (vii) reporting and monitoring-moderate and (viii) information systems-substantial. SMA is implementing corrective actions to ensure that those risk are properly mitigated before project becomes effective. BANOBRAS is providing assistance to ensure that project risk is reduced at the negligible/low level.

**Auditing**. SMA will maintain the records, accounts, files and project documentation, and will produce standard financial statements according to International Accounting Standards (IAS). All project documentation and records are responsibility of SMA, and all Special Account documentation and records (including monthly SA's statements) are the responsibility of BANOBRAS. Project operations will be audited on annually basis in accordance with generally accepted auditing standards (compatible with International Standards on Auditing ISAs and satisfactory to the Bank) and procedures consistently applied, by an independent and qualified auditor (based on applicable Bank guidelines and TOR for auditing). Both TOR and auditor must be satisfactory to the Bank on annually basis. The audit report (including financial statements and its opinion, inform on the internal controls and the compliance with laws, regulations and agreements) will be submitted to the Bank within four months after each audited fiscal year. The *Contraloria General del Gobierno del Distrito Federal* and SMA's internal auditor will coordinate with implementing agency SMA annual audits. A section providing details on auditing will be included in project manual.

Audit reports that will be required to be submitted by each project implementation agency and the due date for submission.

| *Audit Report* | *Due Date* |
|---|---|
| Entity | Not applicable |
| Project/SOE | Annually starting June 30, 2003 |
| Special Account | Annually starting June 30, 2003 |
| Other such as (i) internal control and (ii) compliance. All those required on the Technical Memorandum of Understanding on Auditing MET and TOR agreed between the Federal level and the Bank. Those reports are included in the Project/SOE audit report. | Annually starting June 30, 2003 |

**Conditions**.

The following activities will be included in legal documents as effectiveness conditions: (i) existing Financial Management Systems must be adjusted to adequately handle project implementation -including preparation of FMRs- (ii) preparation of satisfactory TOR for the first audit review and preselection of the external audit firm and (iii) inclusion of the Financial Management section in the Project Manual.

The following activities will be included as negotiation conditions: (i) an operational financial management area within the SMA (this areas must include a full time financial management expert and a full/part time analyst) and (ii) first draft of the Financial Management section of the Project Manual.

**Supervision Plan**. Financial management supervision missions will be carried out twice a year during the first project implementation year, and at least once a year the following years. This missions will be carried out by the Financial Management Specialist in coordination with project team/TTL.

**Flow of Funds Analysis**. The projected disbursements under all components and for all activities has been completed and is attached as **Annex 5 .** The analysis shows that a substantial requirement for project funds is expected in years one and two, with most of the funds being required in year two. The average flow of funds over the four year period is US$390,000 every four months. However, the average for the first two years is estimated at US$560,000. On this basis, the special account is suggested to have an initial allocation of US$560,000.

## Annex 7: Project Processing Schedule
## MEXICO: Introduction of Climate Friendly measures in Transport

| Project Schedule | Planned | Actual |
|---|---|---|
| Time taken to prepare the project (months) | 12 | |
| First Bank mission (identification) | 01/07/2002 | |
| Appraisal mission departure | 07/01/2002 | |
| Negotiations | 08/05/2002 | |
| Planned Date of Effectiveness | 11/15/2002 | |

**Prepared by:**

SMA, SETRAVI and STE

**Preparation assistance:**

**Bank staff who worked on the project included:**

| Name | Speciality |
|---|---|
| Walter Vergara | Lead Chemical Engineer |
| Juan Andrés López - Silva | Environmental Specialist |
| Mauricio Cuellar | Transport Specialist |
| Gerhard Menckhoff | Consultant Transport Specialist |
| Carl-Heinz Mumme | Consultant Transport Economics |
| Seraphine Haeussling | Consultant |
| Aaron Golub | Consultant Transport Specialist |
| John Morton | Consultant |
| José Ramón Gómez | Consultant |
| Alexandra Zenzes | Consultant |
| Esme Abedin | Operations Analyst |
| Lea Braslavsky | Procurement Specialist |
| Víctor Ordóñez | Financial Specialist |
| Heather Maclean | Transport Specialist |
| Ricardo Hernandez | Environmental Specialist |

## Annex 8: Documents in the Project File*
## MEXICO: Introduction of Climate Friendly measures in Transport

### A. Project Implementation Plan

The PIP can be found in the project files.

### B. Bank Staff Assessments

The Project Concept Document (PCD) and other comments in project file.

Cost-Effectiveness Analysis to Evaluate Cleaner Vehicles: methodology with a Case Study in Mexico City, The World Bank, June 2000.

Improving Air Quality in Metropolitan Mexico City An Economic Valuation, Policy Research Working Paper, World Bank, February 2002.

### C. Other

Air Quality Management Report, National Institute of Ecology, Mexico, 1996.

Audit of Transportation and Air Quality Program for Mexico City, Final Report, ICF Consulting, 2000.

Estudio de Prefactibilidad para la Introducción de Autobuses Híbridos para el Servicio de Transporte Público de la ZMVM e Identificación de Barreras a ser Superadas, UNAM, México, 2000.

Estudio Integral de Transporte y Calidad del Aire en la Zona Metropolitana del Valle de México, COMETRAVI, Volumes 1-8 of, México, 1999

GEF Strategy for Development of Fuel Cell Buses for the Developing World, UNDP, New York, 2001.

Hybrid-Electric Drive, Heavy-Duty Vehicle Testing Project, Final Emissions Report, West Virginia University, February 2000.

Implementation Completion Report Mexico Transport Air Quality Management Project for the Mexico City Metropolitan Areas, World Bank, Washington D.C., June 2000.

Inventario de Emisiones a la Atmósfera en la Zona Metropolitana del Valle de México, CAM (Comisión Ambiental Metropolitana), Mexico, 1999.

Llegando Tarde al Compromiso: la Crisis del Transporte en la Ciudad de México, El Colegio de México, Víctor Islas Rivera, México 2000.

Metropolitan Mexico City Mobility & Air Quality. White Paper for the MIT Integrated Program on Urban, Regional And Global Air Pollution , Zegras, C. et al., 2000.

México 2a. Comunicación Nacional ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático, Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) e Instituto Nacional de Ecología (INE), México 2001.

NYCT Operating Experience with Hybrid Transit Buses, World Bus & Clean Fuel Summit, Los Angeles, June 2000.

Preparation of the Air Quality Component of the Argentina Pollution management Project. Final Report Vol 1, Executive Summary, Secretaría de Recursos Naturales y Desarrollo Sustentable, República de Argentina, January 1999.

Programa para Mejorar la Calidad del Aire de la Zona Metropolitana del Valle de México 2002-2010, Secretaría de Ecología del Gobierno del Estado de México, Secretaría de Medio Ambiente del Gobierno del Distrito Federal, Secretaría de Medio Ambiente y Recursos Naturales y Secretaría de Salud, México 2002.

Propuesta Preliminar: Diseño Funcional y Proyecto del Corredor Eje Central, Urbanismo y Sistemas de Transporte, SA de CV, Mexico, 2001.

Reducing Greenhouse Gases and Air Pollution A Menu of Harmonized Options, STAPPA and ALAPCO, October 1999.

Study for Bus-Collectivo Substitution Program and 33 Bus Corridors, SETRAVI, Mexico, 1999.

Transportation in Mexico City, Sheinbaum, C. and Meyers, S., Energy for Sustainable Development, Volume 2, No. 3, 1995..

Transportation Policy in Mexico City, Wirth, C., Urban Affairs Review, Vol 33, No 2., 1997

Urban Structure, Energy, and Environmental Quality in the Metropolitan Area of Mexico City: Indicators of Sustainability, Secretary of the Environment of Mexico City, 1999.
*Including electronic files

# Annex 9: Statement of Loans and Credits

## MEXICO: Introduction of Climate Friendly measures in Transport

| | | | Original Amount in US$ Millions | | | | | | Difference between expected and actual disbursements[a] | |
|---|---|---|---|---|---|---|---|---|---|---|
| Project ID | FY | Purpose | IBRD | IDA | SF | GEF | Cancel. | Undisb. | Orig | Frm Rev'd |
| P057531 | 200 | MX Basic Ed Dev Phase II | 300.00 | 0.00 | | 0.00 | 0.00 | 300.00 | 0.00 | 0.00 |
| P060577 | 2002 | MX Southeast Reg'l Development LIL | 5.00 | 0.00 | | 0.00 | 0.00 | 5.00 | 0.08 | 0.00 |
| P065988 | 2002 | GEF MX-Consolidation of Protected Areas | 0.00 | 0.00 | | 16.10 | 0.00 | 0.01 | 0.00 | 0.00 |
| P064887 | 2001 | DISASTER MANAGEMENT (ERL) | 404.05 | 0.00 | | 0.00 | 0.00 | 395.74 | 58.36 | 0.00 |
| P063463 | 2001 | METHANE CAPTURE & USE AT A LANDFILL | 0.00 | 0.00 | | 6.27 | 0.00 | 6.35 | 1.94 | 0.29 |
| P060908 | 2001 | GEF MX-MESO AMERICAN CORRIDOR | 0.00 | 0.00 | | 14.84 | 0.00 | 13.85 | 3.07 | 0.00 |
| P065779 | 2001 | FEDERAL HIGHWAY MAINTENANCE PROJECT | 218.00 | 0.00 | | 0.00 | 0.00 | 203.93 | -14.07 | 0.00 |
| P066321 | 2001 | MX: III BASIC HEALTH CARE PROJECT | 350.00 | 0.00 | | 0.00 | 0.00 | 350.00 | 0.00 | 0.00 |
| P066674 | 2001 | GEF MX-Indigenous&Community Biodiversity | 0.00 | 0.00 | | 7.50 | 0.00 | 6.84 | 2.22 | 0.00 |
| P071323 | 2001 | Bank Restructuring Facility II | 505.06 | 0.00 | | 0.00 | 0.00 | 350.01 | 0.01 | 0.00 |
| P057530 | 2000 | RURAL DEV.MARG.ARII (APL) | 55.00 | 0.00 | | 0.00 | 0.00 | 38.92 | 3.25 | 0.00 |
| P060718 | 2000 | ALTERNATIVE ENERGY | 0.00 | 0.00 | | 8.90 | 0.00 | 6.98 | 6.92 | 0.00 |
| P066938 | 2000 | MX GENDER (LIL) | 3.07 | 0.00 | | 0.00 | 0.00 | 3.07 | 1.63 | 0.00 |
| P048505 | 1999 | AGRICULTURAL PRODUCT | 444.45 | 0.00 | | 0.00 | 0.00 | 139.94 | 50.19 | -27.05 |
| P007610 | 1999 | FOVI RESTRUCTURING | 505.50 | 0.00 | | 0.00 | 0.00 | 312.00 | 312.00 | 0.00 |
| P007711 | 1998 | MX RURAL DEV. MARG.AREA (APL) | 47.00 | 0.00 | | 0.00 | 0.00 | 29.07 | 22.75 | 0.00 |
| P007720 | 1998 | MX:  HEALTH SYSTEM REFORM - SAL | 700.00 | 0.00 | | 0.00 | 0.00 | 150.00 | 150.00 | 50.00 |
| P044531 | 1998 | KNOWLEDGE & INNOV. | 300.00 | 0.00 | | 0.00 | 0.00 | 195.37 | 78.71 | 0.00 |
| P055061 | 1998 | MX: HEALTH SYSTEM REFORM TA | 25.00 | 0.00 | | 0.00 | 0.00 | 1.31 | 1.31 | 0.00 |
| P049895 | 1998 | MX: HIGHER ED. FINANCING | 180.20 | 0.00 | | 0.00 | 0.00 | 140.19 | 75.92 | 0.00 |
| P007700 | 1997 | COMMUNITY FORESTRY | 15.00 | 0.00 | | 0.00 | 0.00 | 6.07 | 5.59 | 0.00 |
| P007713 | 1996 | WATER RESOURCES MANA | 186.50 | 0.00 | | 0.00 | 0.00 | 117.29 | 101.96 | 44.17 |
| P007689 | 1996 | MX: BASIC HEALTH II | 310.00 | 0.00 | | 0.00 | 0.00 | 23.83 | 23.83 | 23.83 |
| P034490 | 1995 | MX: TECHNICAL EDUC/TRAINING | 265.00 | 0.00 | | 0.00 | 69.69 | 48.07 | 117.75 | 87.72 |
| P007710 | 1994 | N. BORDER I ENVIRONM | 368.00 | 0.00 | | 0.00 | 313.36 | 22.03 | 335.40 | 62.00 |
| P007648 | 1993 | MX MEDIUM CITIES TRANSP | 200.00 | 0.00 | | 0.00 | 65.50 | 40.93 | 106.43 | 83.43 |
| | | Total: | 5386.83 | 0.00 | | 53.61 | 448.55 | 2906.81 | 1445.28 | 324.39 |

MEXICO
STATEMENT OF IFC's
Held and Disbursed Portfolio

In Millions US Dollars

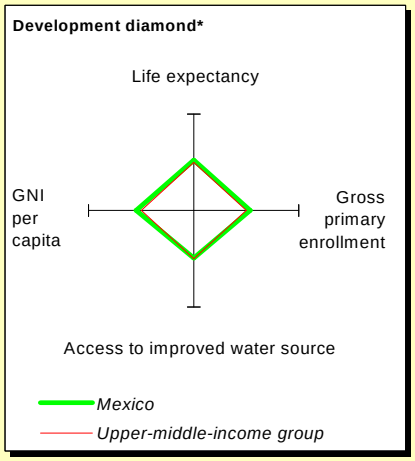
| | | Committed | | | | Disbursed | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | IFC | | | | IFC | | | |
| FY Approval | Company | Loan | Equity | Quasi | Partic | Loan | Equity | Quasi | Partic |
| 1988/91/92/93/95 | Apasco | 10.8 | 0 | 0 | 43.2 | 10.8 | 0 | 0 | 43.2 |
| 1998 | Ayvi | 8.57 | 0 | 0 | 0 | 8.57 | 0 | 0 | 0 |
| 1990/92/96 | BANAMEX | 75.71 | 0 | 0 | 5.49 | 75.71 | 0 | 0 | 5.49 |
| 0 | BBVA-Bancomer | 86.47 | 0 | 0 | 0 | 86.47 | 0 | 0 | 0 |
| 1995/99 | Baring MexFnd | 0 | 2.73 | 0 | 0 | 0 | 1.9 | 0 | 0 |
| 1998 | CIMA Mexico | 0 | 4.8 | 0 | 0 | 0 | 4.8 | 0 | 0 |
| 1998 | CIMA Puebla | 7 | 0 | 0 | 0 | 3.5 | 0 | 0 | 0 |
| 1994 | CTAPV | 2.88 | 0 | 1.69 | 0 | 2.88 | 0 | 1.69 | 0 |
| 0 | Chiapas-Propalma | 0 | 0.82 | 0 | 0 | 0 | 0.82 | 0 | 0 |
| 1997 | Comercializadora | 2.41 | 0 | 1.72 | 4.38 | 2.41 | 0 | 1.72 | 4.38 |
| 2001 | Compartamos | 1 | 0.66 | 0 | 0 | 1 | 0.66 | 0 | 0 |
| 1999 | Corsa | 11.14 | 3 | 0 | 0 | 11.14 | 3 | 0 | 0 |
| 2001 | Ecomex | 5 | 0 | 1.5 | 0 | 3 | 0 | 1.5 | 0 |
| 2000 | Educacion | 6.5 | 0 | 0 | 0 | 4.9 | 0 | 0 | 0 |
| 1997 | Fondo Chiapas | 0 | 4.18 | 0 | 0 | 0 | 0.54 | 0 | 0 |
| 1998 | Forja Monterrey | 12.07 | 3 | 0 | 12.07 | 12.07 | 3 | 0 | 12.07 |
| 1991/96 | GIBSA | 18.93 | 0 | 10 | 63.67 | 18.93 | 0 | 10 | 63.67 |
| 1993 | GIDESA | 2.5 | 0 | 0 | 0 | 2.5 | 0 | 0 | 0 |
| 1996/00 | GIRSA | 45 | 0 | 0 | 60 | 45 | 0 | 0 | 60 |
| 1993 | GOTM | 0.49 | 0 | 0 | 0 | 0.49 | 0 | 0 | 0 |
| 1997/98 | Gen. Hipotecaria | 0 | 1.2 | 0 | 0 | 0 | 1.2 | 0 | 0 |
| 0 | Grupo BBVA | 0 | 2.67 | 0 | 0 | 0 | 2.67 | 0 | 0 |
| 1998 | Grupo Calidra | 10 | 6 | 0 | 7.5 | 10 | 6 | 0 | 7.5 |
| 1989 | Grupo FEMSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1997 | Grupo Minsa | 12 | 10 | 0 | 18 | 12 | 10 | 0 | 18 |
| 1992/93/95/96/99 | Grupo Posadas | 25 | 0 | 10 | 0 | 25 | 0 | 10 | 0 |
| 1998 | Grupo Sanfandila | 8.09 | 0 | 0 | 3.61 | 6.76 | 0 | 0 | 2.95 |
| 1994/96/98/00 | Heller Financial | 0 | 0.32 | 0 | 0 | 0 | 0.32 | 0 | 0 |
| 2000 | Hospital ABC | 30 | 0 | 0 | 14 | 1.76 | 0 | 0 | 1.24 |
| 2000 | ITR | 14 | 0 | 0 | 4 | 14 | 0 | 0 | 4 |
| 2000 | Innopack | 0 | 15 | 0 | 0 | 0 | 15 | 0 | 0 |
| 1994 | Interceramic | 5 | 0 | 4 | 0 | 5 | 0 | 4 | 0 |
| 2000/01 | InverCap | 0 | 0.07 | 0 | 0 | 0 | 0.06 | 0 | 0 |
| 1998 | Merida III | 29.59 | 0 | 0 | 72.15 | 29.59 | 0 | 0 | 72.15 |
| 1995/99 | Mexplus Puertos | 0 | 1.41 | 0 | 0 | 0 | 1.41 | 0 | 0 |
| 1996/99/00/01 | NEMAK | 0 | 0 | 1.51 | 0 | 0 | 0 | 1.51 | 0 |
| 2000 | Pan American | 0 | 9 | 0 | 0 | 0 | 9 | 0 | 0 |
| 2000 | Rio Bravo | 50 | 0 | 0 | 59.5 | 50 | 0 | 0 | 59.5 |
| 2000 | Saltillo S.A. | 35 | 0 | 0 | 43 | 35 | 0 | 0 | 43 |
| 2000 | Servicios | 10.5 | 1.9 | 0 | 10 | 10.5 | 1.9 | 0 | 10 |
| 2001 | Su Casita | 0 | 10.62 | 0 | 0 | 0 | 10.62 | 0 | 0 |
| 1999 | Sudamerica | 0 | 15 | 0 | 0 | 0 | 15 | 0 | 0 |
| 1997 | TMA | 2.58 | 0 | 2.6 | 8.95 | 2.58 | 0 | 2.6 | 8.95 |
| 1992 | Toluca Toll Road | 4.83 | 0 | 0 | 0 | 4.83 | 0 | 0 | 0 |
| 1991/92 | Vitro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1998 | ZN Mxc Eqty Fund | 0 | 25.3 | 0 | 0 | 0 | 14.77 | 0 | 0 |
| | Total Portfolio: | 533.06 | 117.68 | 33.02 | 429.52 | 496.39 | 102.67 | 33.02 | 416.1 |

| | | Approvals Pending Commitment | | | |
|---|---|---|---|---|---|
| FY Approval | Company | Loan | Equity | Quasi | Partic |
| 1999 | BANAMEX LRF II | 50000 | 0 | 0 | 0 |
| 2001 | BBVA-Bancomer CL | 100000 | 0 | 0 | 0 |
| 1998 | Cima Hermosillo | 7000 | 0 | 0 | 0 |
| 2002 | Coppel | 30000 | 0 | 0 | 0 |
| 2001 | Ecomex | 3500 | 0 | 0 | 0 |
| 2000 | Educacion | 3200 | 0 | 0 | 0 |
| 2001 | GFNorte-CL | 50000 | 0 | 0 | 100000 |
| 2001 | Greenmanor | 7000 | 0 | 0 | 0 |
| 2001 | La Colorada | 4300 | 0 | 6000 | 18300 |
| 2001 | PanAme-La Colora | 0 | 1200 | 0 | 0 |
| 2002 | Puertas Finas | 13000 | 0 | 0 | 0 |
| 2001 | Su Casita | 0 | 0 | 2400 | 0 |
| | Total Pending Commitment: | 268000 | 1200 | 8400 | 118300 |

# Annex 10: Country at a Glance

## MEXICO: Introduction of Climate Friendly measures in Transport

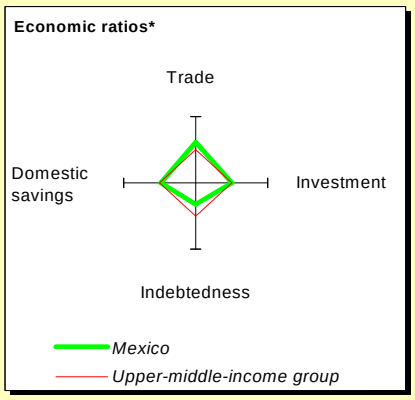
| POVERTY and SOCIAL | Mexico | Latin America & Carib. | Upper-middle-income |
|---|---|---|---|
| **2000** | | | |
| Population, mid-year *(millions)* | 98.0 | 516 | 647 |
| GNI per capita *(Atlas method, US$)* | 5,070 | 3,680 | 4,620 |
| GNI *(Atlas method, US$ billions)* | 497.0 | 1,895 | 2,986 |
| **Average annual growth, 1994-00** | | | |
| Population *(%)* | 1.5 | 1.6 | 1.3 |
| Labor force *(%)* | 2.5 | 2.3 | 2.0 |
| **Most recent estimate (latest year available, 1994-00)** | | | |
| Poverty *(% of population below national poverty line)* | .. | .. | .. |
| Urban population *(% of total population)* | 74 | 75 | 76 |
| Life expectancy at birth *(years)* | 72 | 70 | 69 |
| Infant mortality *(per 1,000 live births)* | 29 | 30 | 28 |
| Child malnutrition *(% of children under 5)* | 8 | 9 | .. |
| Access to an improved water source *(% of population)* | 86 | 85 | 87 |
| Illiteracy *(% of population age 15+)* | 9 | 12 | 10 |
| Gross primary enrollment *(% of school-age population)* | 114 | 113 | 107 |
| Male | 116 | .. | 106 |
| Female | 113 | .. | 105 |




**KEY ECONOMIC RATIOS and LONG-TERM TRENDS**

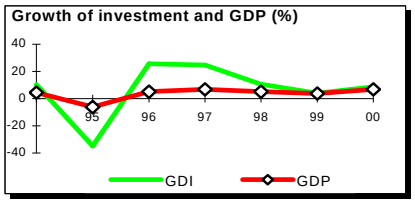
| | 1980 | 1990 | 1999 | 2000 |
|---|---|---|---|---|
| GDP *(US$ billions)* | 223.5 | 262.7 | 479.4 | 574.5 |
| Gross domestic investment/GDP | 27.2 | 23.1 | 23.5 | 23.3 |
| Exports of goods and services/GDP | 10.7 | 18.6 | 30.9 | 31.4 |
| Gross domestic savings/GDP | 24.9 | 22.0 | 21.9 | 21.5 |
| Gross national savings/GDP | 22.4 | 20.3 | 20.5 | 20.1 |
| Current account balance/GDP | -4.7 | -2.8 | -3.0 | -3.1 |
| Interest payments/GDP | 2.0 | 2.2 | 2.1 | 2.0 |
| Total debt/GDP | 25.7 | 39.8 | 35.0 | 26.9 |
| Total debt service/exports | 45.4 | 20.9 | 25.1 | 32.7 |
| Present value of debt/GDP | .. | .. | 33.9 | 26.1 |
| Present value of debt/exports | .. | .. | 102.6 | 77.8 |

| | 1980-90 | 1990-00 | 1999 | 2000 | 2000-04 |
|---|---|---|---|---|---|
| *(average annual growth)* | | | | | |
| GDP | 1.1 | 3.1 | 3.8 | 6.9 | 4.3 |
| GDP per capita | -1.0 | 1.4 | 2.3 | 5.4 | 2.3 |
| Exports of goods and services | 7.0 | 14.6 | 12.4 | 16.0 | 8.5 |

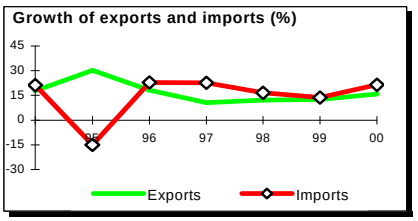



**STRUCTURE of the ECONOMY**

| | 1980 | 1990 | 1999 | 2000 |
|---|---|---|---|---|
| *(% of GDP)* | | | | |
| Agriculture | 9.0 | 7.8 | 4.7 | 4.4 |
| Industry | 33.6 | 28.4 | 28.8 | 28.4 |
| Manufacturing | 22.3 | 20.8 | 21.1 | 20.7 |
| Services | 57.4 | 63.7 | 66.5 | 67.3 |
| Private consumption | 65.1 | 69.6 | 67.1 | 67.5 |
| General government consumption | 10.0 | 8.4 | 10.9 | 11.0 |
| Imports of goods and services | 13.0 | 19.7 | 32.4 | 33.2 |




| | 1980-90 | 1990-00 | 1999 | 2000 |
|---|---|---|---|---|
| *(average annual growth)* | | | | |
| Agriculture | 0.8 | 1.8 | 2.0 | 2.1 |
| Industry | 1.1 | 3.8 | 4.2 | 6.6 |
| Manufacturing | 1.5 | 4.4 | 4.2 | 7.1 |
| Services | 1.4 | 2.9 | 3.7 | 7.4 |
| Private consumption | 1.4 | 2.4 | 4.3 | 9.5 |
| General government consumption | 2.4 | 1.8 | 3.9 | 3.5 |
| Gross domestic investment | -3.3 | 4.6 | 4.1 | 8.8 |
| Imports of goods and services | 1.0 | 12.3 | 13.8 | 21.4 |




Note: 2000 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

# Additional Annex 11: Project Chronogram
# MEXICO: Introduction of Climate Friendly measures in Transport

**Component 1: Harmonization of sector strategies on air quality issues and Integrated Climate Action Plan**

| PY01 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***1. Calibration of plans***

1.1.1 Review of plans

Scope: Review of transport, urban development and air quality programs; identification of policy instruments of reviewed programs; identification of gaps and overlaps; integration of the plans into a working document in order to establish common basis of diagnosis of programs.

1.1.2 Calibration of plans

Scope: Review of mathematical models of the transport, urban development and air quality programs in order to calibrate respective models and adjust them with different

1.1.2.1 Land Use and Transport Forecasting Model in use in MCMA (EMME 2)

Scope: Review current land-use travel model used in MCMA, also model travel interactions of transport activity with land use. Review data sources for basic land use, population, traffic and travel patterns currently used for all models employed by Mexican authorities. Compare with models in use in other mayor urban areas. Evaluate current MCMA projections of traffic levels in 2010 and 2020 for consistency with historical pattern, time use, etc., convene workshops with international experts to discuss ways of improving both data collection and models themselves.

***2. Harmonization of plans***

1.2.1 Workshop (Integration and Harmonization of plans)

Scope: Meeting with international experts, decision makers from the key sectors (environment, transport and land use planning) in order to present review of plans and programs, such as the integration proposal and to realize an open discussion about the integration.

***3. Metropolitan Climate Change Action Plan***

1.3.1 Design of MCCAP*

Scope: Proposal of format and contents of MCCAP for MCMA; Integration of results from 1.1.1, 1.1.2, 1.2.1. in MCCAP design.

| PY02 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***1. Calibration of plans***

1.1.2. Calibration of plans

1.1.2.1 Land Use and Transport Forecasting Model in use in MCMA (EMME 2)

***3. Metropolitan Climate Change Action Plan***

1.3.2. Consultation to key stakeholders

Scope: Integration of experts' opinion, who are participating in the urban, environmental and metropolitan transport administration (Provision with final version of MCCAP, consultancy via direct interviews, via phone, email etc., incorporation of their opinion).

1.3.3. Public consultation

Scope: Integration and participation of citizens in the MCCAP.

1.3.4. Final Presentation of MCCAP to key stakeholders

Scope: Presentation of final MCCAP and familiarization of all actors involved in transport, urban development, air quality and public administration with MCCAP. Search for administration mechanisms and initiation of its adoption as policy instrument.

| PY03 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***3. Metropolitan Climate Change Action Plan***

1.3.5. Monitoring (Actualization) of Metropolitan Climate Change Action Plan

Scope: Implementation of MCCAP, Definition of indicators in order to measure the

| PY04-05 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***3. Climate Action Plan***

1.3.5. Monitoring (Actualization) of Metropolitan Climate Change Action Plan

performance of the MCCAP, permanent monitoring of MCCAP, evaluation and adjustment of MCCAP based on results of measuring indicators.

**Component 2: Definition of an enabling environment to facilitate the implementation of sustainable transport strategies**

| PY01 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***1. Institutional Framework including integration of metro and bus transport***

2.1.1. Analysis of institutional and commercial barriers

Scope: Analysing institutional and commercial barriers hindering the structure and functioning of the transport system at the moment of the integration and implementation of a less polluting transport system.

2.1.1.A Definition of colectivos' interests and potential roles regarding corridors

2.1.2. Definition of institutional framework for the operation of the corridors

Scope: Definition of an adequate institutional framework facilitating the implementation of an efficient and sustainable transport system considering the chosen corridors in the MCMA.

2.1.3. Elaboration of a program proposal for the corridors

Scope: Establish the basis of a transport system focused on the functioning of the corridors.

***2. Reform of bus regulation in the corridors***

2.2.1. Analysis of regulatory framework

Scope: Definition of regulatory framework necessary for the implementa-tion of sustainable transport schemes and presentation of alternatives of modification to actual regulatory framework in an operational and institutional viability scheme.

2.2.1.1 System of quality control of corridors

Scope: Design of a quality control system of the corridors for the operation, the functioning and the integration of the corridors; definition of performance indicators for permanent evaluation of corridors; evaluation of quality control system in chosen corridors.

***3. Business and management structures for operating the bus corridors***

2.3.1. Analysis of business options for the corridors (including analysis of incentives and barriers)

Scope: Definition and integration of incentive scheme for promoting the implementation and use of transport corridors, as well as the elimination of existing barriers; Design of appropriate business structure for operation of corridors.

2.3.1.A Institutional and Economic Models for encouraging Climate Friendly Transport Systems in D.F.

Scope: Engagement of operators of microbuses (colectivos), vehicle manufactureres, and other stakeholders in order to develop viable model for colectivo operators. Definition of role for the colectivos in the corridor project and finding of ways to finance acquisition of vehicles using clean fuels.

2.3.1.B Planning workshop to define the terms of reference for the studies under 2.3.1 and 2.3.2

Scope: Coordination of expert/planning workshop to define terms of reference for the major institutional and economic studies on how to encourage fuel switching, the development of new business models for the public transit systems, and other practices that could be environmentally and financially sustainable.

2.3.1.C Strategy development for loans to small transport operators

2.3.2. Economic and financial assessment of the proposed business structure

corridors, in accordance with regulatory framework in 2.2.1 and with incentive scheme in 2.3.1.

***4. Measures to promote metro rider-ship***

2.4.1. Design of promotion campaign for increasing metro rider-ship

Scope: Design of schemes promoting an increasing intensity in use of metro as part of an integrated transport system whose consistence corresponds to the citizens' necessities.

| PY02 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

***1. Institutional Framework including integration of metro and bus transport***

2.1.4. Design of Origin/Destination Survey

Scope: Improve the existing survey of how people travel in the MCMA, and improve the models of such patterns to answer key questions about future changes, in anticipation of planning of a revised survey of travel behavior (including consideration of the results of 1.1.2.1: Land Use and Transport Forecasting Models).

2.1.4.1. Planning of improved Origin/Destination Survey (Workshop)

2.1.4.2. Design of an Origin/Destination Survey

***5. Action Plan for non-motorized options***

2.5.1. Analysis of options and conditions for cycle lanes

Scope: Characterization and definition of alternatives in order to establish strategic cycle lanes (e.g. in connection with corridors, metro). Review of previous efforts. Discussion of possible long distance routes as well as smaller areas in the region where a saturation of cycle paths is feasible, survey of bus and metro facilities where provision of safe cycle storage would boost both cycling and transit ridership.

2.5.2. Proposal for a regulatory framework for the security in the use of non-

Scope: Integration of a proposal for a regulatory framework for the functioning and operation of the non-motorized transport ensuring the safety of the users and in a institutional viability scheme.

2.5.3. Identification and evaluation of incentives for the use of non-motorized

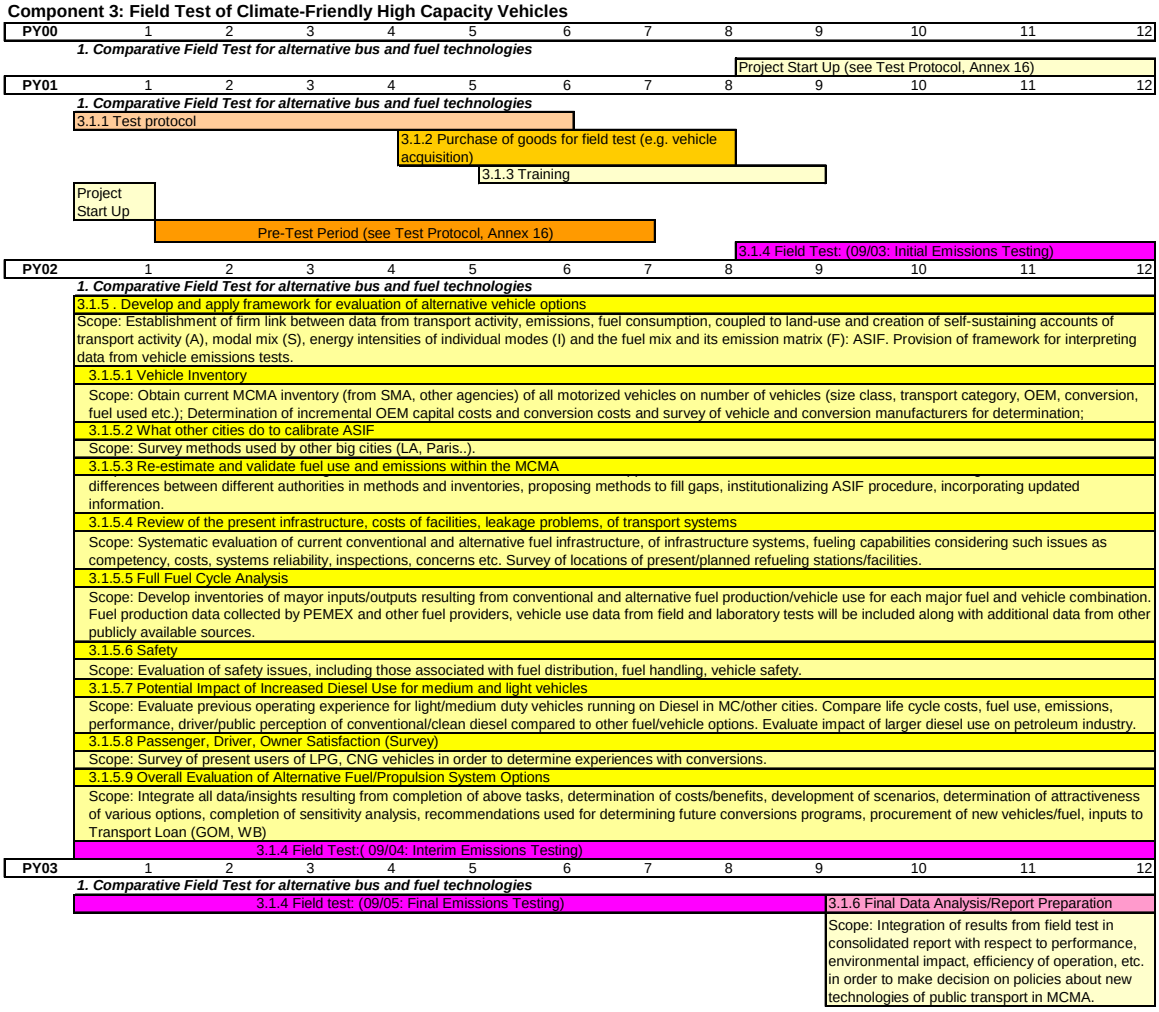
Scope: Elaboration of a proposal of incentives for the use of non-motorized transport based on the local conditions and the successful experiences in other countries and entities. Discussion with private sector interests of ways of stimulating investment in facilities and promoting cycling through employer programs.

2.5.4. Diagnosis and analysis of the infrastructure for the transference of

Scope: Elaboration of a diagnosis on the actual infrastructure serving as a basis for proposing schemes of modal transference from motorized transport to non-motorized transport.

2.5.5. Evaluation of studies for the application of an action plan of non-motorized transport

**Component 3: Field Test of Climate-Friendly High Capacity Vehicles**



**Component 4: Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies**

| PY01 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.1.5. Development of methodologies for measurement and verification of emissions from Metropolitan Area public ground transport | | | | | | | | | | | | |
| Scope: Development of methodologies for measurement and verifications of emissions from public ground transport. | | | | | | | | | | | | |
| | | | | | | 4.1.6. Provision of training to bus operators, mechanics, and maintenance staff on the operation of buses used in the pilot field test | | | | | | |
| | | | | | | Scope: Training to bus operators, mechanics, maintenance staff to ensure that the testing vehicles are well operated and maintained. | | | | | | |

| PY02 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.1.1 Carrying out of review of transport planning regulations of SETRAVI | | | | | | | | | | | | |
| Scope: Review and support to the restructuring of legal functions for SETRAVI as related to transport planning. | | | | | | | | | | | | |
| 4.1.7. Review and development of emission standards and transport regulations proposals to be applied in the Metropolitan Area | | | | | | | | | | | | |
| Scope: Development of standards and regulations to support climate and environmental considerations in transport projects. | | | | | | | | | | | | |
| 4.1.8. Provision of training and support to SETRAVIS's staff for contracting and coordinating market studies on the technology required for buses under part 3.1 | | | | | | | | | | | | |
| Scope: Training and support for contracting and coordinating market studies and surveys. | | | | | | | | | | | | |

| PY03 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.1.2. Analysis of cost benefits of sustainable transport projects | | | | | | | | | | | | |
| Scope: Realization of an analysis on costs/benefits of sustainable transport projects (integration of costs/benefits indicators in sustainable transport projects, establishment of hierarchical order of projects with respect to costs/benefits, maximize relation costs/benefits). | | | | | | | | | | | | |
| 4.1.3. Analysis of environmental impacts of sustainable transport projects | | | | | | | | | | | | |
| Scope: Integration of indicators of environmental impact in decision making on sustainable transport projects (Realization of analysis of environmental impact). | | | | | | | | | | | | |
| 4.1.4. Analysis of climate impact assessments of sustainable transport projects | | | | | | | | | | | | |
| Scope: Estimation of climate impact of sustainable transport projects, considering mitigation of GHG, the impact on vulnerability, the contribution to the adaptation and the schemes with respect to transferring technologies. | | | | | | | | | | | | |

| PY04 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.1.9. Training of officials and staff of UMS, Edomex, DF, companies that manufacture the buses required under part 3.1 and transport operators, academics and NGO's on the climate change action plan referred to in part 2.2 | | | | | | | | | | | | |
| Scope: Training in the form of workshops to transfer knowledge about testing procedures, operation and maintenance protocols and its potential of tested technologies for mitigating climate change and reduce air pollution. | | | | | | | | | | | | |

**Component 5: Public awareness and dissemination**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PY01** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 5.1. Collection and integration of produced information by the project | | | | | | | | | | | |
| | Scope: Support dissemination of technical information, policy recommendations and conclusions from project, promotion and financement of workshops/stakeholder meetings for internal coordination and external communication in establishing permanent mechanism for sharing information, defining format timing and characteristics for presenting information generated and organizing and systematizing information received. | | | | | | | | | | | |
| **PY02** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 5.1. Collection and integration of produced information by the project | | | | | | | | | | | |
| | 5.3. Dissemination of technical information produced by the project | | | | | | | | | | | |
| | Scope: International dissemination of obtained experience and achieved results, above all dissemination to Latin-America for their replication potential. Introduction of the project as a whole to civil society in Mexico City to encourage their support and participation throughout the project (among others through Workshops). | | | | | | | | | | | |
| | 5.4. Promotion and financing of Workshops and stakeholder meetings | | | | | | | | | | | |
| | Scope: Workshops and meetings with stakeholders and experts in order to share the results of the project and to further develop these. | | | | | | | | | | | |
| **PY03** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 5.1. Collection and integration of produced information by the project | | | | | | | | | | | |
| | 5.2. Design of public campaign | | | | | | | | | | | |
| | Scope: Design of public campaign outlining the advantages and objectives of transport corridors as well as the benefits from the use of non-motorized modes of transport. Such as design of public campaign (through workshop) to engage citizens in Mexico City and to gain their support for strategies to reduce negative impacts from transport on environment and quality of life. | | | | | | | | | | | |
| | 5.3. Dissemination of technical information produced by the project | | | | | | | | | | | |
| | 5.4. Promotion and financing of Workshops and stakeholder meetings | | | | | | | | | | | |
| **PY04-05** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 5.1. Collection and integration of produced information by the project | | | | | | | | | | | |
| | 5.3. Dissemination of technical information produced by the project | | | | | | | | | | | |
| | 5.4. Promotion and financing of Workshops and stakeholder meetings | | | | | | | | | | | |

**Component 6: Project Management**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PY01-04** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 6.1. Implementation of the project | | | | | | | | | | | |
| | Scope: Facilitating the proceeding of the administrative implementation of the project with diverse executive entities of the project. | | | | | | | | | | | |
| | 6.1.A Support in the coordination and supervision of the implementation of components | | | | | | | | | | | |
| | 6.2. Operation of the activities | | | | | | | | | | | |
| | Scope: Guaranteeing that in the long term of the implementation all activities included are carried out in accordance with objectives. | | | | | | | | | | | |
| **PY05** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 6.1. Implementation of the project | | | | | | | | | | | |
| | 6.2. Operation of the activities | | | | | | | | | | | |
| | 6.2.1 Information Management System | | | | | | | | | | | |
| | Scope: Design, testing and initiation of an information management system and learning network to support the dissemination of all information produced by the project. Development of guidelines and provision of support to ensure managers of each component to contribute to and to regularly update the information management | | | | | | | | | | | |
| | 6.3. Evaluation of results | | | | | | | | | | | |
| | Scope: Integration and evaluation of results with respect to resources-measures-objectives. | | | | | | | | | | | |

*** MCCAP corresponds to Metropolitan Climate Change Action Plan.**

## Additional Annex 12: Transmilenio Mass Transit System (Bogota)
## MEXICO: Introduction of Climate Friendly measures in Transport

**Transmilenio Mass Transit System**

While the proposed corridor transport concept for the MCMA is different to Transmilenio, the experience of the latter offers valuable lessons that are being considered in the design of the options in Mexico. This annex summarizes some of the key features of the Transmilenio experience.

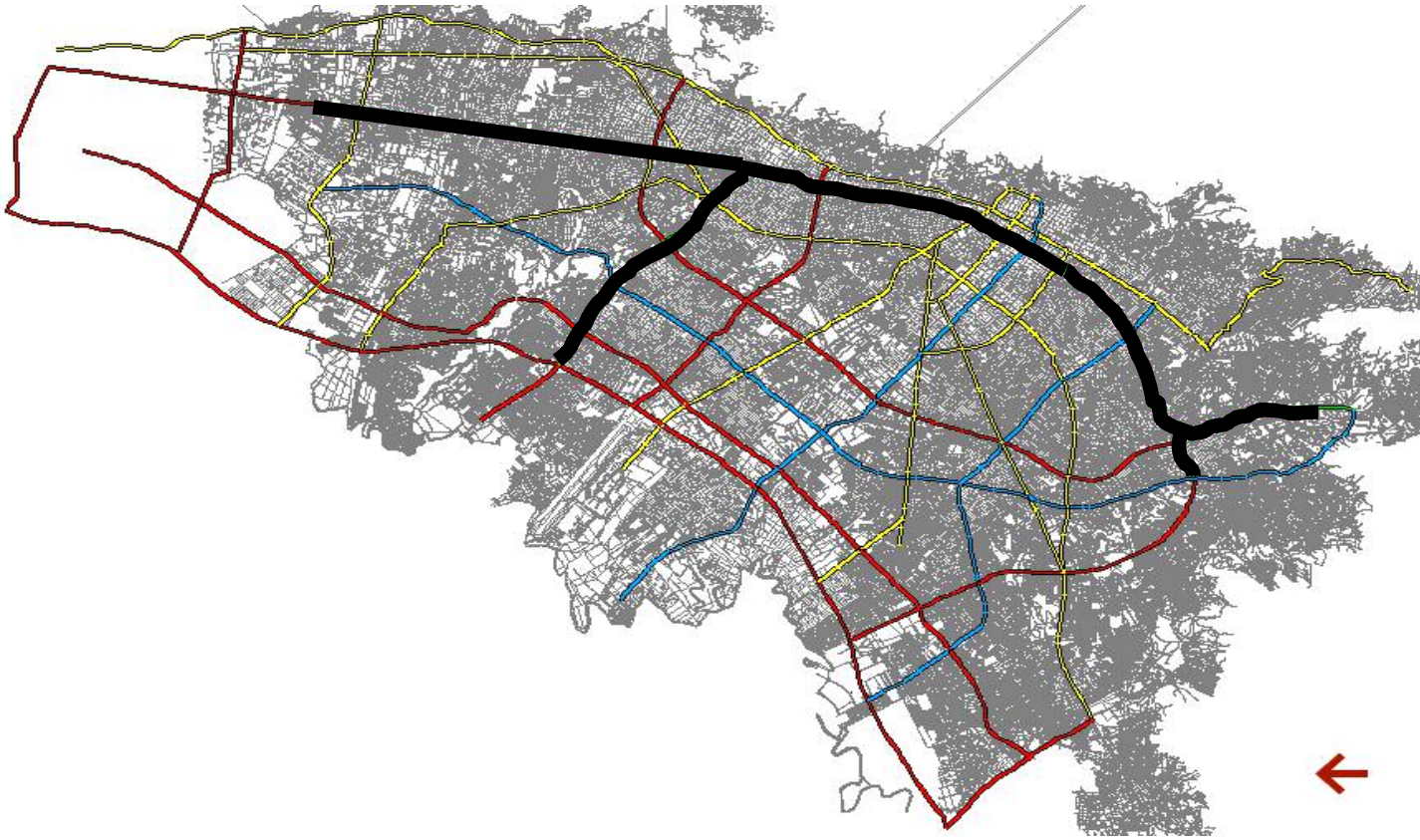
Bogota is one of the most densely populated cities in the world, with approximately 7 million people in an area of only 35,000 hectares. Many of the main roadways are congested with a traffic speed during rush hour of only 10 kilometers per hour. The use of private cars is a major cause of the congestion. Although approximately 71% of motorized person trips are made by bus, 95% of road space is used by private cars that transport only 19% of the population.

Transmilenio, a mass transit system based on buses, is part of the strategy implemented to improve the congestion in the city by reducing reliance on private cars, and consists of the following main components: (i) infrastructure to improve traffic congestion under the responsibility of the public sector (exclusive lanes, stations and terminals, access ways, parking lots and maintenance shops); (ii) an efficient operating system (operation companies, buses and employees) run by the private sector; (iii) an effective and transparent fare collection system (equipment, card based and fiduciary management) run by the private sector; and (iv) a permanent public institution in charge of planning, operation and control.

Some features of the system are: (i) people are transported in articulated buses with a 160 passenger capacity; (ii) there are stations every 500 m with terminals and interchange stations at the end of each line so the passenger can continue his trip using feeder buses (40-80 passenger capacity) without paying an extra fare; (iii) each articulated bus has a GPS (global positioning system) connected by satellite to a control center, where the frequency, position and speed is controlled; (iv) the payment for the use of the system is made before entering the stations using a card system; and (v) the concessionaires for the operation include operators already providing bus services, and domestic and international investors while the feeder bus service is contracted out to existing transport companies.

The first stage of the system, partially under operation, comprises 470 articulated buses, and 41 km of segregated busway. As of June 2002, it was 680,000 passengers per day. The total cost of the first stage was US$ 213 million for the fixed infrastructure plus US$ 115 million for the buses which were financed by the private operators. Stage II and III are proposed to expand the system to include 22 corridors that could meet the demand of about 85% of the trips made in Bogota.

## Diagram of Stage I (thick line) and Proposed Stage II and III Corridors



After 10 months of operation, Transmilenio achievements include:

- Ridership has increased from 312 to 1807 passengers per day per bus;
- Commercial success: it is expected that the bus companies will recover their investment in the articulated buses within 4 years;
- No public subsidies: except for the initial infrastructure investment and road maintenance, all costs are financed from fare collection;
- Passenger benefits: the average travel time for a trip on the corridors has reduced 32%;
- Improved traffic safety: in the bus corridors, the weekly number of traffic accidents has declined form 26.5 to 4.9 in 2001, with injuries and fatalities falling from 18 to 4.5, and from 1.3 to 0.1 respectively;
- Pollution has reduced (SO2, NO2, O3 and PM-10) significantly along the corridors;
- Excellent public image: In a recent survey (9/01), 88% of the respondents rated Transmilenio as either “good” or “very good”.

Transmilenio has created important changes in the transport sector:

- It has catalyzed the modernization of the public transport industry in Bogotá. The creation of solid operation companies and fleet owners, has made the provision of efficient and high quality service a priority;
- It has begun dismantling the “Guerra del centavo” (“war for the penny”) that came about as a result of the traditional payment system to drivers based on the number of passengers moved per day;

- The concession contracts have made it mandatory to retire and destroy 2.7 old buses for each articulated bus purchased.

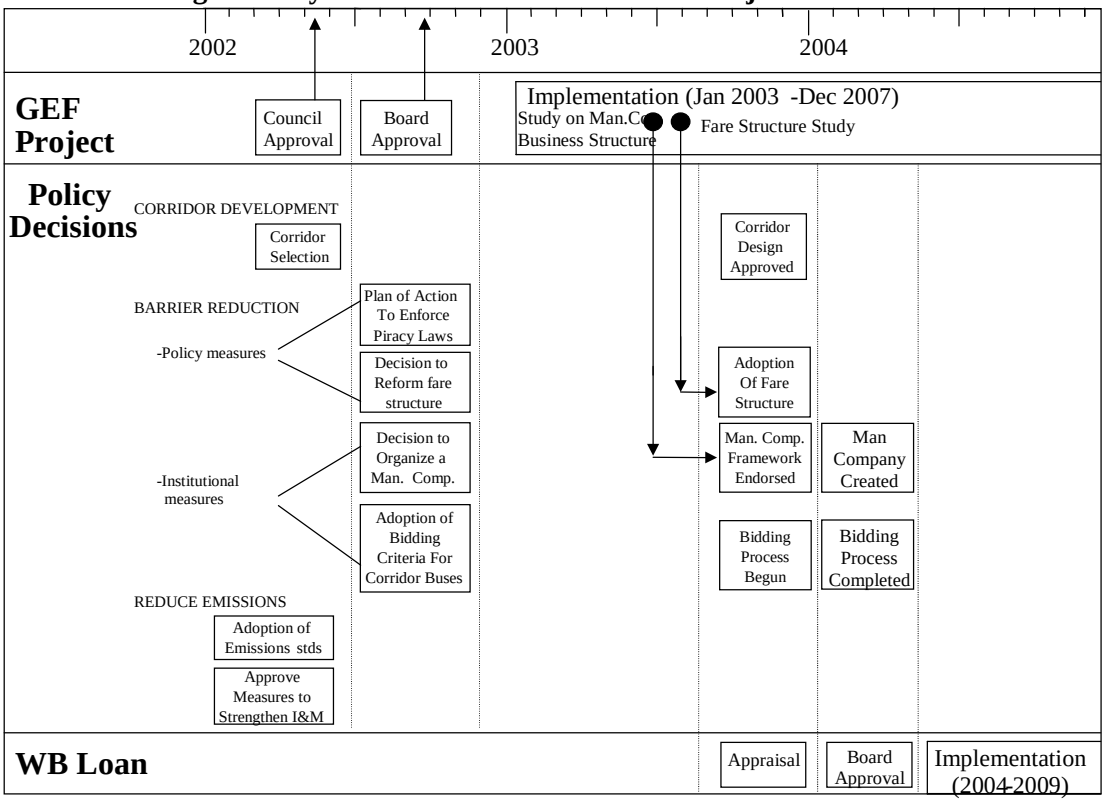
The key factors in successful project implementation have been:

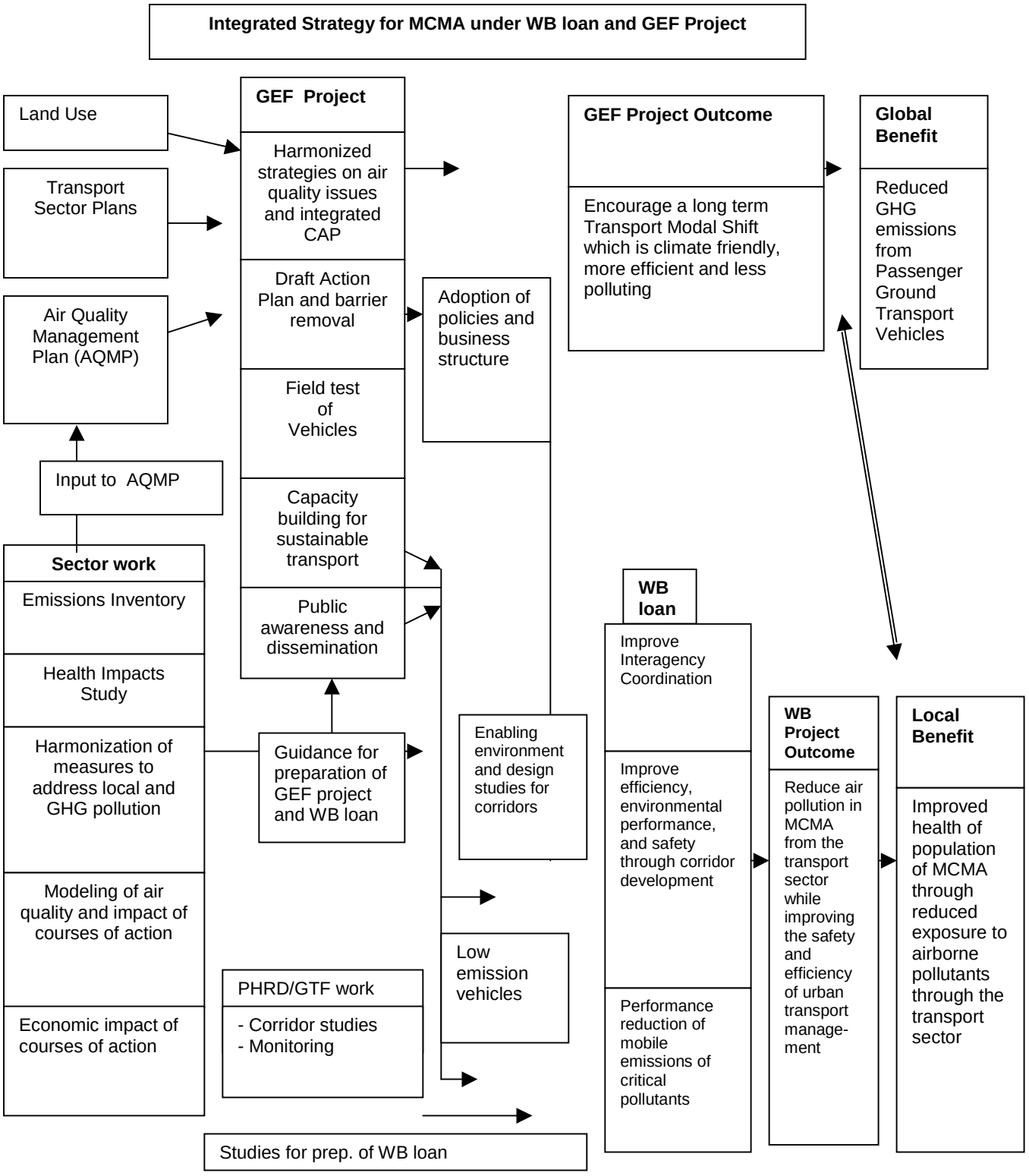
- The city had enough financial resources for the project from the sale of a portion of the Power Company, this allowed the project to be implemented effectively and before the end of the Mayor's term of office;
- The project execution was based on politically and financially realistic planning;
- A highly qualified management and technical team was engaged to develop the project;
- The team worked outside the day to day work of the public institutions to allow them to focus on the development and implementation of the project;
- There was a clear decision to work with the established private operators. The partnership with the private operators permitted a smooth transition into the implementation phase of the project;
- There were minimal negative impacts for the most powerful stakeholders (politicians, bus industry, operators).

The project had strong leadership, political will and institutions.

## Additional Annex 13: Timing and Integrated Strategy
## MEXICO: Introduction of Climate Friendly measures in Transport

**Timing of Policy Decisions in Relation to GEF Project and WB Loa n**




Integrated Strategy for MCMA under WB loan and GEF Project
Land Use
Transport Sector Plans
Air Quality Management Plan (AQMP)
Input to AQMP
Sector work
Emissions Inventory
Health Impacts Study
Harmonization of measures to address local and GHG pollution
Modeling of air quality and impact of courses of action
Economic impact of courses of action
GEF Project
Harmonized strategies on air quality issues and integrated CAP
Draft Action Plan and barrier removal
Field test of Vehicles
Capacity building for sustainable transport
Public awareness and dissemination
Guidance for preparation of GEF project and WB loan
Adoption of policies and business structure
Enabling environment and design studies for corridors
Low emission vehicles
PHRD/GTF work
- Corridor studies
- Monitoring
Studies for prep. of WB loan
GEF Project Outcome
Encourage a long term Transport Modal Shift which is climate friendly, more efficient and less polluting
Global Benefit
Reduced GHG emissions from Passenger Ground Transport Vehicles
WB loan
Improve Interagency Coordination
Improve efficiency, environmental performance, and safety through corridor development
Performance reduction of mobile emissions of critical pollutants
WB Project Outcome
Reduce air pollution in MCMA from the transport sector while improving the safety and efficiency of urban transport manage-ment
Local Benefit
Improved health of population of MCMA through reduced exposure to airborne pollutants through the transport sector

## Additional Annex 14: Center for Sustainable Transport, Energy and Environment MEXICO: Introduction of Climate Friendly measures in Transport

The Shell Foundation and the World Resources Institute are delighted to announce that Mexico City has agreed to become the first and Lead Partner City for the Center for Sustainable Transport, Energy and Environment at the World Resources Institute. This formal cooperation will extend over a five-year period (2002-2006) and involve the joint commitment of resources and effort by the signatory parties to a "Program for Sustainable Transport in Mexico City". The mission of this "Project" is to foster the implementation of an environmentally sustainable urban transport system in Mexico City. Mexico City's commitment to this sustainable transport effort marks it as one of the more far-sighted city governments in the world, committed to delivering a better quality of life for citizens.

Transport is Key conduit of economic and social benefits. It is also a source of major environmental problems, both locally - via congestion, noise and air pollution affecting the health and economic fortunes of many billions of people- and because CO3 emissions from transport in all regions of the world are rising more rapidly than total emissions making transport one of the single most important diverse of global climate change. There is growing societal consensus that "something needs to be done" to tackle the transport/environment conundrum and a number of initiatives have been tried or are underway. Yet, of all the energy-related problems affecting the environment, transport has so far proved the most intractable.

Background. The Shell Foundation is a UK registered charity that was established in June 2000 by Royal Dutch/Shell. The mission of the Foundation is the promotion of sustainable development world-wide. It pursues this mission primarily via providing financial grants to support of projects carried out by established nonprofit organizations and focusing on the Foundation's three major areas of concern: the links between energy and poverty, particularly in developing countries, where some 2 billion people do not have access to modern energy; the impact of energy production and consumption on the local and global environment; the effect of globalization on the welfare and livelihood of marginalized and vulnerable communities.

The Foundation has a distinguished Board of Trustees that includes Mr. Philip B. Watts, Chairman of Royal Dutch/Shell; Sir John Houghton, Co-chair of the Inter-Governmental Panel on Climate Change and Prof Jose Goldemberg, University of Sao Paulo, Brazil and Minister for Environment, Sao Paulo State, Brazil. More details on the Foundation can be found on its website: http://www.shellfoundation.org.

Under the auspices of tis work on the environmental impacts of energy consumption, the Shell Foundation in December 2001 awarded the World resources Institute in Washington D.C. a 5 year, $3.75 million grant to establish a new Center for Sustainable Transport, Energy and Environment.

WRI is one of the world's leading environmental NGOs and is highly respected by the international NGO, government, academic and industrial communities. More information about WRI can be found on its website: http://www.WRI.org. The director of the Center will be Dr. Lee Schipper, who brings 30 years of experience form working in literally dozens of countries of the South and North.

The Shell foundation, via the creation of Center at WRI will support a multi-year program of work that will tackle the transport-environment problems faced by large urban centers particularly in developing countries - where most future growth in transport and transport-related environmental problems will occur. The primary short-term goal of the new Center is the development of proven models of effective intervention introducing sustainable transport solutions in select target cities in the developing world.

The long-term goal is that these models of successful intervention will be subsequently deployed in other developing country cities with growing transport problems. The effort will focus on close partnerships with public and private authorities in the partner cities, with strategic alliances with private fuel and vehicle makers, multi- and bilateral lenders, academics, and NGO's. Information technology will strengthen these partnerships through meaningful exchange of data, experience, and good evaluation of policy and technology experiments.

Institutional Base and project Objectives. The lead Mexico City institutions in the Program will be the Ministry of Environment (SMA), and the Ministry of Transport (SETRAVI). Other city authorities with a major role in transport such STE will also be involved in the work of the Project. The Project will give major support to the World Bank/ Global Environmental Facility Program.

The project will work closely with international motor vehicle and fuel companies and regional and national authorities.

The project will work at four interrelated levels:
a) Analysis: The Program will deliver credible analysis of technical, economic and policy aspects of providing environmentally and financially sustainable solutions to the problem of transport in Mexico City.

b) Advice and Information: The Program will make concrete policy and planning recommendations, and disseminate information relevant to the planning and decision-making of those actors in a position to make major investments. Web-based tools will provide a key means to this end, and other cities in Mexico will be invited to follow the developments in Mexico City.

c) Engagement: The Program will facilitate the engagement and commitment of private, civil society and public sector leaders in Mexico City to a mutually agreed plan to implement the new, sustainable transport policies and programs called for by the above analysis.

d) Implementation: The Program will support SMA's efforts to design, implement and evaluate concrete interventions in land use and transportation, including those arising from the new World Bank/GEF project.

The new Center at WRI and the Mexico City Program for Sustainable Transport was formally launched in Mexico City on June 1, 2002.

## Additional Annex 15: Cost of Field Test
## MEXICO: Introduction of Climate Friendly measures in Transport

## *Cost Estimates Matrix: Alternative Fuel Bus Evaluation Program*

The total vehicle testing costs, not including emissions laboratory construction costs, are estimated to be between **3,094,954** and **3,514,198** dollars (US)

**Vehicle Costs**

| | Diesel | CNG | Diesel-Hybrid | **Totals** (sin LPG) |
|---|---|---|---|---|
| **Fixed Costs:** | | | | |
| # Vehicles | 4 | 4 | 4 | |
| $/Vehicle (US) | 80,000 | 90,000 | 180,000 | 1,400,000 |
| Kms/dia/veh | 220 | 220 | 220 | |
| dia/año | 312 | 312 | 312 | |
| salary/driver | 6,720 | 6,720 | 6,720 | |
| driver/veh | 2.2 | 2.2 | 2.2 | |
| # years | 2 | 2 | 2 | |
| Fuel Tanks, Tools, Pum | 50000 | 50,000 | 50,000 | 150,000 |
| | | | | |
| **SubTotal - Fixed** | 488,272 | 528,272 | 888,272 | **1,904,816** |
| | | | | |
| **Variable Costs:** | | | | |
| # Vehicles | 4 | 4 | 4 | |
| Fuel | .08-.13 $/km | .07-.1 $/km | .06-.1 $/km | |
| Maintenance (US) | .21-.27 $/km | .25-.31 $/km | .31-.36 $/km | |
| Cost/km (low) | 0.29 | 0.32 | 0.37 | |
| Cost/km (high) | 0.40 | 0.41 | 0.46 | |
| Veh-Kms/año | 68,640 | 68,640 | 68,640 | |
| # años | 2 | 2 | 2 | |
| **SubTotal - Var (low)** | 159,245 | 175,718 | 203,174 | **538,138** |
| **SubTotal - Var (High)** | 219,648 | 225,139 | 252,595 | **697,382** |
| total diesel fuel use | 62400 | | 54912 | |
| **Total :** | 647,517 | 703,990 | 1,091,446 | |
| | to | to | to | |
| | 707,920 | 753,411 | 1,140,867 | |

**Program Administration Costs**

| | | | |
|---|---|---|---|
| Program Manager | | 1 "Technical" FTE total for 2 years = | **100,000** (50,000 dollars per ye |
| Advisory Committee | 5 foreigners, 2 visits, 5,000 dollars each visit | | **100,000** |

**Vehicle Emissions Testing Costs** (supplier to be selected through ICB)

| | | | |
|---|---|---|---|
| if we have to pay by test: | | 3days*12 buses*1000$/day*3tests = | **108000** |
| | At VWU | estimated at | **600,000** |

**Training Costs:** **100,000**

**Driver and Passenger Survey Cost:** **2000**

**Data processing and a analysis:** **200,000**

**Contingencies** **340,000**

**Final Report Preparation:** **10,000**

**Total Program Cost Estimates:**

**3,094,954**
**to**
**3,514,198**

**Notes:**

driver/mechanic costs: Technical FTE salary assumed = 40,000 per year

Driver FTE Salary:

| | |
|---|---|
| "overhead | 1.4 |
| months | 12 |
| salary (pes | 4000 |
| pesos/doll | 10 |
| FTE/year = | 6720 |

maintenance = oil, parts, labor, tires, brake pads, repairs, with US. Labor costs.
training costs estimate = 60,000

Concerning the Hybrid operating costs, there are assumed to be higher because the buses are prototypes, and are expected to need more attention than diesel buses.

## Protocol for the Clean Vehicles Testing Program

### 1. Introduction

Through the following proposed testing program of alternative fuel and propulsion system vehicles, Mexico City will become an important laboratory for evaluating the costs, benefits and challenges of operating advanced technologies in the world's largest mega-cities. The study involves the assessment of the life cycle costs (capital, fuel, operation and maintenance) as well as the emissions of pollutants and greenhouse gases from conventional diesel and alternative fueled transit buses over a study period of 2 years. The proposed testing protocol will involve procedures standard to bus testing around the world, and has benefited from the contributions of several experts in the field of bus testing and operations and alternative fuels and propulsion systems. Inputs have been received from 1. Dana Lowell, Assistant Chief Maintenance Officer for Research and Development at New York City Transit (which is currently operating a fleet of 221 CNG buses and 375 Hybrid diesel buses), 2. Richard Gibbs, at the New York EPA, 3. Nigel Clark, Professor of Mechanical Engineering at West Virginia University and 4. Heather MacLean, Assistant Professor of Civil Engineering at the University of Toronto.

The testing program will serve to supply some of the information necessary to make long-term decisions regarding the upgrading and expansion of bus-based transit systems in Mexico City which consider economic, environmental and institutional sustainability. The results of this study have limitations in their application, and additional information will be included based on reviews of existing studies and judgments from experts in the area of alternative vehicle options and Mexican authorities.

The program will give the Mexican agencies the experience of operating alternative fueled vehicles before it comes time to adopt them into operations in a large scale. It will develop the record keeping capacity required to compare costs between different bus platforms run by the agencies. The resulting data will be used for evaluating the costs and benefits of the various technologies. Other nontechnical factors not present in this testing protocol will also come into play in the final analysis and comparisons of the bus technologies.

The deliverables of the tests are 1) measures of the fixed costs and costs of operation for each vehicle, including fuel and other consumables, labor, maintenance and repair, 2) measures of the air pollutant and greenhouse gas emissions of each vehicle at various points during the testing period, 3) subjective measures of the performance of the buses based on passenger, driver, and other staff's comments and evaluations, 4) an understanding of the challenges to operating fleets of advanced vehicles in Mexico City. The management of the testing program

will be described first, followed by the specific protocols for the field tests and the laboratory tests.

## 2. The Testing Program Structure and Management

The testing program will consist of a fleet of test buses to be operated by the Government Company for Electric Transport in Mexico City (STE). The Fleet will be operated in the field under normal service conditions ("the field tests"). The Fleet will be periodically removed from service to undergo emissions testing in a vehicle testing facility, the fleet will also undergo a series of in-service emissions testing using on-board emissions testing equipment. Included in the Fleet are 4 Compressed Natural Gas (CNG), 4 Hybrid Diesel Electric, 4 Clean Diesel and 4 standard diesel buses (to be tested during the pre-test period). The Program will consist of a pre-testing phase, lasting roughly 6 months preceding the arrival of the Fleet, and the testing phase, to last for 2 years from the reception of the Fleet. Processing and interpretation of the data will take place as the data is collected during the 2 years, and several months will be left after the end of the 2 year period for final data analysis. During the field testing, surveys will be performed of the passengers, drivers, mechanics and operations staff to measure satisfaction and performance. A more detailed calendar of events follows below. The program will be managed day to day by a project manager, and will be overseen by an advisory committee.

### The Test Fleet

The expected number of buses to be included in the test fleet (the Fleet) are: 4 Compressed Natural Gas (CNG), 4 Hybrid Diesel Electric, 4 Clean Diesel and 4 standard diesel buses. See Annex 17 for a description of each of these bus technologies. The number of buses of each type, four in this case, was chosen according to a statistical analysis of the errors in the values predicted from the tests. A discussion of how this number was determined can be found in Annex 16. A search for CNG, Hybrid and Clean Diesel vehicles is being carried out. For purposes of comparison, it is hoped that the buses in the fleet are of a very similar capacity. The final selection of buses will depend on the availability of models from the participating manufacturers. Delivery of the vehicles is expected for the summer of 2003. The standard diesel vehicles will be taken from the present fleet of the transit agency.

### The Test Fuels

Conventional diesel (PEMEX 350 ppm) will be used during the pretest period for the conventional diesel buses. Low sulfur diesel (50 ppm) is being obtained through Shell-Mexico and will be stored in separate storage facilities, to be constructed during the start-up and pretest periods. The fuels obtained will be those most appropriate for the engine technologies, keeping in mind expected availability of fuels in Mexico City. An additional supply of Ultra-low-sulfur (· 15 ppm) diesel is currently being negotiated.

The CNG buses will demand CNG fuels, to be supplied through ECOMEX at their local refueling stations. Negotiations between STE and ECOMEX have determined that stations are close enough to STE routes to be feasible for use in the test, without any additional construction

or shipping arrangements. The quality of the CNG fuel used is extremely important and should be monitored during the testing, both in the depot and in the laboratory.

Venue for Field Tests

The venue for tests will be determined during project implementation. The main STE depot at Municipio Libre will be the location for the storage, fueling, maintenance and repair of the Fleet, as this is where the buses will depart for revenue service. Areas of the depot will be dedicated to the additional tools and equipment needed by the new buses, to be arranged and decided by depot staff and managers. The clean diesel fuel storage tanks and pumps will also be located in the STE depot. The installation of these fueling facilities will take place during the pre-test period.

The routes over which the buses will operate during the field tests will be decided by STE staff in consultation with the Advisory Committee. The route will be chosen for how it represents typical bus driving conditions in Mexico City, as well as its proximity to the Ecomex CNG refueling facilities. Other criteria, such as length, will also be considered in the route selection. On-board emissions testing may take place as the buses are operated in service out of the STE depot. This testing will depend on the funds available and further discussion.

Venue for Laboratory Emissions Tests

Technical assistance for the emissions testing and other tests under the protocol will be contracted under competitive bidding.

Program Task Calendar

The following calendar assumes emissions testing will be done once after the initial vehicle break in period, and then once per year after that. It should be noted that the calendar is dependent on the completion of the emissions testing laboratory, and the delivery of the buses and fuels, and the final approval of this protocol by the advisory committee. Other, testing schedules can be accommodated if it is so desired.

1) September, 2002 to January, 2002 : Project Start-Up
(a) Finalize contract for fuel supply
(b) Install fueling infrastructure
(c) Finalize contracts for the supply and delivery of buses
(d) Arrange for fuel use training
(e) Purchase and install any new tool sets or other equipment as needed
(f) Hire Project Manager
(g) Finalize Advisory Committee
(h) Make final decision concerning laboratory testing arrangements
2) February, 2003 to July, 2003 : Pre-test Period
(a) Continue modification of bus depot for the new buses as needed
(b) Develop “Operations Reports” with the input of work crews, managers, Program

Manager, Advisory Committee and Mexican Agencies
(c) Test implementation of Operation Reports
3) April, 2003 : Vehicle Acquisition
(a) Train Staff (work crews, managers, Program Manager) on maintaining, fueling and repairing test fleet.
(b) Train drivers on test fleet vehicle operations.
(c) Place test fleet into service revenue
4) September, 2003 : Initial Emissions Testing (after vehicle "break-in" period)
(a) Initial Emissions testing for entire test fleet
5) September, 2004 : Interim Emissions Testing
(a) Emissions testing for entire test fleet
6) September, 2005 : Final Emissions Testing
(a) Emissions testing for entire test fleet
7) October, 2005: Final Data Analysis and Report Preparation
(a) Final field data analysis is made using now completed test data
(b) Combine Emissions and Field data into final program report

Management of the Testing Program

The testing program will be managed by a Project Manager (see Annex 21 for more details about the manager's responsibilities.), and the project will receive general guidance from an advisory committee. The Manager will be responsible for overseeing the operation and testing of the buses on a day-to-day basis. The Manager will keep aware of the status of each bus in the test bus fleet, making sure that if it is not in operation as scheduled, it is being actively repaired or maintenance. The Manager will serve as the liaison between the transit agency and the bus manufacturers' representatives and repair technicians, and inform the advisory committee (see Annex 21) about relevant developments in the testing. The advisory committee will consist of representatives of all of the Mexican agencies involved, bus and fuel producers, as well as several technical experts from several countries.

The manager will not be responsible for any data processing or analysis. A team of analysts or consultants will process and interpret the test results and data as it is produced. This team should consist of people from the relevant Mexican agencies and receive guidance from the advisory committee. Interim and final reports will be produced by the team with input from the advisory committee.

### 3. The Start-Up and Pre-Test Period

Several things need to happen before the buses are delivered to prepare the bus depot for testing. Physical changes to the depot must take place to make room for new tool sets, fueling facilities, and of course, 20 additional buses. The depot work crews and managers must decide on and make these changes. STE will make arrangements for new tools or assistance directly with bus and fuel producers.

The fueling facilities need to be installed by the appropriate agency, to be arranged when the

fuel contracts are made. The relevant depot staff needs to be trained on how to use and maintain the fueling facilities. The portion of the staff to receive this training is up to the depot managers and will depend on staff responsibilities.

During the Pre-Test period, the work crew managers and Program Manager must develop the format for the "Operations Reports" with the input of the Advisory Committee and Mexican Agencies, based on the basic model included in this proposal (see below). This includes defining the data to be included in the form and the way the forms are filled out, stored and accessed by depot staff. The depot should then test and trouble shoot the Operations Reports by maintaining them for existing buses in the fleet. The Program Manager can then assess that data is being recorded properly and accurately before the test Fleet arrives.

Depot crews should be trained and ready to repair and maintain the Test Fleet before the start of the tests. They should feel familiar enough not to hesitate when confronted with repairs on the new vehicles, which is common to many depots receiving new technologies. The role of the crew managers and Project Manager will be important, and specific workers trained and assigned to the new vehicles will be decided by the crew managers.

Start-Up and Pre-Test Responsibilities

Mexican Agencies must finalize the procurement of the test buses as well as the contracts for fuel supply. The installation of the fuel supply system must be coordinated by the Agencies and the depot managers. The agencies must hire the project manager. Depot managers must plan staff assignments to the test program and make sure fuel training is assigned accordingly. Depot managers should also plan for the physical changes in the depot and any construction or purchases which will be needed.

## 4. The Field Tests

The collection of information about maintenance and fuel costs can only come through the day-to-day operation of the buses. This portion of the testing program is called the field testing. The buses are scheduled into regular service, repaired and maintained as any other bus in the system. The route used for testing should be very typical of the driving conditions experienced by buses in Mexico City. Any revenues collected during the field testing will be retained by STE.

The principal data collection instrument of the field tests is the Operations Report. STE has in place a "fleet maintenance" information management system, called IMANT, which will prove to be a very useful base for developing the data collection system the project demands. A new Operations Report will be developed using the current system, and will include the following information:

1. Date
2. Time
3. Vehicle identifier number

4. Odometer reading
5. Fuel source identifier (i.e. type of fuel or fuel lot number in the case of clean diesel, which will be stored separately in containers)
6. Recorder name
7. Description of 'event' (fueled vehicle, repair of exhaust system, replace injector, rotate tires, etc.)
8. Classification of event into 2 dimensions:
    A. Type of work (routine, i.e. scheduled oil changes, and unscheduled, i.e. repair)
    B. Part of the Bus needing work:
        1. Scheduled Preventative Maintenance
            a. Oil,
            b. Air Filters
            c. Brakes
            d. Tires
        2. Engine
            a. Engine
            b. Coolant
            c. Lubrication
            d. Fuel System
            e. Exhaust
        3. Drivetrain
            a. Transmission
            b. Driveshaft
            c. Rear Axle
        4. Chassis
            a. Front axle
            b. Steering
            c. Suspension
            d. Wheels and Bearings
            e. Body
        5. Driving cycle
9. Parts or materials used or ordered and their costs
10. Total labor hours used
11. Total "down" time of the bus for the event

The definitions of "event" used in the Operation Reports vary among bus service depots. The definitions should be finalized as part of the pre-testing phase of the testing program in order to allow unhindered data collection during the testing phase. In order to facilitate the breakdown of costs for the hybrid vehicles, one or more additional non-traditional work categories will need to be added to the report.

Fuel refilling will be recorded on these forms and this information will be essential to determining the fuel efficiency and costs of the vehicles. Other information deemed pertinent to the specific operations in Mexico City, such as identifying the particular bus depot or work crew involved can easily be added to the Reports. Example reports from other operators can be

reviewed as a starting point for developing the forms.

During the field testing, surveys will be performed of the passengers, drivers, mechanics and operations staff to measure satisfaction and performance. Surveys of riders and drivers will ask for ratings of things like performance, acceleration, noise, odor, and comfort, among other things. Surveys of mechanics and operations will seek feedback on things related to ease of maintenance and reliability. The surveys will be developed by the program manager and senior STE staff, and an assistant will be hired to help with the execution.

Field Test Responsibilities

The bus depot work crew, the depot crew managers, and the Project Manager will all contribute to the field test effort. The work crew will be trained in how to fill out the operations reports, and the crew managers will be charged with insuring that these reports are filled out in a satisfactory manner. Most transit agencies have some kind of recording system for any work done on agency property, so these responsibilities will not be new to most bus maintenance crews. The copying and storage of the reports, and the entry of the data should be the responsibility of the Project Manager. It is important the any special fuels to be used for the test buses are separated and cared for by the crew or depot managers, together with coordination with the Project Manager. STE management will form a relationship with the bus manufacturers in order to schedule any major repairs, overhauls, order special parts, etc. The program manager should also assist in this effort.

## 5. Laboratory Tests

Among the most important results of the testing program are the emissions measurements made on the test fleet. In order to be able to measure these benefits accurately, the emissions of each bus must be tested in laboratory conditions. Currently, there is no legal standard for heavy vehicle testing in the laboratory. The Society of Automotive Engineers (SAE), in conjunction the California Air Resources Board and West Virginia University is developing a statement of standard practice for laboratory emissions testing of heavy-duty vehicles, entitled SAE J2711. This document recommends procedures to be followed in emissions testing, and will serve as a world standard for bus testing. It includes all of the steps needed for laboratory staff to prepare and test a heavy-duty vehicle and is directly applicable to the laboratory at the Mexican Institute of Petroleum. One to two days will be needed to test each vehicle.

The emissions testing will involve driving the buses on a dynamometer. The driving “cycle” which dictates the speeds and accelerations followed by the vehicle during testing must be decided upon by the Mexican agencies. There are numerous established cycles simulating urban driving conditions but it is also common for cities to develop their own in order to more accurately simulate their own typical driving conditions (e.g., New York City developed a driving cycle). Developing a new driving cycle is a fairly straightforward endeavor and can be performed at an institution providing technical assistance for the emission testing which will be contracted under competitve bidding. This development of a new driving cycle will be coordinated with STE during the pre-test period in order to have it ready for the initial testing of

the Test Fleet. It involves measuring the speed history of a bus in typical driving conditions and using software to construct speed profiles which are found to be statistically typical.

The proposed set of pollutant emissions and greenhouse gasses to be measured during the testing are noted below.

Carbon monoxide (CO)
Carbon dioxide (CO2)
Nitrogen oxides (NOx)
Sulfur oxides (SOx)
Hydrocarbons (Methane (CH4) and Non-methane (NMHC))
Particulate Matter (PM) (of sizes to be determined by the needs of the Mexican officials)

These (excluding SOx) are the most commonly tested emissions and are the only ones required by the U.S. EPA. The list may be amended based on consultation with Mexican Officials, together with the group in charge of atmospheric pollution modeling (Multiscale Climate and Chemistry Model). This would not affect the standard procedures (it just changes which pollutants are measured by the chemical analyzers).

The fuels used during the field operations and laboratory tests should be monitored and tested for their actual chemical composition. The study managers should insure that fuels are ordered and are delivered to the laboratories, the bus depot and the emissions testing laboratories. It will be important not to mix the “clean diesel” lot in any tanks or plumbing normally used by standard diesel fuel.

Laboratory Test Responsibilities

The Manager should coordinate laboratory tests with the bus depot and bus dispatchers, so that operations can be planned and substitute buses can be reserved.

## 6. Amendments to this Protocol

It is expected that during the testing, amendments will be made to the testing program. The Advisory Committee along with the Project Manager should all discuss these changes and make them accordingly.

## 7. Interim and Final Reports

A team of analysts or consultants will process and interpret the test results and data at regular intervals as it is produced. Interim and final reports will be produced by the team with input from the advisory committee. The specific information to be included in the reports is to be determined by the consultants, advisory committee and Mexican agencies.

## 8. Test Outcome

It is anticipated that the data on emissions will provide robust information on environmental benefits,

the information collected on operating costs will be complemented with data from other test experiences during this project. This information may support the strengthening of environmental covenants in future bids for transport routes. The data from the test will be shared with results from other experiences and will be facilitated to similar tests being planned in New York, Copenhagen, Santiago and other cities.

After the completion of the tests (within six months), the City Government would prepare an action plan for the possible introduction of new technologies.

With respect to CNG buses, the test will clarify advantages at the altitude of the test and the specific traffic conditions. Same clarifications will be obtained for all other options.

**The Experience with the Pilot Test in New York City**

The New York City Transit's Department of Buses has been operating and testing climate friendly vehicle technology for over 10 years. Beginning in 1990 with two CNG buses, NYCT's fleet now includes over 200 alternative fueled and hybrid buses, with another 300 on order in the coming year. Operating CNG, Hybrids and Clean Diesel technologies side by side in the same operating conditions and by the same personnel and facilities has been extremely valuable in understanding the trade-offs among the different technologies. 221 CNG, 11 hybrid buses and Diesel buses fitted with advanced filters and particulate traps have been tested by NYCT over the past several years.

The results of the testing are complex, and show the difficulties of testing advanced and prototype technologies in real world operating environments. Some of the most general conclusions of the tests were the following. CNG is an effective technology for use in urban transit buses, though it was found to be much (28%) more prone to failure, it was 20-40% less energy efficient, and it was significantly more expensive to operate than diesel buses. On the limited routes the hybrids have been operating energy efficiency has been found to be higher than the diesel buses. Because of its performance and feel, the hybrids rate very highly among drivers and passengers. The hybrids tested have been failure prone due to their untested technologies, and it is expected by NYCT that most of these issues will be resolved with later models. New Clean Diesel engines are found to be 94% cleaner than diesels produced 10 years ago. Retrofitting older engines with filters and catalysts combined with the use of low sulfur fuel can be an effective, low cost and maintenance free solution to cleaning up an existing diesel bus fleet. The entire NYCT fleet is now operating on ultra low sulfur diesel (30 ppm), 570 pollutant filters have been installed, and 120 older diesel engines have been replaced with new clean diesel engines.

## Additional Annex 17: Cleaner Buses
## MEXICO: Introduction of Climate Friendly measures in Transport

### Cleaner Buses

### Advanced Diesel Bus

Advanced diesel buses are equipped with state-of-the-art emission control devices such as filters and catalysts which make them much cleaner than conventional diesel buses. The term "advanced diesel bus" is used for a bus which is equipped with one or more of these. In order to function properly, these devices require the use of low-sulfur diesel fuel which is more expensive. The California Air Resource Board (CARB) estimates that the incremental cost necessary to meet the standards set for 2007 will be less than 10,000 US$ per bus. Some but not all of the technologies employed are already well established on certain markets One of the future challenges for advanced diesel bus technology is the widespread distribution of low sulfur fuel.

### CNG Buses

CNG buses run on natural gas (which is mostly methane) which they burn in specially designed spark-ignition engines. Natural gas is relatively cheap and abundant, and it burns much more cleanly than diesel fuel. According to a recent test from Australia, the CO2 equivalent reduction for diesel replacement amounts to 17%-25%. In addition, substantial noise reduction has been achieved in diesel replacement by CNG. Today CNG buses are the only commercial alternative to diesel buses. They require significantly higher investments, but the fuel itself tends to be cheaper. Overall cost effectiveness has to be assessed in the light of local economic background conditions. CNG buses are already being employed in a number of cities throughout the world. One of the main obstacles for further spreading is the lack of fuelling infrastructure.

### Fuel Cell Bus

Fuel cells represent a novel technology entirely different from that of the internal combustion engine. They use hydrogen gas as a fuel to produce electricity, the only emission being water vapor. Their energy efficiency and emission reduction potential make them attractive for use within polluted urban environments - their overall environmental performance however depends on the means of hydrogen production.

Fuel cell buses exist only as prototypes as yet and are extremely expensive compared to other alternatives such as CNG. Many experts consider fuel cells to be the technology of choice for the long-term future of urban transport. Currently however, they cannot be regarded as cost effective. A number of technological barriers must be overcome for fuel cell buses to reach market maturity - as for example hydrogen storage. There is currently intensive research going on in this field.

### Hybrid Buses

Hybrid buses use two (or more) different energy conversion systems. The most common combination is that of an internal combustion engine with a battery and electric motor. Their main advantage is the reduction of emissions by means of greater fuel efficiency. As hybrid vehicles are still in the development stage, capital costs are currently high. These will be to some extent offset by fuel savings, and prices may fall in the future if hybrid vehicles become more widespread. While some smaller hybrid

vehicles are already available, hybrid buses exist only as prototypes yet.

## Additional Annex 18: Previous Fleet Test for Emissions Data Measurement
## MEXICO: Introduction of Climate Friendly measures in Transport

| Citation | Number of vehicles | Engine Model | Year | Fuel | Emissions treatment and engine features | PM | Nox | Toxics |
|---|---|---|---|---|---|---|---|---|
| McCormick 1999 | 1 | Cummins L 10G | 1995 | CNG | | 0.09 | 16.5 | |
| | 1 | John Deere 8.1L | 1996 | CNG | | 0.09 | 14.8 | |
| | 1 | Cummins B5.9G | 1997 | CNG | Oxidation catalyst | 0.12 | 7.8 | |
| | 2 | Detroit Diesel 50G | 1994 | CNG | Open loop | 0.19 | 44.7 | |
| | 2 | Detroit Diesel 50 | 1993 | Diesel (No2) | | 0.77 | 45.0 | |
| Ahlvik, 2000 #20 | 1 | Scania Euro II city bus engine | | Diesel (<10 ppm S) | | 0.34 | 17.9 | 0.05 formaldahyde 0.03 acetaldehyde 0.13 PAC |
| | 1 | Scania Euro II city bus engine | | Diesel (<10 ppm S) | Oxidation catalyst | 0.28 | 17.7 | 0.03 formaldahyde 0.02 acetaldehyde 0.02 PAC |
| | 1 | Scania Euro II city bus engine | | Diesel (<10 ppm S) | Oxidation ctalyst + DPF | 0,03 | 17.2 | 0.02 PAC |
| Northeast Advanced Vehicle Consortium 2000 # 31 | 1 | Detroit Diesel 50 | 1998 | Diesel (300 ppm S) | Oxidation catalyst | 0.24 | 30.1 | |
| | 1 | Cummins L 10 280G | 1998 | CNG | Oxidation catalyst | 0.02 | 25.0 | |
| | 1 | Detroit Diesel 50G | 1999 | CNG | Oxidation catalyst | 0.02 | 14.9 | |
| | 1 | Detroit Diesel 50G | 1998 | CNG | Oxidation catalyst | 0.02 | 9.7 | |
| New York State Department of Environmental Protection, 2000 #21 | 2 | Detroit Diesel 50 | 1999 | Diesel (350 ppm S) | Oxidation catalyst | 0.20 | 24.5 | |
| | 2 | Detroit Diesel 50 | 1999 | Diesel (30 ppm S) | Oxidation catalyst | 0.14 | 25.4 | |
| | 2 | Detroit Diesel 50 | 1999 | Diesel (30 | Oxidation catalyst + | 0.03 | 25.1 | |

## Additional Annex 19: Disbursement
## MEXICO: Introduction of Climate Friendly measures in Transport

### Disbursement of the GEF grant per component by activity

**Component 1: Harmonization of sector strategies on air quality issues and Integrated Climate Action Plan for the MCMA**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 1.1.1 Review of plans | 40000 | 0 | 0 | 0 | 0 | | 40000 |
| 1.1.2 Calibration of plans | 7000 | 18000 | 0 | 0 | 0 | | 25000 |
| 1.2.1 Workshop (Harmonization of plans) | 15000 | 0 | 0 | 0 | 0 | | 15000 |
| 1.3.1 Design of Metropolitan Climate Change Action Plan | 70000 | 30000 | 0 | 0 | 0 | | 100000 |
| 1.3.2 Consultation key stakeholders | 0 | 5000 | 0 | 0 | 0 | | 5000 |
| 1.3.3 Public consultation | 0 | 5000 | 0 | 0 | 0 | | 5000 |
| 1.3.4 Final presentation | 0 | 0 | 0 | 0 | 0 | | 0 |
| 1.3.5 Monitoring of Metropolitan Climate Change Action Plan | 0 | 0 | 160000 | 25000 | 25000 | | 210000 |
| **Total of component** | **132000** | **58000** | **160000** | **25000** | **25000** | **SUM** | **400000** |

**Component 2: Definition of an enabling environment to facilitate the implementation of sustainable transport strategies**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 2.1.1 Analysis of institutional and commercial barriers | 100000 | 0 | 0 | 0 | 0 | | 100000 |
| 2.1.2 Definition of an institutional framework for the operation of the corridors | 20000 | 40000 | 0 | 0 | 0 | | 60000 |
| 2.1.3 Elaboration of a program proposal for the corridors | 350000 | 660000 | 0 | 0 | 0 | | 1010000 |
| 2.1.4 Design of an origin destination survey | 0 | 160000 | 0 | 0 | 0 | | 160000 |
| 2.2.1 Analysis of the regulatory framework | 290000 | 0 | 0 | 0 | 0 | | 290000 |
| 2.3.1 Analysis of business options for the corridors (including analysis of incentives and barriers) | 150000 | 310000 | 0 | 0 | 0 | | 460000 |
| 2.3.2 Economic and financial assessment of the proposed business structure | 200000 | 490000 | 0 | 0 | 0 | | 690000 |
| 2.4.1 Design of measures to promote metro rider-ship | 50000 | 50000 | 0 | 0 | 0 | | 100000 |
| 2.5.1 Analysis of options and conditions for cycle lanes | 0 | 0 | 0 | 0 | 0 | | 0 |
| 2.5.2 Proposal for a regulatory regime for the security in the use of non-motorized transport | 0 | 0 | 0 | 0 | 0 | | 0 |
| 2.5.3 Identification and evaluation of incentives for the use of non-motorized transport | 30000 | 0 | 0 | 0 | 0 | | 30000 |
| 2.5.4 Diagnosis and Analysis of the infrastructure for the transference of motorized, non-motorized transport | 0 | 0 | 0 | 0 | 0 | | 0 |
| 2.5.5 Evaluation of studies for the application of an action plan of non-motorized transport | 0 | 0 | 0 | 0 | 0 | | 0 |
| 2.5.6 Design of promotion campaign | 0 | 0 | 0 | 0 | 0 | | 0 |
| **Total of component** | **1190000** | **1710000** | **0** | **0** | **0** | **SUM** | **2900000** |

**Component 3: Field test of Climate-Friendly High Capacity Vehicles**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 3.1.1 Elaboration of Field Test protocol | 40000 | 0 | 0 | 0 | 0 | | 40000 |
| 3.1.3 Training | 0 | 80000 | 0 | 0 | 0 | | 80000 |
| 3.1.4 Field Test | 107000 | 431500 | 431500 | 0 | 0 | | 970000 |
| 3.1.5 Framework for evaluation of alternative vehicle options | 0 | 410000 | 0 | 0 | 0 | | 410000 |
| **Total of component** | **147000** | **921500** | **431500** | **0** | **0** | **SUM** | **1500000** |

**Component 4: Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 4.1 Carrying out of a review of the transport planning regulations of SETRAVI | 0 | 5000 | 0 | 0 | 0 | | 5000 |
| 4.2 Analysis of benefits and costs of sustainable transport projects | 0 | 20000 | 120000 | 0 | 0 | | 140000 |
| 4.3 Analysis of environmental impacts of sustainable transport projects | 0 | 0 | 65000 | 0 | 0 | | 65000 |
| 4.4 Analysis of climate impact assessments of sustainable transport projects | 0 | 0 | 70000 | 0 | 0 | | 70000 |
| 4.5 Development of methodologies for measurement and verification of emissions | 50000 | 0 | 0 | 0 | 0 | | 50000 |
| 4.6 Training to bus operators, mechanics and maintenance staff | 10000 | 0 | 0 | 0 | 0 | | 10000 |
| 4.7 Review and development of emission standards and transport regulations proposals | 0 | 15000 | 0 | 0 | 0 | | 15000 |
| 4.8 Training and support for contracting and coordinating market studies | 0 | 5000 | 0 | 0 | 0 | | 5000 |
| 4.9 Training | 0 | 0 | 0 | 40000 | 0 | | 40000 |
| **Total of component** | **60000** | **45000** | **255000** | **40000** | **0** | **SUM** | **400000** |

**Component 5: Public awareness and dissemination**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 5.1.1 Collection and integration of information produced by the project | 12000 | 12000 | 12000 | 12000 | 12000 | | 60000 |
| 5.2.1 Design of public campaign | 0 | 0 | 10000 | 0 | 0 | | 10000 |
| 5.3.1 Dissemination of technical information produced by the project | 0 | 21250 | 21250 | 21250 | 21250 | | 85000 |
| 5.4.1 Promotion and financing of workshops and stakeholder meetingealization of workshops | 0 | 2500 | 2500 | 2500 | 2500 | | 10000 |
| **Total of component** | **12000** | **35750** | **45750** | **35750** | **35750** | **SUM** | **165000** |

**Component 6: Project Management**

| Activity | PY01 | PY02 | PY03 | PY04 | PY05 | | Total per activity |
|---|---|---|---|---|---|---|---|
| 6.1.1 Implementation of the project | 20000 | 20000 | 20000 | 20000 | 20000 | | 100000 |
| 6.2.1 Operational Integration of the activities | 25000 | 75000 | 75000 | 25000 | 35000 | | 235000 |
| 6.3.1 Evaluation of the results | 0 | 0 | 0 | 0 | 100000 | | 100000 |
| **Total of component** | **45000** | **95000** | **95000** | **45000** | **155000** | **SUM** | **435000** |
| | | | | | | | |
| **Total of components** | **1586000** | **2865250** | **987250** | **145750** | **215750** | **SUM** | **5800000** |
| **Cumulative** | **1586000** | **4451250** | **5438500** | **5584250** | **5800000** | | |

## Additional Annex 20: Institutional Matrix
## MEXICO: Introduction of Climate Friendly measures in Transport

| Component | Carrying out/Coordinating Institution | Participating Institutions for the operational period | Time Period |
|---|---|---|---|
| 1.1 Calibration of plans<br>1.1.1 Review of plans<br>1.1.2 Calibration | SMA | SETRAVI/ CST | <br><br>01/03-08/03<br><br>01/03-12/03 |
| 1.2 Harmonization of plans<br>1.2.1 Workshop | SMA | SMA, SEDUVI, SETRAVI, SE, SCT WRI/CST | 08/03-09/03 (depending on calibration) |
| 1.3 Climate Action Plan<br>1.3.1 Design of CAP<br>1.3.2 Consultation to key stakeholders<br>1.3.3 Public consultation<br>1.3.4 Final Presentation<br>1.3.5 Monitoring | SMA | SMA, WRI/CST | 09/03-12/04<br><br>09/03-12/03<br><br>01/04-02/04<br><br><br>01/04-04/04<br><br>07/04<br><br>01/05-12/07 |
| 2.1 Institutional Framework including integration of metro and bus transport | SETRAVI | STE, STC, RTP, SCT,WRI/CST | 01/03-12/03 |
| 2.2 Reform of bus regulation in the corridors | SETRAVI | SETRAVI, SCT | 01/03-06/03 |
| 2.3 Business and management structures for operating the bus corridors | SETRAVI | STE, STC, RTP, SCT, WRI/CST | 01/03-12/03 |
| 2.4 Measures to promote metro rider-ship | SETRAVI | STC, SCT | 01/03-12/03 |
| 2.5 Action Plan for non-motorized options | SETRAVI, SMA | WRI/CST | 01/03-12/03 |
| 3. Field Test | STE, SMA | IMP, Shell, SCANIA, MAN, Mercedes Benz, RTP, CCA | 06/02-12/05 |
| 4. Technical assistance and training for | SETRAVI, SMA | SMA, WRI/CST, CCA | 01/03-12/03 |

| | | | |
|---|---|---|---|
| incorporation of climate change and air quality considerations in the design and analysis of transport strategies | | | |
| 5. Public awareness and dissemination | SMA, STE | CCA | 07/04-12/07 |
| 6. Project Management | SMA | SMA | 01/03-12/07 |

## Additional Annex 21: Advisory Committee - Climate Friendly Vehicles Testing Program
## MEXICO: Introduction of Climate Friendly measures in Transport

### Terms of Reference

An Advisory Committee will be needed to oversee the Climate Friendly Vehicles Testing Program. The Committee will serve as a source of general intellectual guidance for the testing program as issues arise which require special attention and experience. The Committee will be contacted only periodically concerning general issues arising in the testing program, with progress reports or with installments of collected data. It should take an interest to insure the success and relevancy of the testing program and each member should be ready to contribute according to their expertise and experiences.

The responsibilities of the Advisory Committee include:

Communicate with the project manager concerning specific requests made by the Manager.
Answer or solve specific problems as requested by the Manager or Mexican Agencies.
Evaluate draft interim and final reports.
Advise manager or Mexican Agencies of any relevant developments affecting the bus testing program.

### Terms of Reference:

### Project Manager - Climate Friendly Vehicles Testing Program

The Project Manager will be the person most responsible for the success of the testing program. The testing program will involve 20 buses in a battery of field and laboratory tests over a 2-year period. The field tests require the test buses to be run each day on a normal bus route as scheduled by the bus dispatcher. Data on fuel use and repairs is recorded by the bus depot crew on special forms. Periodically, each bus will be removed from service and taken to the Mexican Institute of Petroleum for laboratory testing.

The responsibilities of the Project Manager include:

On a daily basis, check on the status of each bus in the test fleet.
On a daily basis, be aware of the route and time of operation scheduled for each bus in the test fleet.
On a daily basis, be aware of any repairs required for any bus in the test fleet.
On a daily basis, be in communication with test fleet bus manufacturers' technical representatives concerning any repair
or maintenance issues needed for any bus in the test fleet.
On a daily basis, be in communication with the depot crew managers over any general maintenance or repair issues
involving any bus in the test fleet.
On a daily basis, check on and make copies of Operations Reports filed for each bus in the test fleet.
On a daily basis, check on fuel storage issues for the fuels used by the test fleet.
Periodically, schedule with the Mexican Institute of Petroleum the laboratory testing of buses from the test fleet,
according to the recommendations of the Mexican Agencies and the Advisory Committee and the test

schedule.
Periodically, arrange with the bus dispatchers the removal of test buses for laboratory testing.
Periodically, communicate with the Mexican Agencies and the Advisory Committee concerning any special issues.
Periodically, send data to the Mexican Agencies and the Advisory Committee.

The project manager must have good communication skills to interact with the many stakeholder involved. He should have proven understanding of the technologies involved and be able to work in complex and demanding environments. The project manager will have to organize and communicate collected information effectively and regularly to the project team, Advisory Committee and the Mexican institutions involved.

## Additional Annex 22Footnotes
## MEXICO: Introduction of Climate Friendly measures in Transport

1 Mexico City would thus be one of the first cities in the hemisphere with a Climate Action Plan.
2 The two largest are Tokyo with 20 million and Mumbai with 19 million.
3 The MCMA covers an area of 4,945 km2 or about 0.25% of the Mexican territory. It is sited at an altitude of 2,240m above sea level and surrounded by mountains having an average height of 3,200m and peaks of 5,400m which induces frequent thermal inversions in its atmosphere. At that altitude the oxygen contents of the air is 23% less than at sea level. Deforestation of the MCMA has caused disappearance of about 75% of the woods. Moreover, exiting water ponds now are only one percent of their original size. Population of the MCMA has grown from 3.0 million in 1950 to 11 million in 1975 and 17.2 million in 1995. Most of the population growth has been outside the Federal District. Currently, the population of the MCMA is estimated at about 18.8 million of which 51% reside in the Federal District. Population growth is projected at an annual rate of 1.9% from year 2000 to 2010 and 1.5% from 2010 to 2025, i.e. a population of 22.7 million in 2010 and 28.4 million in 2025. The increased urban activity of the 4 million additional people expected to live in the MCMA by year 2010 would have an impact on the environment resulting in a deterioration of the quality of life.
4 Improving Air Quality in Metropolitan Mexico City :An Economic Valuation, World Bank, draft document, 2001
5 Since tropospheric ozone is highly variable geographically, estimates of its contribution to radiative forcing and global warming are difficult. But IPCC estimates it at about 0.3 Watts/m2 (meters squared) compared to say 1.4
for CO2.
6 Organización Latinoamericana de Energía
7 Since the power plants transform the natural gas into electricity with an efficiency of 34.7%, the total final energy consumed in the MCMA (592 PJ in 1998) is only 94 % of all the energy supplied to it. Consequently, in terms of total final energy consumption (592 PJ), the transport sector consumes 49%, the residential, commercial and public sectors consume 26%, and the industry consumes 25%. The agriculture sector consumes less than 0.17% of the total final
energy. Regarding LPG, the residential, commercial, and public sector consume 85%, the transport 10.4%, and the industry 4.4%. Regarding electricity, 25.3% is generated in the MCMA and the balance is imported to the MCMA where 52% is consumed by the industry, 43% is consumed by the residential/commercial/public sectors, and 4% is consumed by the transport sector. Diesel is almost 100% consumed by the transport sector, natural gas is mainly consumed by power plants (41.5%) and industrial sector (58.4%) and LPG is consumed in 85% by the residential, commercial and public sectors.
8 At the time the study was conducted, the 1998 inventory had not been completed; thus it was decided by the consultants to base the study on the 1996 inventory.
9 Accounts for CO2, and weighted CH4 and N2O emissions, according to IPCC.
10 Electricity generation as a sector only includes the power generation facilities that operate in the MCMA.
11 In the laboratory test the emissions of each bus will be tested in order to measure the expected benefits of alternative fueled vehicles in form of lower pollutant emissions. The results will be reported in emissions rate (grams per km) and can be compared from bus to bus and ,in general terms, to buses in other countries and from different tests. The directors of the laboratory will oversee the testing and report all relevant results to the bus study managers who should coordinate laboratory tests with field operations. It is recommended that the fuels used during the field operations and laboratory tests should be monitored and tested for their actual chemical composition.

## Additional Annex 23: Contribution of private local sources
## MEXICO: Introduction of Climate Friendly measures in Transport

**Contribution of private local sources**

| Buses manufacturers | Quantity of buses | Costs in US $ |
|---|---|---|
| Scania | 4 | 300,000.00 |
| Volvo | 4 | 300,000.00 |
| Mercedes | 4 | 300,000.00 |
| International | 4 | 300,000.00 |
| **Total** | | 1,200,000.00 |
| **Fuel suppliers** | | |
| Shell | | 800,000.00 |
| **Total** | | 800,000.00 |
| **Operation/Training/ Technical Support** | | |
| Scania | | 200,000.00 |
| Volvo | | 200,000.00 |
| Mercedes | | 200,000.00 |
| International | | 200,000.00 |
| Shell | | 200,000.00 |
| **Total** | | 1,000,000.00 |
| **Total Contribution** | | 3,000,000.00 |