Foundation Course on Air Quality Management in Asia
Edited by Gary Haq and Dieter Schwela

Presented by Wenman LIU

wenman.liu@sei.se
Content

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• Air Quality Management in Asia
• Governance and Policy Options for AQM
Introduction on Foundation Course on Air Quality Management in Asia

- The Course
- Structure of the modules
The Course

- The **Foundation Course on Air Quality Management in Asia** aims to enhance capacity by providing a good grounding in the key components relevant to managing urban air quality.
- The Course has been compiled by an international team of air pollution specialists and aims to provide the student with a good grounding in the mains issue relevant to each aspect of air quality management.
- The Foundation Course was produced by the Stockholm Environment Institute (SEI) and the University of York (UoY) as part of the Clean Air for Asia Training Programme.
Module Structure

1. Urban Air Pollution in Asia
   - Range of air pollutants and their impact
   - Indoor, outdoor and transboundary air pollution
   - Concept of air quality management

2. Emissions
   - Need for emissions inventories
   - Different types of pollution sources
   - Basic considerations in developing an emission inventory
   - Computer programs available to compile an emission inventory
   - Measures available to control emission sources

3. Air Quality Modelling
   - Air pollution meteorology and modelling
     - Box dispersion models
     - Gaussian plume models
   - Data requirements for dispersion models
   - Source apportionment
   - Receptor models

4. Air Quality Monitoring
   - Key factors in the design of an air quality monitoring programme
     - Different types of monitoring equipment
     - Interpretation of air quality data and air quality reporting

5. Air Pollution Impacts
   - Effect of key air pollutants on health
   - Health studies approaches
   - Information required for health studies
   - Approaches to assess the air pollution economic impacts
   - Approaches to manage indoor air pollution
     - Environmental impacts

6. Governance and Policies
   - Air quality guidelines and standards in Asia
     - Clean air implementation plans
     - Role of different stakeholders
     - Policy instruments to implement air quality management
     - Institutional arrangements for air quality governance
Air Quality Management in Asia

• Background on AQM in Asia
• Air Quality Management Capacity in Asia
Background

- Levels of air pollution in Asian cities regularly exceed World Health Organization (WHO) recommended guidelines with smoke and dust particles being double the world average.
- Many Asian governments have recognised air pollution as a key environment problem that needs to be addressed.
- Those cities which have been able to introduce emission control early in their development path (e.g. Hong Kong, Tokyo and Singapore) have avoided the extremely high levels of urban pollution that are often associated with other cities that have introduced emission control measures later.
- The earlier integrated AQM systems are introduced, the lower the maximum pollution levels that will occur.
International and National Air Quality Guidelines and Standards

PM10 24 hr (μg/m3)
SO2 24hrs (μg/m3)
WHO PM10 Standard
WHO SO2 Standard
The WHO/UNEP/MARC AQM capability index was used to assess AQM capabilities in the 20 Asian cities.

Source: Schwela et al. (2006)
Governance and Policy Options for AQM

- Controlling Local Stationary Air Pollution
- Reducing Air Pollution from the Transport Sector/Mobile Source
Controlling Local Stationary Air Pollution

• Comparison on Conventional Approaches (CAC; Emission Charge; Emission Trading)
• Case Study: Innovative Option-Information disclosure (participatory governance) in Hohhot, China
Comparison on Conventional Approaches

<table>
<thead>
<tr>
<th>Approaches</th>
<th>Comparison</th>
</tr>
</thead>
</table>
| Control and Command Approach (Regulations, standards) | ❖ provide more direct control of pollution sources and reduce the uncertainty of the policy result  
❖ but less cost-effective compared to economic instruments |
| Emission Charge                                  | ❖ A clear incentive occurred when the fee is high enough.  
❖ However, if the fee is disproportionately low compared to the cost of reducing emissions, there is a risk that the companies will prefer to pay the fees rather than to implement air pollution control |
| Emission Trading                                 | ❖ Provides flexibility to industry to pursue the lowest cost options while meeting government policy objectives.  
❖ However, it may be considered that sufficiently developed markets are a prerequisite for an emissions trading system in developing countries. |
## Cost-Effectiveness of CAC Approaches

<table>
<thead>
<tr>
<th>Study and Year</th>
<th>Pollutants Covered</th>
<th>Geographic Area</th>
<th>CAC benchmark</th>
<th>Assumed pollutant type</th>
<th>Ratio of CAC to least cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atkinson and Lewis (1974)</td>
<td>Particulates</td>
<td>St. Louis Metropolitan Area</td>
<td>SIP regulations</td>
<td>Nonuniformly mixed</td>
<td>6</td>
</tr>
<tr>
<td>Hahn and Noll (1982)</td>
<td>Sulfates</td>
<td>Los Angeles</td>
<td>California emission standards</td>
<td>Nonuniformly mixed</td>
<td>1.07</td>
</tr>
<tr>
<td>Krupnick (1986)</td>
<td>Nitrogen dioxide</td>
<td>Baltimore</td>
<td>Proposed RACT regulations</td>
<td>Nonuniformly mixed</td>
<td>5.9</td>
</tr>
<tr>
<td>Spofford (1984)</td>
<td>Sulfur dioxide</td>
<td>Lower Delaware Valley</td>
<td>Uniform percentage reduction</td>
<td>Nonuniformly mixed</td>
<td>1.78</td>
</tr>
</tbody>
</table>
Performance Rating Procedure in Hohhot, China

None of TSP, SO2 & COD Meeting Concentration Stds
  ▼
  N

All of TSP, SO2 & COD Meeting Concentration Stds?
  ▼
  Y
  ▼
  N

All of TSP, SO2 & COD Meeting Load Stds?
  ▼
  Y
  ▼
  N

ISO 14000 Certificate?
  ▼
  Y
  ▼
  N

Source: Worldbank 2002
Performance Rating Results in Hohhot

A. Ratings in 1999

- Red: 66.1%
- Yellow: 19.6%
- Black: 10.7%
- Blue: 3.6%

B. Ratings in 2000

- Red: 33%
- Yellow: 47%
- Black: 5%
- Blue: 15%

Source: Worldbank 2002
Reducing Air Pollution from the Transport Sector/Mobile Source

- Comparison on Controlling Emissions at the Point of Production and Mobile-Source Pollution Control
- Case Study: Singapore’s approach (COE & ERP)
Total Quantity of Mobile-Source Emissions

- Direct emission charge
- Vehicle Entitlement
- Public Transportation
- Fuel quality controls and alternative fuels
- Development and use of clean fuel vehicles
## Comparison on Controlling Emissions at the Point of Production and Mobile-Source Pollution Control

<table>
<thead>
<tr>
<th>Approaches</th>
<th>Some Potential Problems</th>
</tr>
</thead>
</table>
| Controlling Emissions at the Point of Production | ❖ The emission rate may deteriorate over time  
❖ It may take longer to reach target of emission reduction as new cars replace old vehicles slowly  
❖ The amount of emissions is also critically affected by choices made by vehicle owners. |
| Mobile-Source Pollution Control                   | ❖ While the additional private cost of insurance for additional miles driven is typically zero, the social cost is not zero.  
❖ Road construction and maintenance costs are often funded out of tax revenues and the marginal private cost of extra mile in terms of these costs is zero. |
Singapore’s COE and ERP System

- **The Certificate of Entitlement (COE) Open Bidding System fully replaced the Closed Bidding System from April 2002.**
  The COE Open Bidding System allows you to submit your bid for a COE, monitor the Current COE Price and revise your reserve price for your bid. With the real-time information provided by the Open Bidding System, you will be able to make more informed decisions when placing your bids for a COE.

- **Electronic Road Pricing (ERP)**
  ERP is an electronic system of road pricing based on a pay-as-you-use principle. It is designed to be a fair system as motorists are charged when they use the road during peak hours.