Mexico City Vehicular Emission Control Strategy

Prabhakar Vaidyanathan
Anas Benbarka
Rebecca Dodder

Presentación al Gobierno del Distrito Federal de México
9 de diciembre, 1999

Problem Definition

- Need to reduce levels of CO emissions in Mexico City
- Vehicles contribute 97% of total emissions
- Older vehicles represent 26% of the total fleet, and contribute to 40% of all vehicle emissions
- Government has decided to target vehicles older than 1980 for removal
Goals

- Design a dynamic strategy to get the maximum value from the emission reduction effort
- Flexible plan
  - Size of processing plant for vehicles removed
  - Enforcement levels
  - Information dissemination
- Desirable outcomes
  - High emission reductions
  - Minimal costs

Recommended Strategy

Phase 1 → Medium level of effort

Compliance

High → Medium level of effort
Medium → Medium level of effort
Low → High level of effort

Phase 2
Options Under Consideration

- Three levels of effort
  - High
    - $30 million capital cost
    - High scale economies
    - Strict enforcement mechanisms
    - Emphasis on information and promotion
  - Medium
    - $20 million capital cost
    - Flexible
    - Moderate enforcement and promotion efforts
  - Low
    - $10 million capital cost
    - Highly flexible
    - Minimal enforcement and promotion

Sources of Uncertainty

- Public response to vehicle removal program
  - Effort of the project
  - Willingness to participate

- Compliance levels
  - High (100%)
  - Medium (50%)
  - Low (20%)
Dynamic Strategic Plan

- First phase: Option between three strategies / levels of effort
- Uncertainty: Three possible compliance levels
- Second phase: Flexible response
  - expand
  - continue
  - quit

Value of Strategy

- Expected Emissions reductions: 159,703 tons
  - 38% reduction in emissions from older vehicle fleet
  - 15% reduction in all mobile emissions
- Total costs: $273.25 M
- Reductions/Cost Ratio 585 tons/$M
Comparison to inflexible strategies

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>Expected Value (tons per $M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Flexibility</td>
<td></td>
</tr>
<tr>
<td>High Effort</td>
<td>510</td>
</tr>
<tr>
<td>Medium Effort</td>
<td>521</td>
</tr>
<tr>
<td>Low Effort</td>
<td>498</td>
</tr>
<tr>
<td><strong>Recommended Strategy</strong></td>
<td><strong>585</strong></td>
</tr>
</tbody>
</table>

Analytical Methodology

- The benefits of emissions reductions are not given a monetary value

- Two analytical approaches
  - 1. Value-neutral - ratio of benefit / cost
  - 2. Value-sensitive - ranking of preferences
Incorporating Stakeholder Input

- Decision maker evaluates tradeoff between air quality and cost

- Impact on Recommendation
  - Cost sensitive - Medium Effort
  - Air quality sensitive - High Effort

Value of cost versus emissions

Recommended Strategy

Air Quality Preference
Conclusions

- For the first stage of the program, we recommend a medium level of effort
- Second stage choices are dictated by first stage outcomes
- Strategy robust over a range of preferences

Thank you

Gracias