Overview of Clean Air Transport Issues in Latin America

Sustainable Transport in Latin America
From Theory to Practice

Outline

- The Current Air Pollution Problem in Latin America is Very Serious
- Future High Growth Could Further Exacerbate the Problem
- Future Worsening of Air Pollution Problems in the Region Is Not Inevitable
- Good Examples of Effective Strategies Exist in the Region But Need To Spread

Ozone-Number of Standards Violations and Alert Levels in Ibirapuera

PM10 Levels in Latin American Cities

Source: Luis A. Cifuentes
P. Universidad Catolica de Chile
Contribution to different pollutants by sector—São Paulo 2002

- **CO**
- **HC**
- **NOx**
- **SO2**
- **PM10**

<table>
<thead>
<tr>
<th>Sector</th>
<th>CO</th>
<th>HC</th>
<th>NOx</th>
<th>SO2</th>
<th>PM10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light vehicles</td>
<td>20%</td>
<td>30%</td>
<td>25%</td>
<td>10%</td>
<td>35%</td>
</tr>
<tr>
<td>Heavy vehicles</td>
<td>10%</td>
<td>15%</td>
<td>12%</td>
<td>5%</td>
<td>20%</td>
</tr>
<tr>
<td>Industry</td>
<td>15%</td>
<td>20%</td>
<td>30%</td>
<td>25%</td>
<td>5%</td>
</tr>
<tr>
<td>Ressuspension</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Secondary aerosols</td>
<td>10%</td>
<td>15%</td>
<td>12%</td>
<td>5%</td>
<td>10%</td>
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</table>

PM10 averages in diesel corridors are 50 to 100% higher than in normal streets, even those very congested. "One vehicle" PM peaks hit 200 µg/m³.

Receptor Modeling Results

Meta-analysis of the effects of PM10 All Cause Mortality

- PM10 Alone
- PM10 + O3
- PM10 Alone
- PM10 + O3

Source: Luis A. Cifuentes
Forecasted Trends For Latin America (Normalized to 2000)

Source: WBCSD Base Case

Forecasted Trends For Latin America (Normalized to 2000)

Source: WBCSD Base Case

ELEMENTS OF A COMPREHENSIVE VEHICLE POLLUTION CONTROL STRATEGY

CLEAN VEHICLE TECHNOLOGY

APPROPRIATE MAINTENANCE

TRANSPORTATION & LAND USE PLANNING

CLEAN FUELS

Lead Phase-Out Progression

- Unavailability of leaded gasoline
- Availability of leaded gasoline

1997: 15 countries unleaded only
2001: 23 countries unleaded only
2005: 30+ countries expected to be unleaded only

Source: ARPEL, 2001, EPQ

Total PM10, fine and coarse modes trends: Santiago Monitoring Network (1989-2001)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total PM10</th>
<th>Fine Mode</th>
<th>Coarse Mode</th>
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<tbody>
<tr>
<td>1989</td>
<td>44.6</td>
<td>43.7</td>
<td>41.4</td>
</tr>
<tr>
<td>1990</td>
<td>48.7</td>
<td>42.7</td>
<td>41.1</td>
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<td>1991</td>
<td>36.3</td>
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<tr>
<td>1992</td>
<td>35.1</td>
<td>35.1</td>
<td>31.3</td>
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<tr>
<td>1993</td>
<td>38.8</td>
<td>38.8</td>
<td>39.2</td>
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<tr>
<td>1994</td>
<td>37.2</td>
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<tr>
<td>1995</td>
<td>35.9</td>
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<td>33.7</td>
<td>33.7</td>
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<td>1997</td>
<td>36.3</td>
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<tr>
<td>2001</td>
<td>32.0</td>
<td>32.0</td>
<td>30.3</td>
</tr>
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- **Renovation of buses:**
  - Reduction of 2004 PM10 and 40% NOx with the Urban transport plan
  - Retirement of 2,700 pre-EPA buses
  - Incorporation of low-emission’s buses and post treatment systems starting year 2004
- **Renovation of trucks:**
  - EURO III and EPA98 Standards
  - Incorporation of post combustion treatment systems.
- **New standards for light vehicles:**
  - Tier1 and EURO III Standards
- **Dust Control:**
  - Street dust control
  - Street pavement programs
- **Fuel Improvement:**
  - Diesel Quality from 300 to 50 ppm by 2004
  - Gasoline Quality improvement by 2005
  - Progressive regulations on firewood burning
- **New industry standards:**
  - CO emission standards
  - SOx emission standards
  - Reduction program of SOx in major industrial processes
- **Integrated System of Compensations and Tradable Emission Permits**
  - Emission shares of NOx in the industry
  - Emission shares of PM10 in industrial processes
  - A 100% emissions compensation for all activities (industry and transport)

Source: Gianni Lopez

Actions effectiveness - tons/year

<table>
<thead>
<tr>
<th>Action</th>
<th>PM10</th>
<th>NOx</th>
<th>SOx</th>
<th>CO</th>
<th>Fuel Improvement</th>
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</thead>
</table>

Figure 1-1: Light Duty Vehicle Emissions Standards in Brazil

Figure 1-2: Heavy Duty Engine Emissions Standards in Brazil
**Lessons From Mexico City I/M Program**

- Test and Repair
  - Very convenient for vehicle owners
  - Very Difficult to Control
  - Often Degenerates into a visibly flawed program with no Public Support

- Test Only-Centralized
  - Good Technical and Administrative Control
  - Design program for profitability
  - Legal framework to favor sanctions
  - Minimize impact of technician on Results

**Lessons From Mexico Gasoline Testing Protocols**

- Easy to generate False Pass on Static (Idle) Tests
- Dynamometers and NOx testing are essential to minimize False Passes
- Short, loaded-mode, constant-speed test (ASM) easy to operate at reasonable investment and cost
- Dynamic tests technically better but more difficult for low-skill technicians

**Lessons From Mexico Harness Public Opinion**

- Program success depends on public support
- Program benefits must be seen to outweigh social costs
- Must be seen to be effective, totally objective, transparent and focused on the gross polluters
- Well enforced, supervised and audited
- False Passes critically damage public opinion
- Design the Program to minimize False Passes from Day One

**Elements of A Successful I/M Program**
Conclusions

- The Current Air Pollution Problem in Latin America is Very Serious
- Future High Growth Could Further Exacerbate the Problem
- Future Worsening of Air Pollution Problems in the Region Is Not Inevitable
- Good Examples of Effective Strategies Exist in the Region But Need To Spread
  - Tighter New Vehicle Standards
  - Clean Fuels (No Lead, low sulfur, other)
  - I/M
  - BRT