Colloquium Framework Document

Colloquium Framework

International Perspectives on Air Quality:
Risk Management Principles for Policy Development
Global perspective on the development and implementation of air quality management policies at the international, national, regional, state, and local levels

Purpose of the Framework

The purpose of this document is to provide a framework for the presentations and discussions at the Colloquium on International Perspectives on Air Quality: Risk Management Principles for Policy Development. This framework is intended to define the fundamental elements and terminology to be used in the development of principles and policies for managing air quality in relation to human health. The framework is specifically designed to guide our deliberations in the following directions:

1. Support the five colloquium objectives, as stated below.
2. Adoption of a global view that recognizes differences in airsheds and societies
3. Focus on principles and strategies that will lead to improvements in population health.
4. Use evidence from case studies to inform air quality policy development
5. Examine how scientific findings on the association between air quality and health can be used in support of air quality risk management actions in different policy environments throughout the world
6. Be as simple and transparent as possible, without compromising the ultimate goal of protection of population health from adverse effects due to exposure to ambient air pollution.

The five colloquium objectives are grouped under three major themes for the framework:

Policy Strategies

1. How can airshed-based policies effectively address **transboundary** air pollution issues?

2. What is required to build the **capacity of organizations** to develop and implement effective air quality policies?

Exemplary Air Quality Management Case Studies

3. What **science and policy lessons** have been learned from evaluation of national, regional, state and city-level air quality management strategies?

Basic Policy Principles and Drivers

4. What **other factors** (such as technology, cost, or risk policy guidelines) have influenced the standard-setting process?

5. How is **scientific evidence** used in establishing air quality objectives around the world?

The intent is to use this framework to facilitate the discussions as well as to structure the colloquium report. The colloquium will compare and contrast existing air quality policies and risk management practices in North America, South America, Europe, Asia, and India to determine if there are differences in the way health-based standards are applied, whether methods of source apportionment are used, what policy options are considered, and how the policy environment shapes policy development. The intent is to develop a number of sound principles and policy strategies for air quality risk management that are supported by case studies. It is hoped that these principles and strategies will have applicability worldwide.

Description of the Framework

The Framework is described in the following four figures. **Figure 1** provides a conceptual overview of the process for achieving the overall Colloquium objective, which is to ***"to establish principles for air quality management based on identification of international best practice in air quality policy development and implementation"***. Figure 1 indicates how strategic policy options based on political realities and health impact analyses need to be compared and contrasted at the global level in developing basic principles for strategic policy development. The plenary presentations on Day 1 and panel session on Day 2 will describe air quality policy strategies in Europe, Mexico, Brazil, United States, California, Asia, and India, emphasizing transboundary approaches to air quality risk management.

Speakers are encouraged to relate their presentations both to the five colloquium objectives and to the framework. Each session will conclude with plenary discussion of lessons learned and implications for principles for global air quality management. Break out sessions and the concluding plenary session on Day 2 will build on these discussions, with the objective of producing a colloquium statement on guiding principles and best practice for global air quality management.

Figure 2 illustrates a general process and terminology for the development of air quality policies to address fixed, mobile and area sources of pollution at the local, regional and international level. The process begins with existing levels of ambient air pollution (baseline) and estimates of associated health impacts. The impacts of new policy options (including regulatory and voluntary policy options) for air quality and health in the target year, 2015, are estimated, taking into consideration changes in population, economic factors, technology, and impacts of proposed air quality policies currently being implemented. The policy analysis must also consider the source of pollution. The framework recognizes that estimates of changes in air quality and associated population health benefits are subject to considerable uncertainty.

Relevant pollutants and strategies may well shift with geographic scale. Alternative controls for hemispheric transport of air pollution precursors that may have no consequence on a local/regional scale, specifically methane, may be the most important to address in global transport of ozone. It is necessary to consider multiple benefits of strategies – for example, in a choice between NOx and methane reductions to reduce intercontinental transport of ozone, methane may prove superior because it has additional benefits for climate change. There is a growing awareness that regional and local air pollution can have profound effects on regional weather and climate. For example, rice crop yield reduction in China from reduced solar radiation from high fine particles, or regional effects on the Monsoon in India. A more recent finding is decreased snow pack build up in the Rockies (from transported sulphates) that may aggravate drought. These ultimately can affect health as well. It is of interest that in North America, we sometimes implement UNECE LRTAP agreements through bi-national arrangements.

Figure 2 illustrates how new policy proposals are evaluated within the context of the policy environment. Such proposal evaluations may be based on scientific capacity, social/cultural conditions, stakeholder acceptability, international harmonization, technical feasibility, economic impacts associated with compliance, other health priorities, government commitment, effectiveness criteria, and capacity to implement and monitor compliance programs.

As suggested in Figure 2, the starting point - estimates of existing health impacts could be expressed in disability adjusted life years or DALYs (Cohen & Anderson, 2005), or other relevant measures of population health impact. This approach is used in the WHO Global Burden of Disease initiative, under which population health impacts of a number of health risks, including air pollution, are being developed.

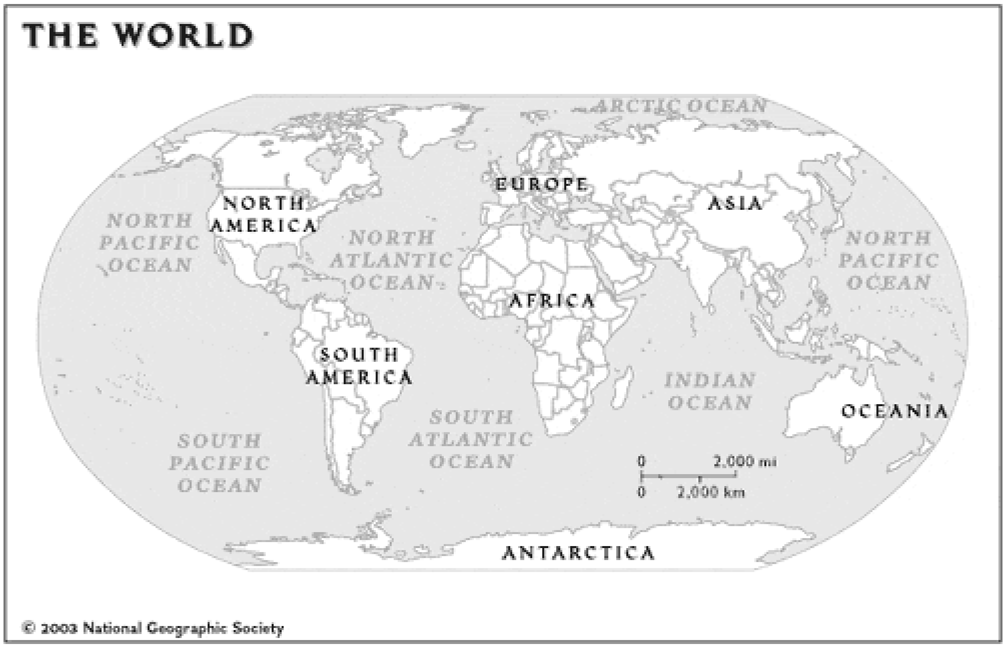
Health Effects Institute (HEI) has recognized the need to evaluate the health impact of regulatory actions through their "accountability" research initiative. A 2003 HEI Monograph entitled "Assessing the Health Impacts of Air Quality Regulations: A Monograph on Concepts and Methods" sets out a conceptual framework for accountability, identifies the types of evidence required by the framework, and proposes methods by which that evidence can be obtained. HEI is providing support for studies that assess the health impact of regulatory actions taken to improve air quality on local, regional and national scales over both the short and long terms. A number of potential targets of opportunity for health-focused policy evaluation have been identified, including the heavy-duty diesel-low sulfur fuel rule, local air quality policies, implementation of U.S. state implementation plans and Tier II regulations for light and medium duty vehicles and fuels.

Figure 3 identifies generic air quality management options organized according to the source of pollution: mobile, fixed and area sources at the local, regional and global level. While these generic policy options were developed from the literature on air pollution policy strategies, they are intended to be a starting check list for discussion. It is expected that they will be modified at the colloquium.

Figure 4 illustrates specific policy examples or case studies and the results of analyses undertaken to estimate the projected costs and air quality and public health benefits. For each case study in Figure 4 it is desirable to include: 1) a description of the policy strategy, 2) the health impacts of the strategy, and 3) the costs of the strategy.

Figures 3 and 4 provide a template for organizing the various international policy strategies and case studies presented at the colloquium.

Figure 1: Development of International Principles and Policy Strategies for Air Quality and Health



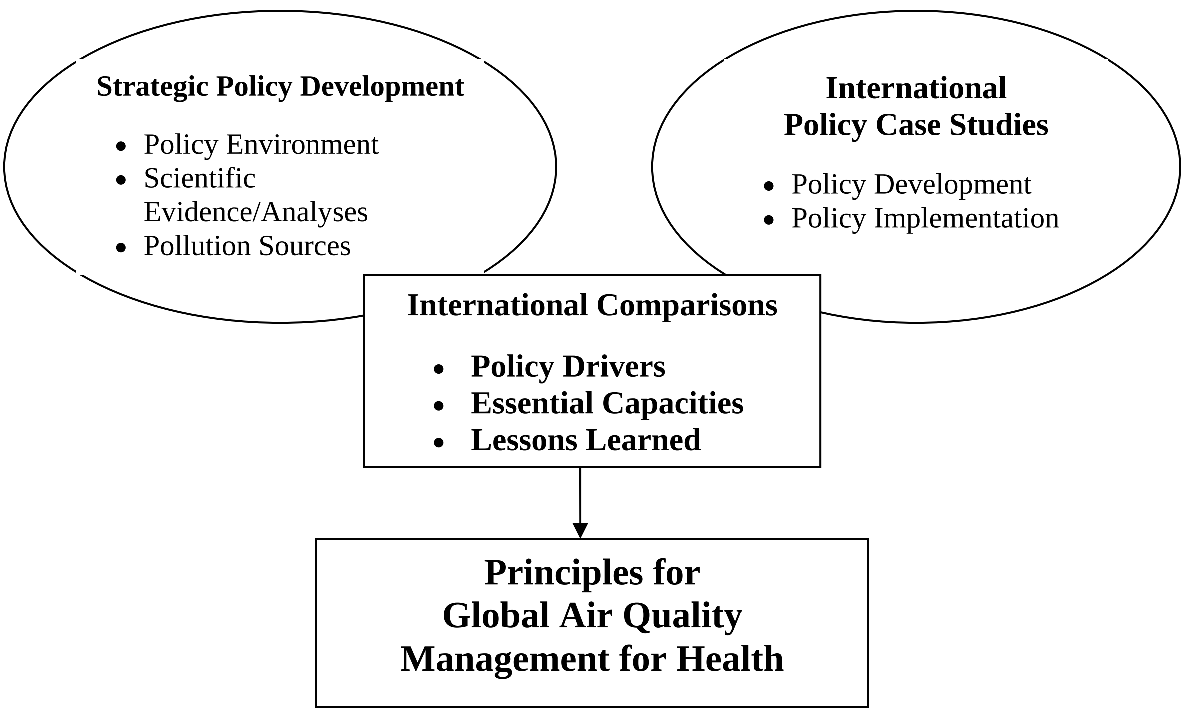


Figure 2 Development of Strategic Policy: Basic Elements and Terminology

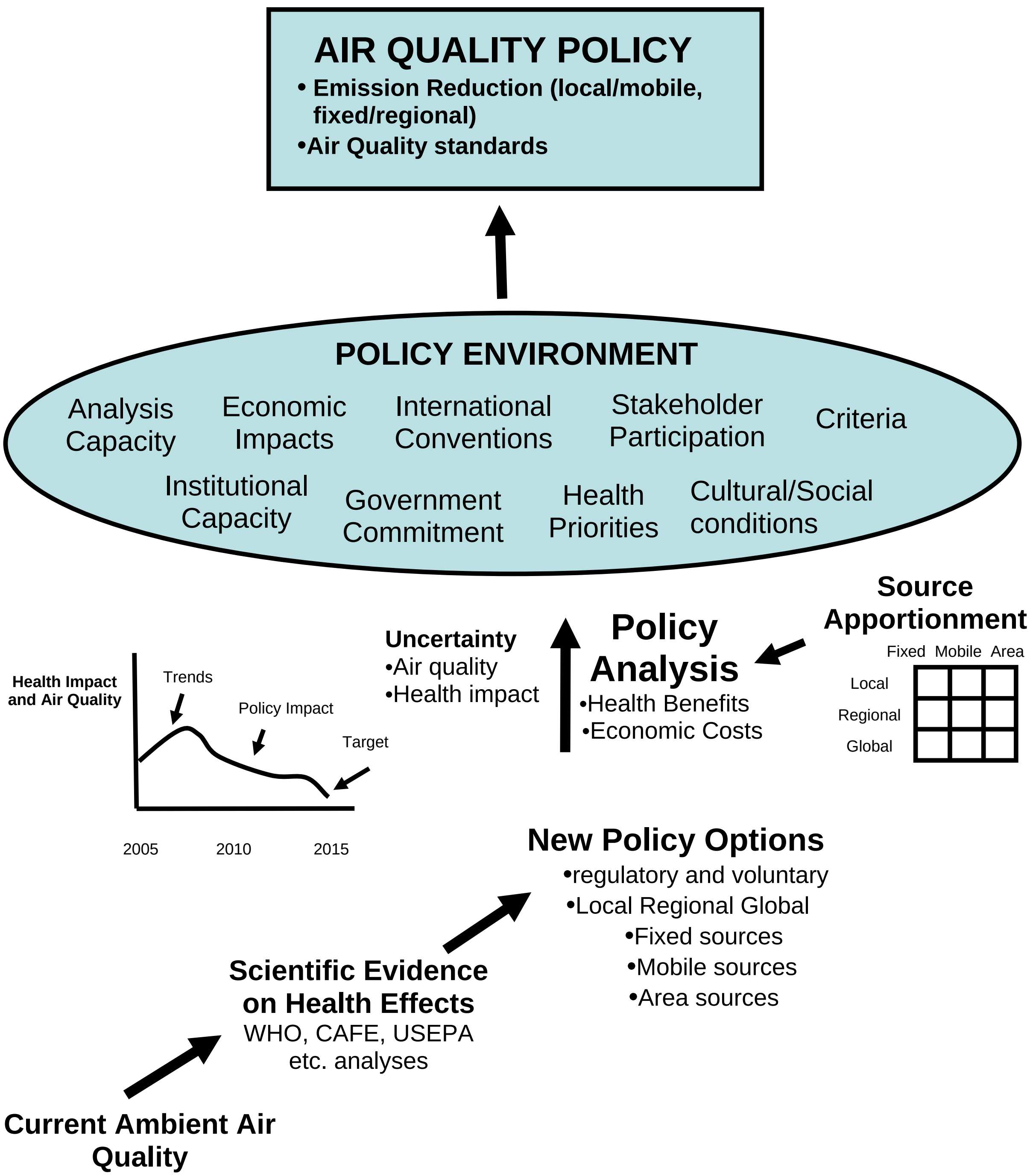


Figure 3. Generic Policy Options (Draft to be expanded at Colloquium)

Emission Sources

<table>
<tr><td rowspan="7">Strategies</td><td></td><td>Fixed Facilities</td><td>Mobile Sources - Land Use/Transportation/vehicles/fuel</td><td>Area Sources
(consumer and commercial products, pesticides, vapour recovery, natural sources, agricultural, forest fires)</td></tr>
<tr><td>Global</td><td colspan="3">G1: International Agreements (European Union Directives; protocols under the UNECE Convention on Long Range Transboundary Air Pollution)</td></tr>
<tr><td rowspan="2">Regional</td><td>RF1: Regional Emissions budgets (caps)
RF2: Sector emission caps and allowances
RF3: Mandatory minimum emission limits for all new and modified facilities
RF4: Alternative energy sources</td><td>RM1: Regulations setting minimum standards for pollution from vehicle engines and fuels (including 2-stroke 2 and 3 wheeled vehicles)
RM2: Market based strategies (financial incentives for cleaner fuels, low emission vehicles)</td><td>RA1: Technical strategies (cleaner production and pollution prevention technologies and best practices)
RA2: Regulations setting emission limits for products, pesticides, vapour recovery
RA3: Educational strategies
RA4: Market based strategies</td></tr>
<tr><td colspan="3">R1: Air Quality Standards, Regulations and Conventions (Canada-wide standards, WHO Air Quality Guidelines);
R2: Emission Reduction Targets</td></tr>
<tr><td rowspan="2">Local</td><td>LF1: Siting and Planning Permitting Systems
LF2:Voluntary and/or Legislated:Source Emission Reduction (cleaner fuels, scrubbers, energy conservation)
LF3:Emission limits through permits
LF4:Partnerships and Agreements: Industry Self-Monitoring</td><td>LM1:Traffic Demand Management: Incentives to develop and use public transportation, carpooling, walking, cycling; mass transit investment
LM2: Traffic Management: Short term vehicle use restrictions (including 2-stroke 2 and 3 wheeled vehicles)
LM3: Vehicle inspection and maintenance programs (including 2-stroke 2 and 3 wheeled vehicles)
LM4: Vehicle retirement and scrappage programs (including 2-stroke 2 and 3 wheeled vehicles)
LM5: Land use planning/Smart Growth strategies
LM6: Alternative fuels in government fleets and three wheelers (CNG/LPG)
LM7: Mandating/promotion of improved 2-stroke lubricating oils
LM7: Anti-idling bylaws
LM8: Improving road infrastructure</td><td>LA1: Greening, in particular reforestation
LA2: Road cleaning and street cleaning
LA3: Reduced open burning</td></tr>
<tr><td colspan="3">L1: Monitoring, Compliance and Enforcement
L2: Community Airshed Studies
L3: Public Education and Outreach: vehicle inspection and maintenance, energy efficiency/conservation; exposure reduction
L4: Municipal and corporate smog alert response plans</td></tr>
</table>

DRAFT Figure 4: Exemplary Illustrative Case Studies: Policies and Change in Air Pollution and Health ***(NOTE: DRAFT WILL BE EXPANDED BASED ON CASE STUDIES PRESENTED AT COLLOQUIUM. Example here is for US policy initiatives addressing mobile sources - to be completed for other strategies including policies addressing 2-cycle engines in Asia and India)***

RM1a. US EPA Tier 2 Vehicle Emission Standards

Policy Description Tier 2 is a comprehensive US national control program that regulates the vehicle and its fuel as a single system. The new tailpipe emission standards for passenger vehicles will reduce NOx emissions by 77 percent from cars and up to 95 percent from SUVs and trucks. The standards for SUVs and trucks will be brought in line with those of other cars for the first time, and the same standards will be applied to gasoline, diesel, methanol, ethanol, natural gas, and LPG fuels. The exhaust emission standards for these light duty vehicles will be phased in between 2004 and 2009. The exhaust emission standards are structured into eight certification levels called "certification bins." Vehicle manufacturers can choose any of the eight bins, but must meet the average NOx standard for the entire fleet of 0.04 g/km (0.07 grams per mile). The vehicle "full useful life" has been extended to 192,000 km. Sulfur in gasoline is required to be reduced to a mandatory average of 30 wt ppm.

Cost and Benefits The cost to consumers is estimated by EPA to be less than US$100 for cars, $200 for light-duty trucks, and less than $0.02 per gallon (0.5 U.S. cents per liter) for gasoline sulfur reduction, with the overall cost to industry on the order of $5.3 billion against health and environmental benefits of about $25 billion (U.S. EPA 1999) (Source: The World Bank, 2004)

RM1b. US EPA Clean Air Nonroad Diesel Rule

Policy Description

EPA's Clean Air Nonroad Diesel Rule requires stringent pollution controls on diesel engines used on diesel engines used in industries such as construction, agriculture and mining, and it will reduce the sulfur content of diesel fuel. Nonroad diesel equipment currently accounts for 47 percent of diesel particulate matter and 25 percent of nitrogen oxides from mobile sources nationwide. Existing Air Quality: Nearly 160 million people live in nonattainment areas for 8-hr ozone. About 65 million people live in areas that violate air quality standards for PM2.5.

Costs:

The anticipated costs vary with the size and complexity of the equipment, but are in the range of 1-3 percent of the total purchase price for most nonroad diesel equipment categories. The estimated added cost for low-sulfur fuel will average about 4 cents per gallon (7 cents/gallon overall fuel cost increase – 3 cents fuel cost savings from reduced equipment maintenance cost). Costs for both the engine and fuel requirements are estimated to be $2 billion (USD) annually.

Benefits

Emission reduction

The new standards will cut PM (129,000 tonnes annually)and NOx (738,000 tons annually) emissions from nonroad diesel engines by over 90 percent. Sulfur levels will be reduced in nonroad diesel fuel by 99 percent from current levels (from approx. 3,000 ppm now) to 15 ppm in 2010. New engine standards take effect, based on engine horsepower starting in 2008.

Health benefits

EPA estimates that by 2030, controlling these emissions will annually prevent 12,000 premature deaths, 8,900 hospitalizations, and one million work days lost. EPA's valuation of health benefits is approximately $550 billion (USD-2004) for the period 2007-2030 (present value in 2004 using 3% inter-temporal discount rate.) The overall benefits of the off-road diesel engine standards and accompanying diesel fuel sulphur reduction are estimated to be $80.6 billion (USD) annually by 2030 (based on 3% concurrent discount rate).

Source: USEPA. May 2004. Clean Air Nonroad Diesel Rule – Facts & Figures. http://www.epa.gov/nonroad-diesel/2004fr/420f04037.htm

Development of International Principles and Policy Strategies for Air Quality and Health

The objective of the break out sessions on Day 2 and final plenary discussion is to develop a colloquium statement on principles for global air quality management based on the collective perspectives of the colloquium delegates and themes for best practice underlying the various international air quality management case strategies. A number of organizations including WHO (1999), the World Bank Group (1998), have identified guiding principles for the development of air quality management strategies including consideration of technical, financial, social, health and environmental factors, as well as the speed with which policies can be implemented and whether they are enforceable. For example, in 2001, the International Council for Clean Transportation (ICCT), comprised of international regulators and experts on clean transportation issues, developed an unprecedented consensus document on preferred government policies for motor vehicle technology and fuel worldwide. The Bellagio Memorandum on Motor Vehicle Policy (http://www.cleantransportcouncil.org/) provides 43 key principles for policymakers, automakers and oil companies as they design cleaner vehicles for the next decade. The principles address overarching principles for clean vehicle strategies and provide guidelines for cleaner fuels, standard-setting, pollutant and greenhouse gas emission control, and advanced technology. More detailed consensus statements on five key topics: sulfur, diesel, urban heavy duty vehicles, bus rapid transit and advanced vehicle technologies were developed by ICCT in May 2003.

Criteria used by the South Coast Air Quality Management District in evaluating their 2003 air quality management plan control measures (SCAQMD, 2003) are given in Table 1 as a basis for initial discussion.

Table 1 Criteria for Evaluating California's 2003 AQMP Control Measures

Criteria	Description
Cost Effectiveness	The cost of a control measure to reduce air pollution by one ton (cost covers obtaining, installing, and operating the control measure).
Efficiency	The positive effects of a control measure compared to negative effects
Emission Reduction Potential	The total amount of pollution that a control measure can actually reduce.
Enforceability	The ability to force polluters to comply with a control measure
Equity	The fairness of the distribution of all the positive and negative effects among various socioeconomic groups
Legal Authority	Ability of the District or other adopting agency to implement the measure or the likelihood that local governments and agencies will cooperate to approve a control measure
Public Acceptability	The support the public gives to a control measure
Rate of Emission Reduction	The time it will take for a control measure to reduce a certain amount of air pollution
Technological	The likelihood that a technology for a control measure will be available as anticipated.

Guiding principles for air quality management developed through consultation with stakeholders in Asia as part of the Air Pollution in the Megacities of Asia (APMA) project and the Clean Air Initiative for Asian Cities (CAI-Asia) were published in 2004 (see Box 1).

Box 1
The Guiding Principles of AQM

Access to environmental information: all stakeholders should have access to information regarding air quality.

Awareness: knowledge of stakeholders of the seriousness of air pollution, its causes and possible preventive and remedial measures.

Best practice: application of best available technology.

Coherence: orientation of the efforts of all stakeholders, including different neighbouring jurisdictions, towards a common objective.

Concerted effort: discussion and cooperation among all stakeholders involved in the implementation of AQM measures.

Compatibility: development of AQM compatible with regional, national and local needs.

Continual improvement: to promote the continual improvement of AQM as well as air quality itself.

Cost-effectiveness: AQM measured at minimum cost but high effectiveness.

Decentralization: implementation of decentralized AQM, regional, national and local components, and due consideration to local capacity.

Equity: fair and equal protection of all people from air pollution and consideration of individual vulnerability.

Integrated approach: development of comprehensive and integrated AQM (prevention, monitoring of adverse impacts, control of sources and education).

Market: apply market mechanisms, as far as possible.

Opportunity: sound solutions to air quality problems at the most suitable moment.

Participation: active participation of different stakeholders, including the general population, in the development and implementation of the plans to minimize air pollution and prevent the deterioration of air quality.

'Polluter pays' principle: individuals or entities responsible for pollution should bear the cost of its consequential impacts.

'Precautionary' principle: where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Stakeholder: commitment of all stakeholders to AQM.

Sustainability: development of economically, socially and environmentally compatible AQM which is sustainable over the long term.

Stepwise approach: AQM following a target and milestone approach.

Universality: comprehensive AQM, including human health and the environment.

NERAM IV will provide an opportunity to build on these criteria to identify guiding principles for air quality management at the global level through international participation of air quality experts from both developed and developing countries. The principles are not limited to evaluation criteria but may include:

1) Science
2) Policy Environments
3) Practical and Credible methods of estimating air quality and health impacts that are global in application
4) Practical Priority Setting
5) Possible International harmonization
6) Treatment of Uncertainty
7) Monitoring of health impacts and air quality

The final statement resulting from the 2003 NERAM III Colloquium "Strategies for Clean Air and Health" (see http://www.irr-neram.ca/rome/Rome%20Statement.pdf for the complete statement) included principles for the development of clean air strategies in North America and Europe. The principles include concepts identified in by SCAQMD and the Clean Air Initiatives in Asia project such as integrated policy approaches, cost effectiveness/efficiency and stakeholder involvement. These guiding principles for policy development included the following:

• Focus on policies that are likely to achieve broad population health co-benefits. For example, integrate clean air objectives within urban planning and community design (green spaces, public transport, traffic demand management), no-regrets climate change policies, energy conservation and energy efficiency programs, and health promotion planning, such as in the areas of obesity, diabetes and substance abuse (e.g. tobacco).

• Emission reduction strategies should target all relevant emission sources which contribute to pollution levels in an affected airshed(s). With respect to ambient PM there is a need to focus on those fractions and sources that are suggested to be toxicologically most important (if sound data exist).

• Reduce pollutants that are likely to result in multiple benefits for air quality, for example, precursors that form both fine PM and ozone such as NOx.

• There are potentially cost-effective control measures for reduction of emissions from small scale combustion sources including domestic heating.

• Adopt a risk-based approach to quantitative impact assessment and policy development considering predicted effectiveness and its uncertainties, estimated benefits and costs, and implementation time and feasibility.

• Engage the public and other stakeholders early in the process to help design, focus and build support for policy changes that directly affect them (e.g. urban transportation solutions, energy conservation and sustainable development).

• Improve linkages with the medical and patient communities to promote their roles in providing an early warning on adverse health effects of air pollution, in credible communication of information, and advocates for solutions.