


**Diesel Days**  
January 16 – 17, 2003

World Bank Clean Air Initiative  
World Resources Institute

Dr. Victor Hugo Páramo – Figueroa  
Director General of Air Quality Management



GOBIERNO DEL DISTRITO FEDERAL  
México – La Ciudad de la Esperanza

SECRETARIA DEL MEDIO AMBIENTE

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- 1. Driving Forces and Status**
- 2. Main Actions**
- 3. Implementation Progress**



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**1. Driving Forces and Status**



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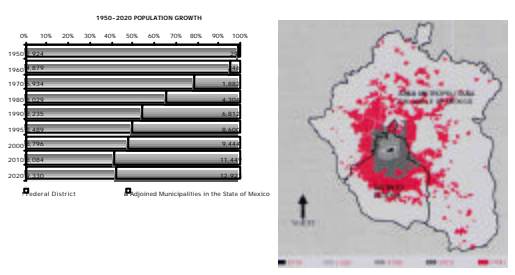
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### **Population and Urban Growth in Mexico City Metropolitan Area (MCMA)**




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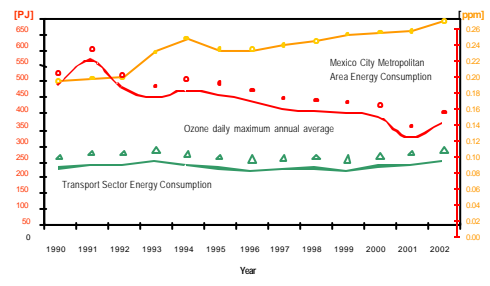
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### **Energy Consumption and Ozone Concentrations in MCMA**




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### **Number of Days Above the Air Quality Standards in Mexico City Metropolitan Area**

Year	O <sub>3</sub>		P M10		CO		SO <sub>2</sub>		NO <sub>2</sub>		Pb	
	No	%	No	%	No	%	No	%	No	%	No	%
2002	280	77	4	7	0	0	0	0	0	0	0	0
2001	273	75	5	8	0	0	8	2.2	1	0.3	0	0
2000	308	84	16	26	1	0.3	1	0.3	23	6.2	0	0
1999	286	78	33	54	2	0.5	0	0	19	5.2	0	0
1998	305	84	27	44	4	1.1	0	0	30	8.2	0	0
1997	311	85	28	46	1	0.3	0	0	38	10.4	0	0
1996	317	87	42	72	6	1.6	0	0	84	23	0	0
1995	319	87	30	49	4	1.1	0	0	32	8.8	0	0
1994	340	93	33	55	4	1.1	0	0	28	7.7	0	0
1993	320	88	41	68	5	1.4	0	0	29	8	1	2.5
1992	317	90	21	37	24	7.2	29	8.6	8	2.3	2	50
1991	335	97	13	24	42	12.4	8	2.3	16	4.7	4	100
1990	325	92	58	72	43	12.1	11	3.1	31	8.9	4	100

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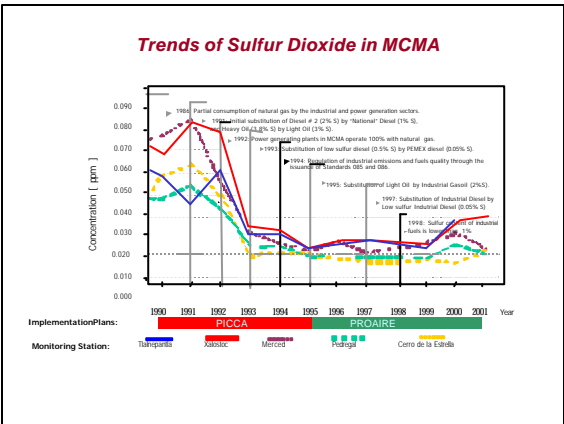
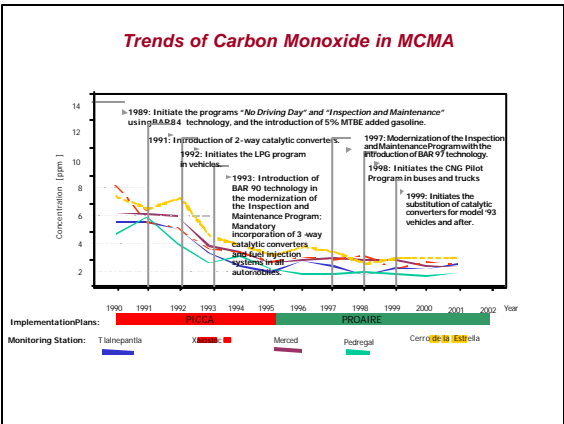
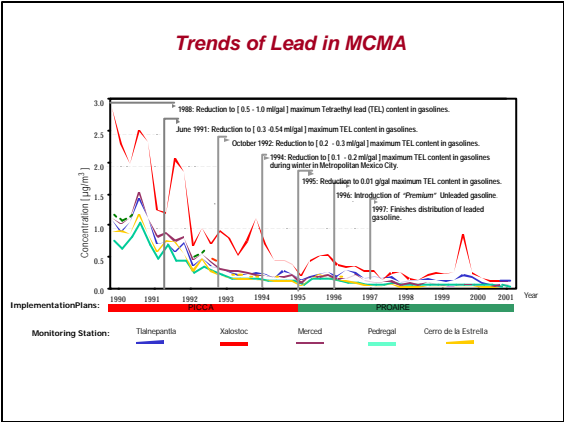
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**Relevance of Nitrogen Oxides in the atmosphere of MCMA**

NO<sub>x</sub>  
+ VOCs  
+ Sunlight

→

O<sub>3</sub>  
+ NO<sub>2</sub> + PAN  
+ HNO<sub>3</sub> + particles,  
etc.



“... in contrast to most cities elsewhere, ozone formation in the MCMA is NO<sub>x</sub>-sensitive.”

Molina et al. 2002. Air Quality in the Mexico City Megacity.

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**Health impacts**

<p style="text-align: center;"><i>Ozone</i></p> <p>Ozone is a strong oxidant that affects the respiratory system and damages lung tissue.</p> <p>Among the acute effects are cough and chest pain, eye irritation, headaches, lung function losses and asthma attacks.</p> <p>Chronic exposure to elevated ozone levels are responsible for losses in immune system functions, accelerated aging, and increased susceptibility to other infections.</p>	<p style="text-align: center;"><i>PM</i></p> <p>Coarser PM<sub>10</sub> have a higher probability of depositing in the tracheobronchial region, while finer PM<sub>2.5</sub> particles can reach the periphery of the lung, the respiratory bronchioles and alveoli.</p> <p>Elevated particulate concentrations in the atmosphere, have been linked to rises in the number of hospital visits for upper respiratory infections, cardiac disorders, bronchitis, asthma, pneumonia, emphysema and the like.</p> <p style="text-align: center;">Some particulates are specially dangerous because of their toxicity.</p>
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**Economic Impacts of Ozone and PM in MCMA**

**Costs associated with Premature Mortality and Morbidity:**

- Hospital Admissions
- Visits to Emergency rooms
- Restricted Activity Days (adults)
- Loss of school days (children and youths)

**Costs Associated with Activities During Ozone and PM Episodes:**

- Epidemiologic Surveillance
- Vehicles' Usage Limitations
- 30% to 60% emissions reduction of stationary sources (depending on severity of episode)
- Temporarily Closing of Selected Gasoline Service Stations and the Asphalt Plant

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**A 10% reduction in ambient concentrations of**

Ozone

PM<sub>10</sub>

might prevent as many as 300 premature deaths each year and reduce the number of minor restricted activity days experienced by the population by 2 million per year.

The benefit of such reduction is on the order of \$200 million USD per year.

might prevent as many as 3,000 premature deaths and 10,000 new cases of chronic bronchitis each year.

The benefit of such reduction is on the order of \$2 billion USD per year.

Molina et al. 2002. Air Quality in the Mexico City Megacity.

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**Scientific Fact**

Significant epidemiological evidence exists for the carcinogenicity of diesel exhaust. In particular, diesel particles have been associated with lung cancer. The effect is biologically plausible given their small size of diesel particles and the multiple mutagens and carcinogens adsorbed to the particles surfaces.

Nauss et al. 1995. Critical Issues in Assessing the Carcinogenicity of Diesel Exhaust.

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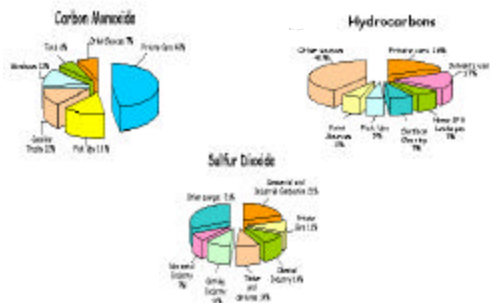
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**Mexico City Metropolitan Area  
1998 Emissions Inventory**




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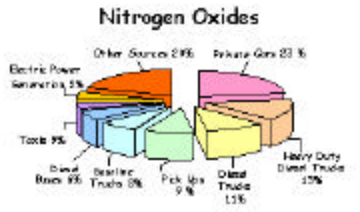
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**Mexico City Metropolitan Area  
1998 Emissions Inventory**




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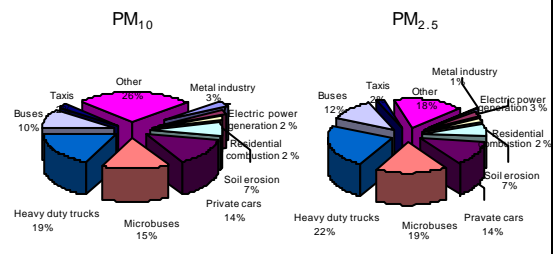
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**Mexico City Metropolitan Area  
2000 Emissions Inventory**




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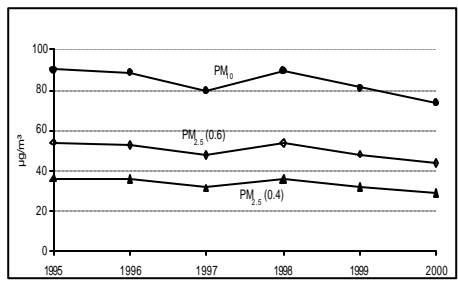
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**MCMA Annual Averages of Measured PM<sub>10</sub> and  
PM<sub>2.5</sub> Estimates (µg/m<sup>3</sup>)**



Source: National Institute of Ecology

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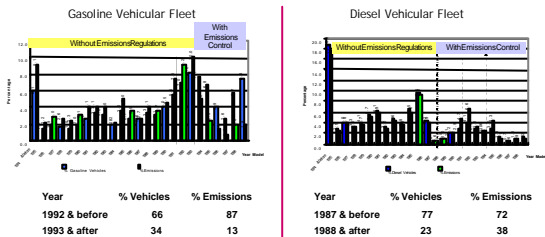
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### MCMA Vehicular Fleet Ageing and Emissions



The Gasoline fleet renews faster than the Diesel fleet.  
Diesel emissions control technology initiated in 1990 and gasoline control technology in 1993.

### 2. Main Actions



#### Main Actions Contained in the ProAire III Implementation Plan for Gasoline Vehicles

- Establishment and application of more strict emission limits for new vehicles.
- Sulfur content reduction to 50 ppm in gasoline.
- Continuous improvement of the mandatory emissions test program.
- Modernization and update of the *No-Driving Day Program* to promote the renewal of the vehicular fleet.
- Redesign of the *Catalytic Converter Replacement Program (PIREC)*.
- Adaptation of the vehicular emissions control program for vehicles not equipped from factory.
- Redesign of the *Ostensible Pollutant Vehicles Program* and vehicles without pollutant emissions test.
- Renewal of the low-capacity public transportation vehicular fleet.
- Substitution of the medium-capacity public transportation vehicular fleet with high-capacity new vehicles.



**Main Actions Contained in the ProAireIII Implementation Plan for Diesel Vehicles**

- Establishment and application of more strict emissions limits for new vehicles.
- Update the *Emissions Test Program* of the federal jurisdiction fleet for diesel vehicles and its homologation with Canada and the USA.
- Instrumentation of a Program for the substitution of diesel motors and retrofit of emissions control systems.
- Revision and reinforcement of the *Diesel Vehicles Autoregulation Program*.
- Renewal of the diesel public transport and electric vehicles fleets.
- Renewal of the local cargo carrier fleet.
- Regulation of the driving schedule of the local cargo carrier fleet.
- Reduction of sulfur content in diesel fuel.

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**Other Actions on the Transport Sector Contained in the ProAireIII Implementation Plan**

- Establishment of transport corridors.
- Foster the management and coordination for the construction of peripheral highways.
- Elimination of old pollutant vehicles of private use.
- Integral Program of the local cargo carrier fleet
- Foster the use of alternative fuels in the public transportation vehicular fleet.

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**Implementation Progress**



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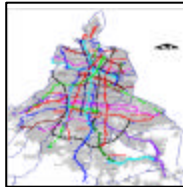
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### **Establishment of Transportation Corridors**

The Federal District Government established the Sustainable Transportation Center, with World Bank and Shell Foundation funds. The purpose is to find solutions to air pollution and transportation problems and to coordinate studies for the selection and construction of strategic transportation corridors that will allow:

- A fluid traffic for the high-capacity public transportation vehicles.
- Reduce the fuel consumption and pollutant emissions.
- Test new technologies, such as hybrid, CNG and fuel cells vehicles.



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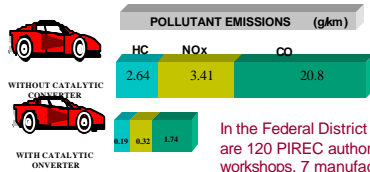
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### **REDISIGN OF THE POLLUTANT EMISSIONS REDUCTION INTEGRAL PLAN (PIREC)**

The implementation of the new PIREC scheme did allow the substitution of 22,438 catalytic converters from July to November 2002.



In the Federal District there are 120 PIREC authorized workshops, 7 manufacturing facilities and/or distributors and 3 importers of catalytic converters.

Source: SCRAP A CLEANAIR INITIATIVE FROM UNOCAL

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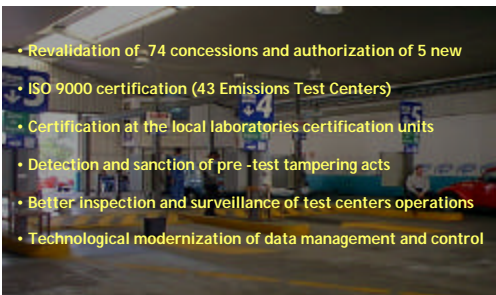
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### **Continuous Improvement of the Mandatory Vehicular Emissions Tests Program**



- Revalidation of 74 concessions and authorization of 5 new
- ISO 9000 certification (43 Emissions Test Centers)
- Certification at the local laboratories certification units
- Detection and sanction of pre-test tampering acts
- Better inspection and surveillance of test centers operations
- Technological modernization of data management and control

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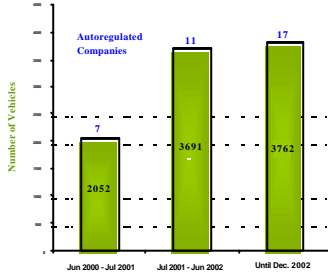
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**Revision and reinforcement of the Diesel Vehicles Autoregulation Program**

Autoregulation agreements were renewed and improved and improved the supervision and control processes for the participating units.




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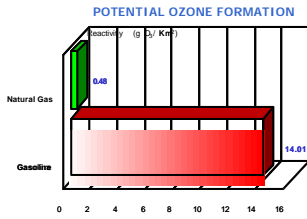
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**Foster the Use of of Alterantive Fuels**

- At present there are 2,006 CNG vehicles and 3 service stations.
- There are 14,253 LPG vehicles.



Source: Meciona Petroleum Institute August 1997  
Base Vehicle: Pick-up Ford 1997

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**Public Transportation Bus Fleet Renewal**

- Acquisition of 881 low-emission diesel buses.
- At present, 506 old diesel buses have been decommissioned.




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**Substitution of Medium-Capacity Public Transportation Buses by New High-Capacity Vehicles**




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**Low-Capacity Public Transportation Fleet Renewal**




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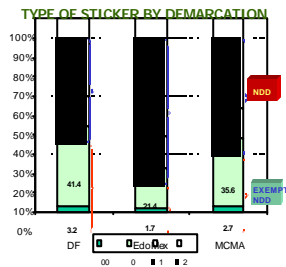
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**Modernization and update of the No-Driving Day (NDD) Program**

Nowadays only 13% of the vehicular fleet is restricted to the No-Driving Day, in contrast with the initially 20% figure. Therefore, there is a revision in course of the criteria for exempting the program in case of episodes and to avoid the saturation of traffic.



Source: Estudios Técnicos Program 200, Environmental Accounts, CDM.

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**Foster the Construction of  
Peripheral Higways in MCMA**



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**Mexico City Megalopolis Air Quality Research**

Initiated the 2nd phase of the project *"Integrated Strategy for Air Quality Management in the Mexico City Metropolitan Area"*. Main objectives are the design and application of methodologies for:

- Improve the knowledge of the ozone formation processes and behaviour of ozone and suspended particles
- Evaluate the effects of pollution on human health, and
- Prioritize strategies to reduce pollutant emissions.



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**Other Actions Taken**

- Maintenance of the Subway Network
- Rehabilitation of the Subway wagons
- Adequate vehicular intersections of the light train route
- Rehabilitation of trolleys and acquisition of new units
- Integral maintenance of trains, trolleys, railways and installations
- Roads re-pavement
- Construction of vehicular distributors
- Traffic improvement at conflictive intersections

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**Immediate Actions Pending**

- Transfer the presidency of the Metropolitan Environmental Commission to the Federal District Government
- Revision and update of the No-Driving Day and Atmospheric Environmental Contingencies programs
- Revision and reinforcement of programs to reduce diesel vehicles emissions
- Homologation of the Maintenance and Inspection programs
  - Normative revisions and adequateness
  - Further sulfur content reductions in fuels
  - Introduction to new emissions control technologies

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**Immediate Actions Pending (Cont.)**

- Public Transportation Integral Program
  - Public Transportation Mobility Study
  - Regulation of schedules
  - Vehicular Fleet Renewal
- Diesel and gasoline emissions control retrofits
- Energy Reconversion of the Industrial Sector

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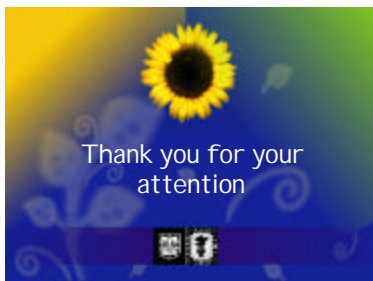
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