

**Air Quality Issues
in
Hanoi**
(January, 2005)

Dr. M. Khaliquzzaman

**HUTP-AQMC Main Concern:
Vehicular Emission Reduction**

- **Is vehicular emission important for Air Pollution in Hanoi?**
- **What Pollutants are of concern for vehicular Air Pollution?**

Pollutants of Concern in Vehicular Emission Reduction

- **PM2.5 - important for vehicular emission**
- **EC/BC – important for Diesel vehicle emission**
- **Monitoring of these parameters - Not included in existing monitoring stations**
- **PM measurements using automated methods are good for AQI but not for source apportionment**
- **Filter based methods for PM required for source apportionment**

ABATEMENT/CONTROL

§ **MONITORING**

§ **SOURCE IDENTIFICATION**

§ **STANDARDS: Laws & Regulations**

§ **PRIORITIZATION : Effects & Costs**

§ **MEASURES**

§ **ENFORCEMENTS: Legal & Technical**

§ **PUBLIC AWARENESS**

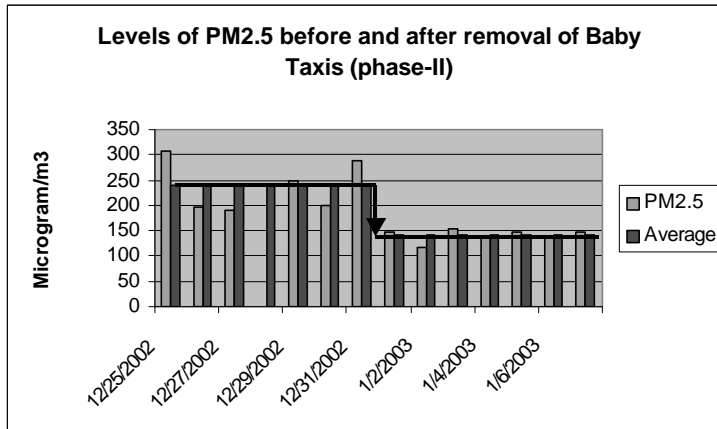
AQMC Project Components

- 1. Air Quality Management**
 - § a. Air Quality Monitoring and Data management**
 - § b. Inventories, Data Analysis and Source Apportionment**
 - § c. Health Impact analysis, Policy and Control Strategy**
 - § d. Control Measures Implementation**
- 2. Public Awareness and participation**
- 3. Strategic Environmental Assessment and Planning**

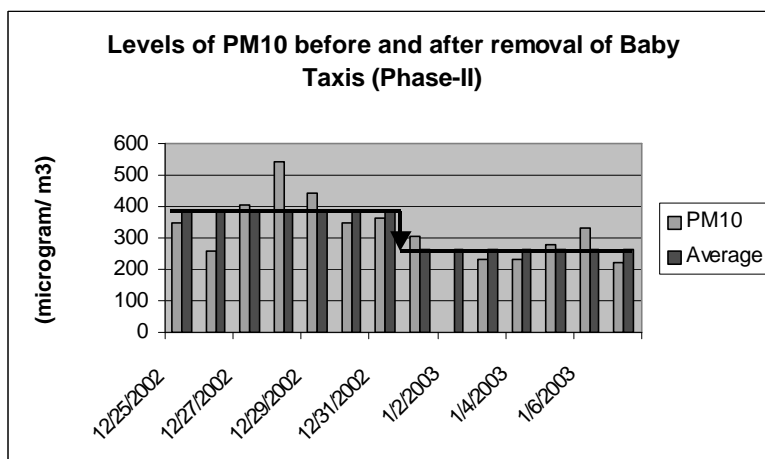
SUCCESS STORIES IN BANGLADESH

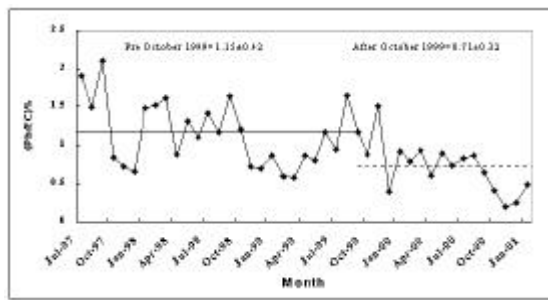
- REMOVAL OF BABY TAXIS FROM DHAKA**
- INTRODUCTION OF UNLEADED GASOLINE IN BANGLADESH**

PM2.5 concentrations in Dhaka (CAMS) during last week of December 2002 and 1st week of January 2003: Decline of 41%



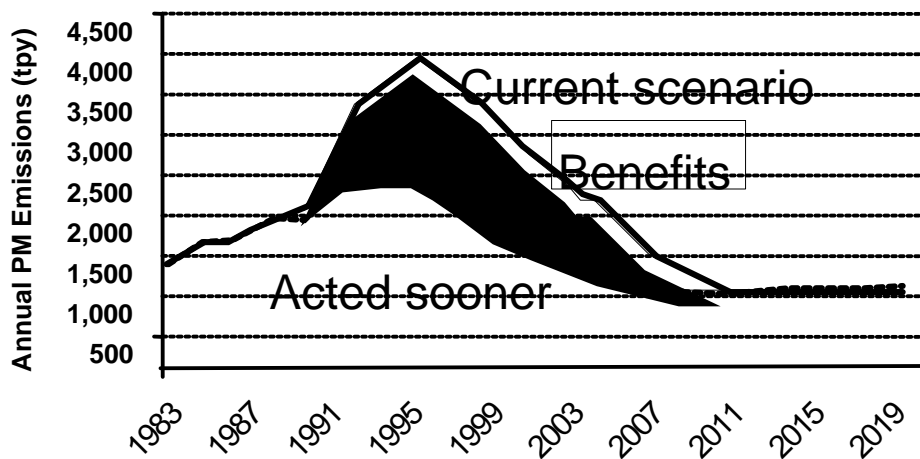
PM10 concentrations in Dhaka Declines by 31%





Timing is important...

Motorcycle Pollution Benefits of acting 5 Years Sooner in Bangkok



Sources of Information

§ **SVCAI Report**

§ **P. D. Hien, V. T. Bac, N. T. H. Think**
Vietnam Atomic Energy Commission
(Hanoi)

§ **Bjarne Sivertsen , The Nguyen Thanh, Le**
Van Khoa , Vo Thanh Dam (HCMC-AQ)

§ **ADB report – RETA5937**

| | Year | 1999 | 2000 | 2001 | 2002 | 2003 |
|------------------|------|-------|-------|------|-------|------|
| CO | mean | 2456 | 2209 | 2122 | 2468 | 3520 |
| | max | 14410 | 11060 | 8737 | 12391 | 8750 |
| NO ₂ | mean | 6 | 9 | 16 | 29 | 33 |
| | max | 23 | 117 | 160 | 173 | 90 |
| SO ₂ | mean | 6 | 8 | 22 | 38 | 38 |
| | max | 82 | 150 | 261 | 208 | 142 |
| PM ₁₀ | mean | 155 | 126 | 122 | 90 | 112 |
| | max | 970 | 1000 | 997 | 777 | 589 |
| O ₃ | mean | 14 | 16 | 21 | 22 | 19 |
| | max | 57 | 75 | 86 | 48 | 42 |

Liquid Fuel Consumption in Vietnam

Fuel consumption increases in accordance with growing number of automobiles and motorcycles

Unit: mil ton

| | <u>1998</u> | <u>1999</u> | <u>2000</u> |
|----------|-------------|-------------|-------------|
| Gasoline | 1,24 | 1,27 | 1,48 |
| Diesel | 3,57 | 3,60 | 3,79 |

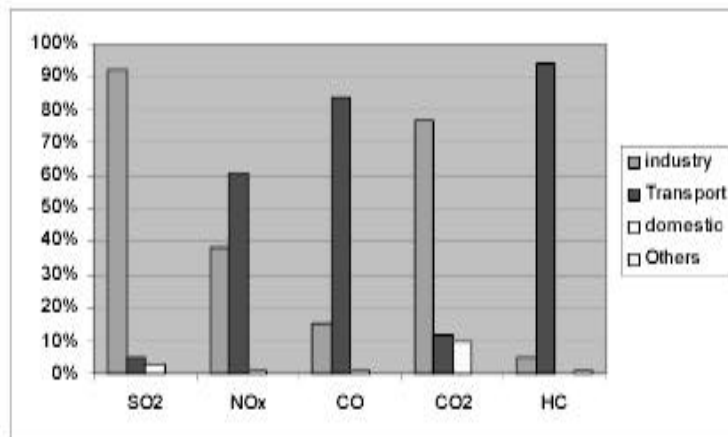
- Gasoline and diesel consumption for transportation: 30 % total
- Consumption for road transportation : 65 % total of transportation sector

Annual Pollutant Production, Hanoi

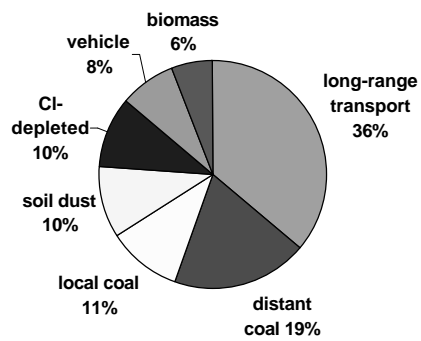
(tons/year)

| Year | SO ₂ | NO _x | CO | TSP | PM ₁₀ |
|------|-----------------|-----------------|---------|--------|------------------|
| 2000 | 1,226 | 9,953 | 145,093 | 24,155 | 6,207 |
| 2005 | 3,858 | 29,077 | 329,715 | 53,638 | 14,767 |
| 2010 | 6,362 | 47,550 | 495,108 | 77,681 | 22,146 |

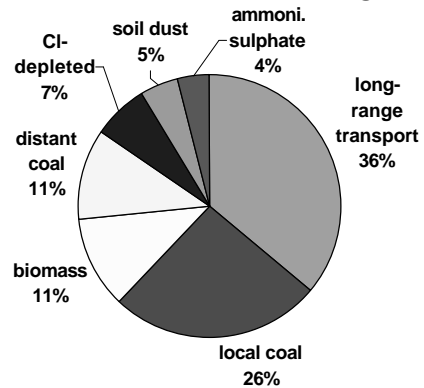
Transport is a significant source of air pollution, especially CO, NOx, and HC pollution, for example in HCMC



Hanoi, fine PM10, FM=31.1 ug_m-3



Lucnam, FM=32 ug_m-3



**Table : Leading Causes of Disease in SE Asia
(measured in DALYs lost)³**

| (1998 data for both sexes, among WHO member countries) | DALY Rank | | % of total DALYs Lost | |
|--|-----------------------|-----------------------|-----------------------|------------|
| | S Asia | Global | S Asia | Global |
| ALRI | 1st | 1st | 8.1 | 6.0 |
| Perinatal Conditions | 2nd | 2nd | 7.9 | 5.8 |
| Diarrhoeal diseases | 3rd | 3rd | 7.2 | 5.3 |
| Unipolar Major Depression | 4th | 5th | 4.0 | 4.2 |
| Ischaemic Heart disease | 5th | 6th | 3.8 | 3.8 |

SVCAI Situation Analysis

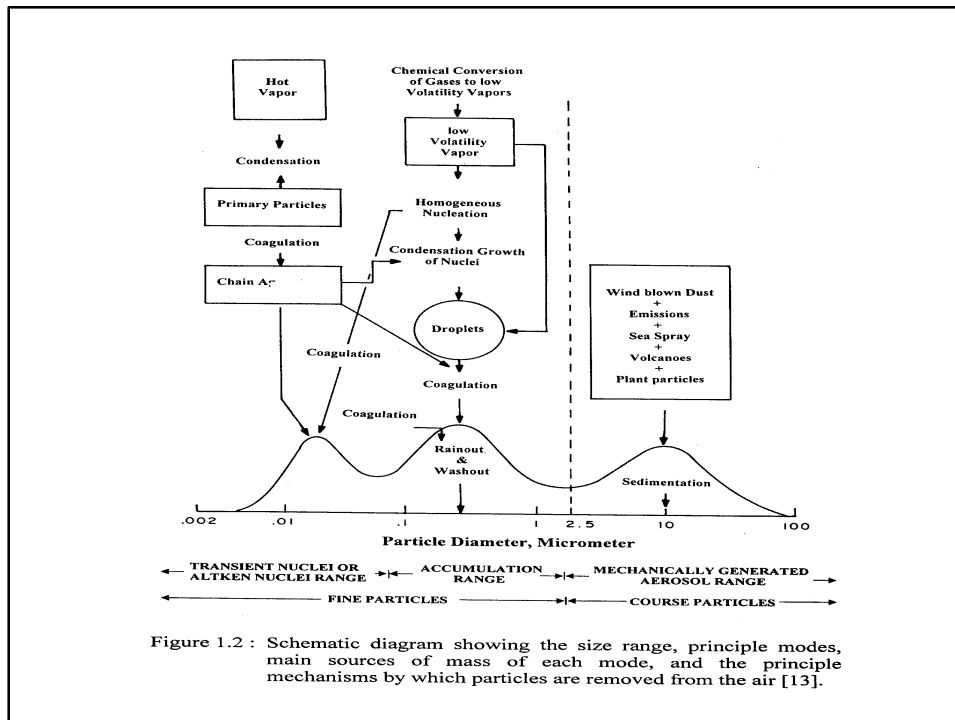
- Sub-optimal Location of Stations
- Limited Data Availability
- Low Data Quality
- Incoherent data storage, presentation and reporting
- Lack of comprehensive Emission Inventory

SVCAI Proposed Measures

- Investment in existing monitoring stations
- Re-siting of one station
- QA/QC procedure for data
- Training
- Investment in Data Management

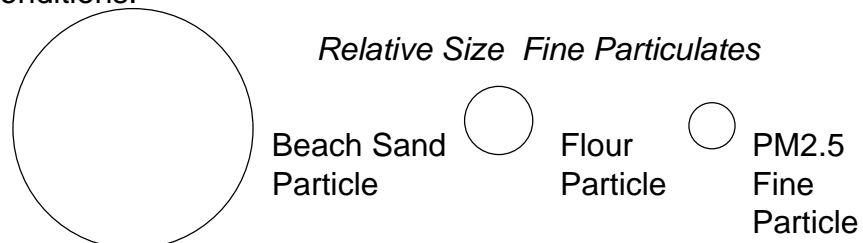
SOURCES AND PM SIZE

- § **Coarse Particles are produced in the mechanical processes**
- § **Fine particles are produced in high temperature processes**
- § **MOST VEHICULAR PM are in the form of Fine Particles**
- § **COMBUSTION in COOKING, HEATING, POWER GENERATION, INCINERATION, INDUSTRY produce Fine Particles**



Comparative Size of PM

Particulate matter (PM) is considered fine if it has a diameter of less than 2.5 microns (also referred to as PM_{2.5}). PM can travel deep into the lungs where it can aggravate asthma, chronic bronchitis, emphysema, and other lung conditions.

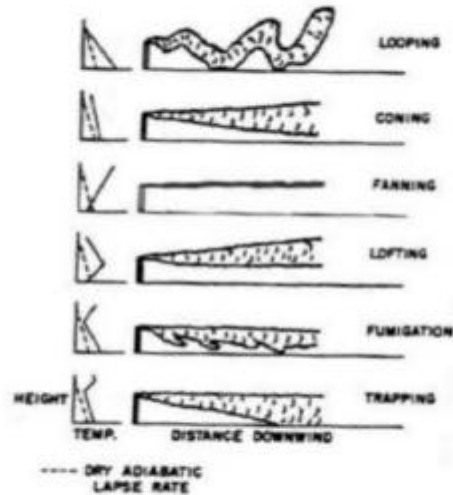


Air Quality Standards in Vietnam and some other selected countries for six criteria pollutants.

| Pollutant | Averaging Time | Vietnam | Who Guidelines | USEPA | Australia (goals) |
|-------------------|----------------|-----------------------|-----------------------|-----------------------|------------------------|
| CO | 1 hour | 40 mg/m ³ | 30 mg/m ³ | 40 mg/m ³ | --- |
| | 8 hour | 10 mg/m ³ | 10 mg/m ³ | 10 mg/m ³ | 10.4 mg/m ³ |
| | 24 hour | 5 mg/m ³ | --- | --- | --- |
| SO ₂ | 1 hour | 500 mg/m ³ | --- | --- | --- |
| | 24 hour | 300 mg/m ³ | 125 mg/m ³ | 365 mg/m ³ | 228 mg/m ³ |
| | Annual | 80 mg/m ³ | 50 mg/m ³ | 80 mg/m ³ | 57 mg/m ³ |
| NO ₂ | 1 hour | 400 mg/m ³ | --- | --- | --- |
| | 24 hour | 100 mg/m ³ | --- | --- | --- |
| | Annual | --- | 40 mg/m ³ | 100 mg/m ³ | 61 mg/m ³ |
| Ozone | 1 hour | 200 mg/m ³ | --- | 135 mg/m ³ | 213 mg/m ³ |
| | 8 hour | --- | 120 mg/m ³ | 157 mg/m ³ | 171 mg/m ³ |
| | 24 hour | 60 mg/m ³ | --- | --- | --- |
| PM ₁₀ | 1 hour | 300 mg/m ³ | --- | --- | --- |
| | 24 hour | 200 mg/m ³ | --- | 150 mg/m ³ | 120 mg/m ³ |
| | Annual | --- | --- | 50 mg/m ³ | --- |
| PM _{2.5} | 24 hour | --- | --- | 65 mg/m ³ | --- |
| | Annual | --- | --- | 15 mg/m ³ | --- |

**POLLUTION LEVEL
DEPENDS ON:**

- § Amounts of pollutants produced
- § Control at source
- § Dispersion
- § Dispersion depends on Adiabatic lapse rate (Plume dispersion pictures), stack height, wind speed and direction
- § Suspension time (for PM)



Effect of Adiabatic lapse rate on Plumes

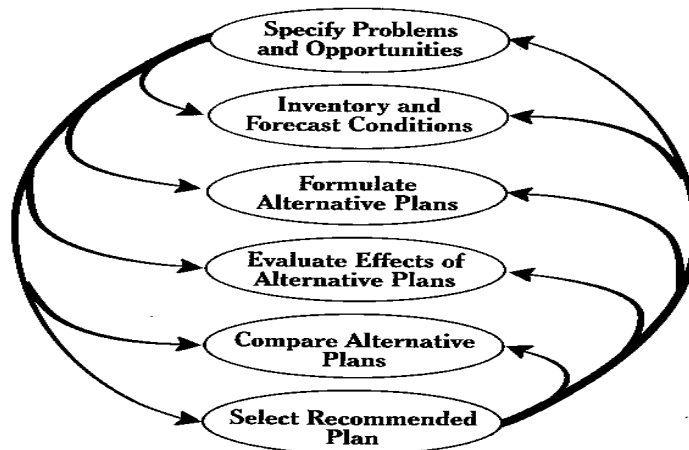
Nature of Urban Air Pollution and its Mitigation

§ Urban Air Pollution: Result of Anthropogenic activities

§ Can be mitigated by appropriate Policy decisions and their Enforcement

The Six Steps

PLANNING PROCESS



Analysis & Evaluation

- § **Correct evaluation needed for policy decisions**
- § **Strong knowledge base needed**
- § **High level of cooperation with academic community needed**
- § **International networking essential**

Consensus on New Measures

- § Stakeholder consultations and transparency in decision making**
- § Stakeholders: GOs (Line Departments), NGOs, Civil Society Representatives, Academics, Trade Associations, Industry Representatives and others relevant**

THANK YOU

THE END