Initiatives to cut emissions from vehicles in Hong Kong

Mike Kilburn
Civic Exchange
Presentation outline

1. The size of the problem
2. The shape of the problem
3. Attempted solutions
4. Possible alternatives
The size of the problem

Multiple sources of pollution
1. Power stations
2. Marine & port sources
3. 80,000 Pearl River Delta factories
4. Roadside emissions
Figure 2.4: Emissions of SO\textsubscript{2}, NO\textsubscript{x}, RSP (or PM\textsubscript{10}) and VOCs in PRD (2003)

- **SO\textsubscript{2}**
  - PRD: 745,200 tonnes (89%)
  - Hong Kong: 91,804 tonnes (11%)

- **NO\textsubscript{x}**
  - PRD: 647,900 tonnes (85%)
  - Hong Kong: 110,934 tonnes (15%)

- **RSP (or PM\textsubscript{10})**
  - PRD: 525,700 tonnes (99%)
  - Hong Kong: 7,074 tonnes (1%)

- **VOCs**
  - PRD: 473,000 tonnes (91%)
  - Hong Kong: 44,254 tonnes (9%)
Identified impacts

1. **Harm to public health**
   people are suffering
   wealthy & educated are leaving town
   businesses are leaving town

2. Harm to economic development
Did You know? : **Children and people over the age of 45 are more vulnerable to air pollution.**
Roadside: not all areas are equal

![Graphs showing particle concentrations and BC levels in different areas.](image-url)
Yau Tsim Mong
Historical Series - NO₂

Key:
- WHO Guideline (1 hr)
- WHO Guideline (Annual)
- General Stations Average
- Roadside Stations Average

Air Quality Tracker
- Historical Series:
  - PM₁₀
  - NO₂
  - SO₂
  - O₃

Hedley Index
- Historical Series

How does this work?

[Graph showing air quality data for NO₂ over a period from 25 Sep 2009 to 03 Oct 2009, with horizontal lines indicating different thresholds and a key for the data categories.]
The shape of the problem - The vehicle mix

<table>
<thead>
<tr>
<th>Type of vehicle</th>
<th>No. of vehicles</th>
<th>NOx Tonnes</th>
<th>NOx kg/vehicle</th>
<th>RSP Tonnes</th>
<th>RSP kg/vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>All road vehicles</td>
<td>643,371</td>
<td>20,900</td>
<td>32</td>
<td>1,680</td>
<td>2.6</td>
</tr>
<tr>
<td>Diesel commercial vehicles</td>
<td>130,703</td>
<td>15,884</td>
<td>121</td>
<td>1,478</td>
<td>11.3</td>
</tr>
<tr>
<td>Non-road mobile machinery</td>
<td>13,500</td>
<td>6,800</td>
<td>500</td>
<td>600</td>
<td>44</td>
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Various sources in Civic Exchange July 2010
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The shape of the problem - the mindset

“Emissions from NRMMs account for about 7% and 11% of the local emissions of NOx and RSP respectively. If all NRMMs in local use are replaced with ones meeting the proposed emission standards, local emissions of NOx and RSP can be reduced by 4.7% and 9% respectively.”

“The proposed revised control framework is as follows-
(a) Emission Standards
   EPD will formulate emission standards making reference to the US, the EU and Japan
(b) Approval prior to sale, lease and supply for local use
(c) Exemption for existing NRMMs
(d) Prohibition of the use of NRMMs without approval or exemption labels”

Environmental Protection Department  July 2011
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Various sources in Civic Exchange July 2010
The shape of the problem - road vehicles

- Diesel Commercial Vehicles (20%)
  - 76% of Total Vehicular NOx Emissions
  - 24% of No. of Vehicles
  - 88% of Total Vehicular RSP Emissions

Other Vehicles (80%)
- 12%
<table>
<thead>
<tr>
<th>Bus company</th>
<th>Kowloon Motor Bus Company Limited</th>
<th>Citybus Limited (Franchise 1) [Note 1]</th>
<th>New World First Bus Services Limited</th>
<th>Long Win Bus Company Limited</th>
<th>Citybus Limited (Franchise 2) [Note 1]</th>
<th>New Lantao Bus Company Limited</th>
<th>No.</th>
<th>Cumulative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Euro</td>
<td>371</td>
<td>48</td>
<td>34</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>456</td>
<td>7.9%</td>
</tr>
<tr>
<td>Euro I</td>
<td>938</td>
<td>312</td>
<td>82</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>1,338</td>
<td>31.1%</td>
</tr>
<tr>
<td>Euro II</td>
<td>1,487</td>
<td>370</td>
<td>475</td>
<td>136</td>
<td>167</td>
<td>53</td>
<td>2,688</td>
<td>77.7%</td>
</tr>
<tr>
<td>Euro III</td>
<td>1,099</td>
<td>10</td>
<td>72</td>
<td>18</td>
<td>0</td>
<td>34</td>
<td>1,233</td>
<td>99.1%</td>
</tr>
<tr>
<td>Euro IV [Note 2]</td>
<td>7</td>
<td>13</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>53</td>
<td>0.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,902</strong></td>
<td><strong>750</strong></td>
<td><strong>681</strong></td>
<td><strong>157</strong></td>
<td><strong>171</strong></td>
<td><strong>104</strong></td>
<td><strong>5,768</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
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Percentage Comparison of Euro Emission Standards (NOx)

<table>
<thead>
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<th>Euro Emission Standard</th>
<th>Percentage Relative to Euro I</th>
</tr>
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<tbody>
<tr>
<td>Euro I</td>
<td>100%</td>
</tr>
<tr>
<td>Euro II</td>
<td>90%</td>
</tr>
<tr>
<td>Euro III</td>
<td>60%</td>
</tr>
<tr>
<td>Euro IV</td>
<td>40%</td>
</tr>
<tr>
<td>Euro V</td>
<td>20%</td>
</tr>
<tr>
<td>Euro VI</td>
<td>0%</td>
</tr>
</tbody>
</table>
Attempted Solutions

1. **Environmental Protection Department**
   1. Switch of taxis & minibuses to LPG
   2. Incentive schemes (diesel commercial vehicles)
   3. Progressively tightened fuel standards
   4. DPF/catalytic converter retrofit
   5. Idling engine legislation

1. **Transport Department**
   1. Bus franchises (replacement requirements)
   2. Inspection and maintenance
Impediments

1. Decades of weak legislation & standards
2. Powerful transport lobby
3. “Silent epidemic”
4. Misallocation of authority in Government
5. Convenience-focused public attitude
6. Increasing wealth gap
7. Fragmented market (trucks & non-fran. buses)
Possible solutions

1. Accelerated replacement of diesel buses (G)
2. Planned and structured systemic change (G)
3. Low emission zones (e.g. airport) (G)
4. Get back on the tram (G, B)
5. Tender conditions (G, B)
6. Improved inspection & maintenance (G)
7. Customized ownership packages (B)
8. Stimulating new voices (NGO)