Overview of Air Quality Management in Thailand

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Air Pollutants

• National Ambient Air Quality Standards/Air Quality Monitoring Network
  - Criteria Air Pollutants: health-based criteria
    • Primary Pollutants
      - TSP, PM$_{10}$, SO$_2$, NO$_2$, CO and particulate lead
    • Secondary Pollutants
      - O$_3$
  - Volatile Organic Compounds- VOCs
Sources of Air Pollution

- **Stationary Sources or Point Sources**
  - Industries
  - Power Plants
  - Incinerators

- **Mobile Sources or Line Sources**
  - Automobiles - cars, buses, trucks, motorcycles

- **Fugitive Sources or Area Sources**
  - Gas Service Stations
  - Open Burning
  - Construction
  - Mining

Policy on Air Quality Management

- General policy on air quality management
  - To maintain air quality in attainment areas not to exceed the national ambient air quality standards
  - To mitigate air pollution problems in non-attainment areas
Air Quality Management in Thailand

- Air Quality Goal/Criteria
  - National Ambient Air Quality Standards
  - Criteria air pollutants – CO, SO₂, NO₂, O₃, TSP, Pb, PM₁₀ and PM₂.₅
- Air quality evaluation
  - Air Quality Monitoring System
- National Plans and Action Plans
- Law compliance and enforcement
- Follow-up and evaluation
### Thailand’s National Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Concentration (mg/m³ or ppm)</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-hr average</td>
<td>8-hr average</td>
</tr>
<tr>
<td>CO</td>
<td>34.2 (30)</td>
<td>10.26 (9)</td>
</tr>
<tr>
<td>NO₂</td>
<td>0.32 (0.17)</td>
<td>-</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.78 (0.30)</td>
<td>-</td>
</tr>
<tr>
<td>TSP</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>O₃</td>
<td>0.2 (0.1)</td>
<td>0.14**</td>
</tr>
<tr>
<td>Lead</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: * unit is microgram/m³  ** approved and are being prepared for promulgation³

Reference: Air Quality and Noise Management Bureau, Pollution Control Department, 2007

### Annual VOCs Standards in Ambient Air

<table>
<thead>
<tr>
<th>VOCs</th>
<th>Annual average (ug/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>1.7</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>10</td>
</tr>
<tr>
<td>1, 2 Dichloroethane,</td>
<td>0.4</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>23</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>22</td>
</tr>
<tr>
<td>1,2 Dichloropropane</td>
<td>4</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>200</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0.43</td>
</tr>
<tr>
<td>1, 3 Butadiene</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Ambient air quality monitoring network

<table>
<thead>
<tr>
<th>Region</th>
<th>Air Quality Stations</th>
<th>Met. Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Northeast</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Central</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>East</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>South</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

55 Continuous Monitoring Stations in 23 Provinces
Bangkok’s Air Quality Monitoring Program

- General ambient air quality monitoring
- Roadside ambient air monitoring
  * Long-term continuous roadside ambient air monitoring
  * Short-term temporary roadside ambient air monitoring

**Pollutants:** TSP, PM$_{10}$, CO, O$_3$, NO, NO$_2$, SO$_2$, HC, and Pb
**Meteorological stations**

**Parameters:** Wind speed, wind direction, relative humidity, temperature, solar radiation, net radiation, barometric pressure, rain

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**Schematic Diagram of An Air Quality Monitoring Station**

[Diagram of an air quality monitoring station with various components such as wind speed, wind direction, temperature, relative humidity, solar radiation, etc., connected to a central station with a data logger, alarm printer, and extended file storage.]
National Monitoring Plan for EANET

- Thailand National Monitoring Plan for EANET was developed in 2008 by the Pollution Control Department, Ministry of Natural Resources and Environment, which has been designated by the Government as the National Center for EANET.

- The plan includes the monitoring activities (site selection, monitoring parameters), data analysis, quality assurance and control.
Monitoring Activities

- Wet Deposition Monitoring (Rain sampling)
- Dry Deposition Monitoring (Gases and Aerosols sampling)
- Soil and Vegetation Monitoring
- Inland Aquatic Environments Monitoring
- Meteorological Monitoring

Acid Deposition Monitoring Network of Thailand

10 Stations
- 6 EANET Sites
- 4 National Sites
Wet Deposition Monitoring Sites

- Bangkok
- Samutprakan
- Pathumtani
- NE Chiang Mai
- Khanchanaburi
- Nakhon Ratchasima

Dry Deposition Monitoring Sites

- Bangkok
- Samutprakan
- Patumthani
- NE Chiang Mai
- Khanchanaburi
- Nakhon Ratchasima
Soil and Vegetation Monitoring Sites

Vachiralongkorn Dam site  Vachiralongkorn Puye site

Toxic Air Monitoring Network

- Air toxic monitoring network began in 2002
- Three monitoring sites located in Bangkok, Chiang Mai, Mabtapud at Rayong
- Sampling sites
  - Residential area
  - Roadside
  - Background
- Three group of air toxics: Carbonyl compounds, Hydrocarbon (BTX), and PAHs
Air quality status in Bangkok Metropolitan Region

- **Bangkok**
  - Road side, particulate matter (PM-10) and total suspended particulate matter (TSP) are the major air pollutants. Ozone is problematic in some areas.
  - General area, PM10 is the major air pollutions in most areas. Ozone is problematic in some areas.

- **Metropolitan Area (except Bangkok)**
  - The major air pollutants include PM10 and Ozone.

![Trends in PM10 levels in Bangkok, Thailand (annual average) between 1993 and 2007](image-url)
Trends in SO2 levels in Bangkok, Thailand (annual average) between 1996 and 2007

Trends in NO2 levels in Bangkok, Thailand (Annual average) between 1996 and 2007

Annual Average CO in Bangkok 1992 - 2007

Unit : ppm
Areas having PM$_{10}$ problem

Trend of PM$_{10}$ level in selected provinces

Fuel Consumption & New Vehicle Registered in BKK
Sulfur Reduction

PM10 in Various Asian Cities

Source: CAI-Asia (2007)
Thailand: Air Quality Status Report
www.pcd.go.th

Air Quality Index (AQI)
Daily report

Media: Newspapers, Television, Radio

- Newspaper
  - Bangkok Post
- BTS
- Television
- Radio
DISTRIBUTE ENVIRONMENTAL QUALITY INFORMATION TO THE MEDIA, THE GENERAL PUBLIC ETC.
Automotive Air Pollution Control

- Improvement of fuel quality
- Emission standards for new vehicles
- Emission standards for in-used vehicles
- Inspection and Maintenance program
- Roadside inspection
- Traffic management
- Gasoline vapor recovery system
- Green Auto Services

Elements of a Comprehensive Vehicle Pollution Control Strategy

Better Air Quality

Clean Vehicle Technologies

Transport & Land use Planning

Low Emissions

Clean Fuels

Appropriate Maintenance
Green Service

Stationary source control

- Environmental Impact Assessment
- Emission standards
- Source Monitoring/Compliance
- Continuous Emission Monitoring System requirement
- Cleaner Technology
- Cleaner energy conservation program
Major Issues for AQM national plan

- Strengthening Air Quality Management System:
  - Policy to the implementation
- Strengthening compliance and enforcement
- Action plan in major cities and specific areas
- Public participation and involvement

Existing and ongoing strategies

- Ambient air quality standards/Emission standards
- Diesel Emissions Reductions
- Manage high polluting buses & trucks
- Inspection and Maintenance program
- Alternative fuel
- Open burning control
- Improvement of fuel quality standards
- Environmental Impact Assessment
- VOCs emission control from industries and transport sectors
- Continuous Emission Monitoring Systems (CEMs)
- Enhance capacity in regulation compliance and enforcement
- City Action Plan and Implementation
- Co-benefit with Climate Change Strategies
Examples of success strategies

- Establishment of the national ambient air quality monitoring network
- Lead in gasoline phased-out
- Two stroke motorcycles phased-out
- Continuous improvements in vehicle emissions and fuel quality standards
- Control of sulfur dioxide emission from power plants

Haze Pollution Campaign
Car Free Day

Public Awareness Raising
International Cooperation

• EANET (Aid Deposition Monitoring in East Asia)
• ASEAN Haze Agreement
• Clean Air for Small Cities in ASEAN
• Environmental and Health Forum in South East and East Asia

Future challenges

► Policy: environmental sustainability, transport and traffic management, open burning control, renewable and alternative energy policy, stakeholder participation
► Technological: cleaner fuel and cleaner technology, CNG retrofit, air pollution control devices
► Economic: emission taxes, emission trading
► Administrative: integrated area based management, sector management, energy efficiency and fuel quality standards, industrial zoning, co-benefits
► Supportive: research and study in AQM
Thank You
http://www.pcd.go.th