



Overview of International AQM Practices: Options for China?

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Overview of Presentation

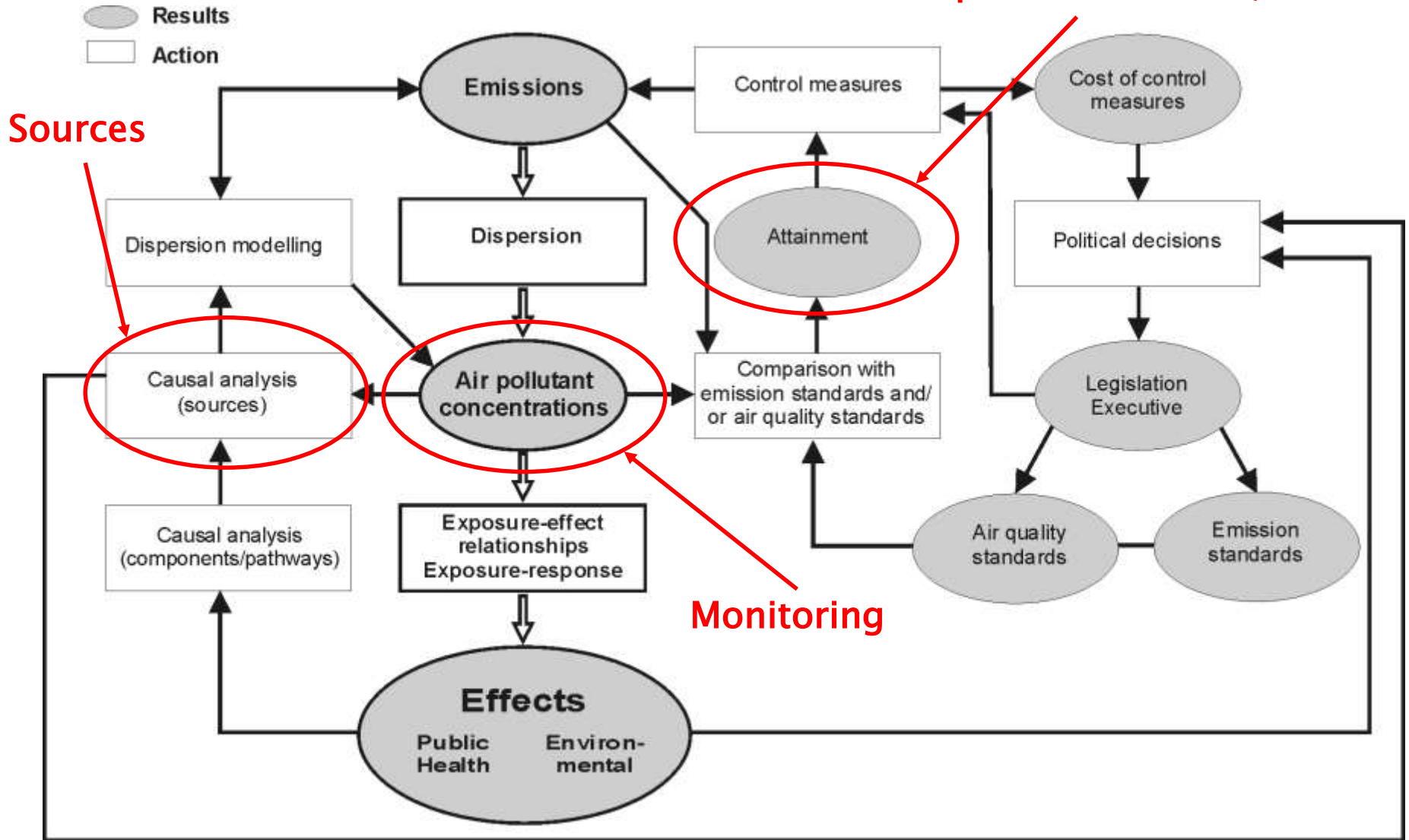


- Introduction and Framework for AQM
- Air Quality in Asia
- Controlling Vehicle Emissions
- AQM Gaps in Asia and China
- Success Stories

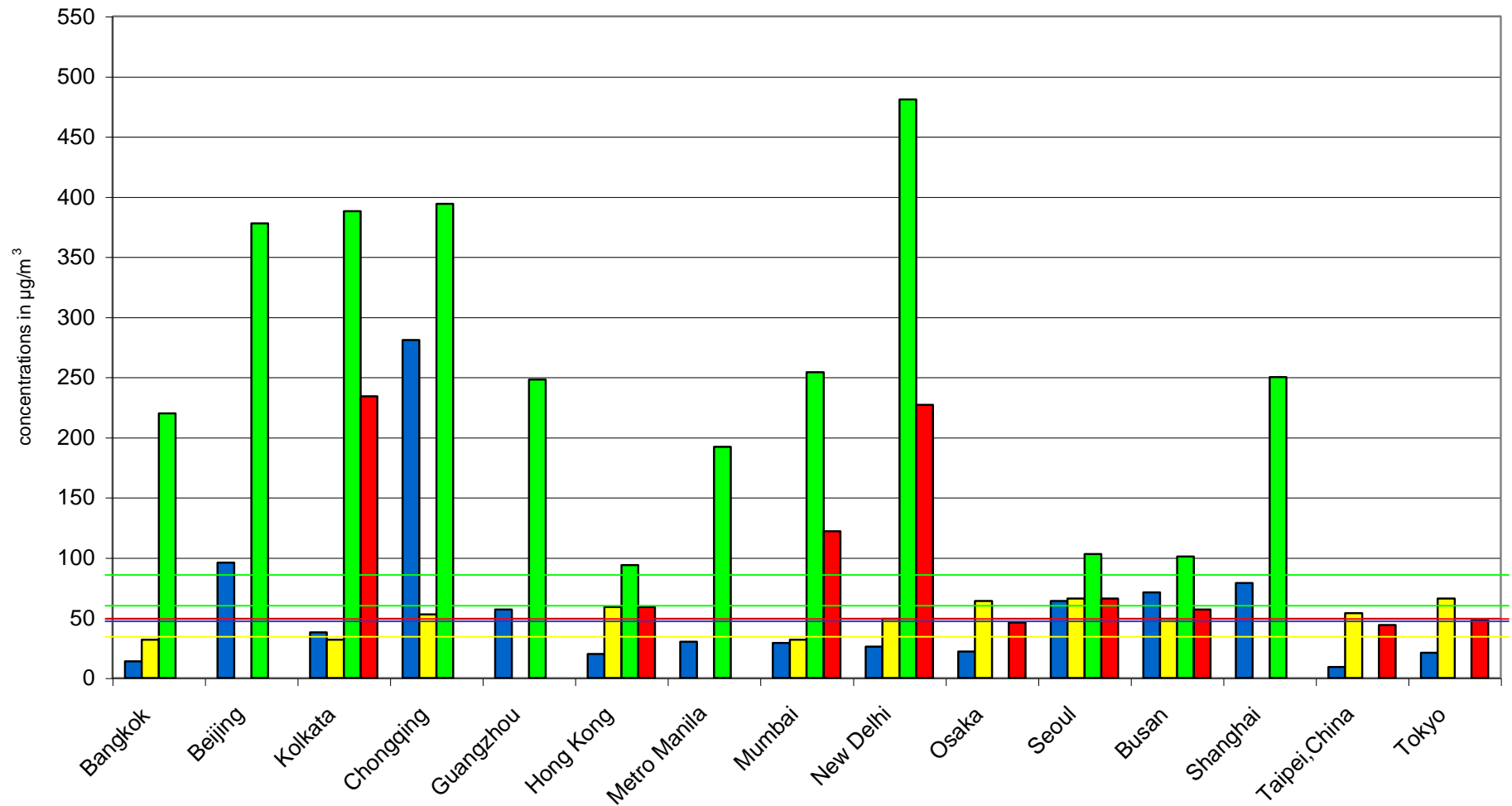
Framework for AQM



Compliance with AAQS



Average Annual Air Pollution Concentrations (1990–1999) in selected Asian Cities



SPM Guidelines = 60-90 µg/m³ (WHO, 1979)

PM₁₀ Limit = 50 µg/m³ (USEPA, 1997)

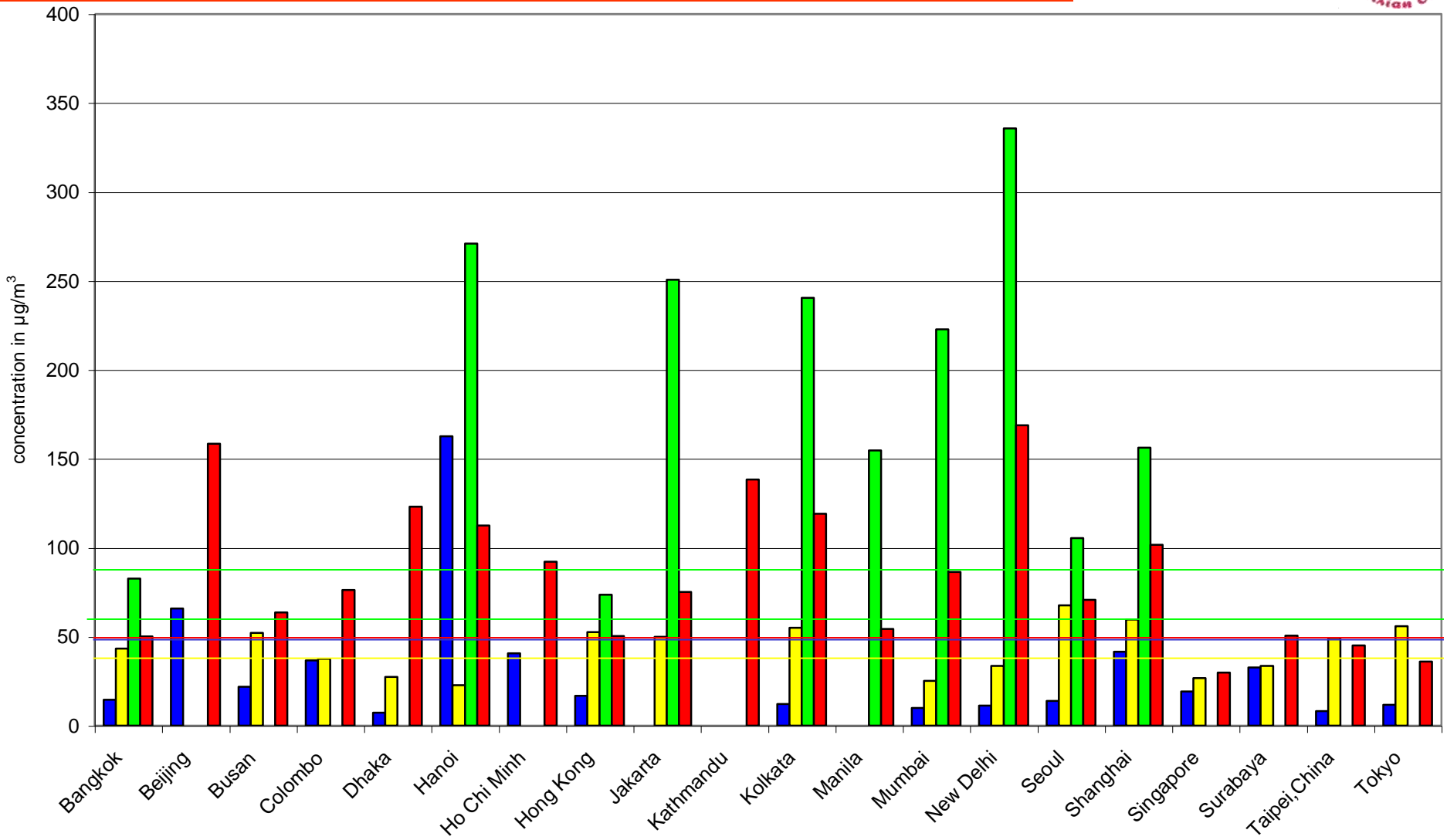
SPM
PM₁₀

SO₂ Guideline = 50 µg/m³ (WHO, 1999)

NO₂ Guideline = 40 µg/m³ (WHO, 1999)

SO₂
NO₂

Average Annual Air Pollution Concentration in selected Asian Cities (2000–2003)



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SPM

PM₁₀

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SO₂

NO₂

2000–2003 compared with 1990–1999 Air Quality Data



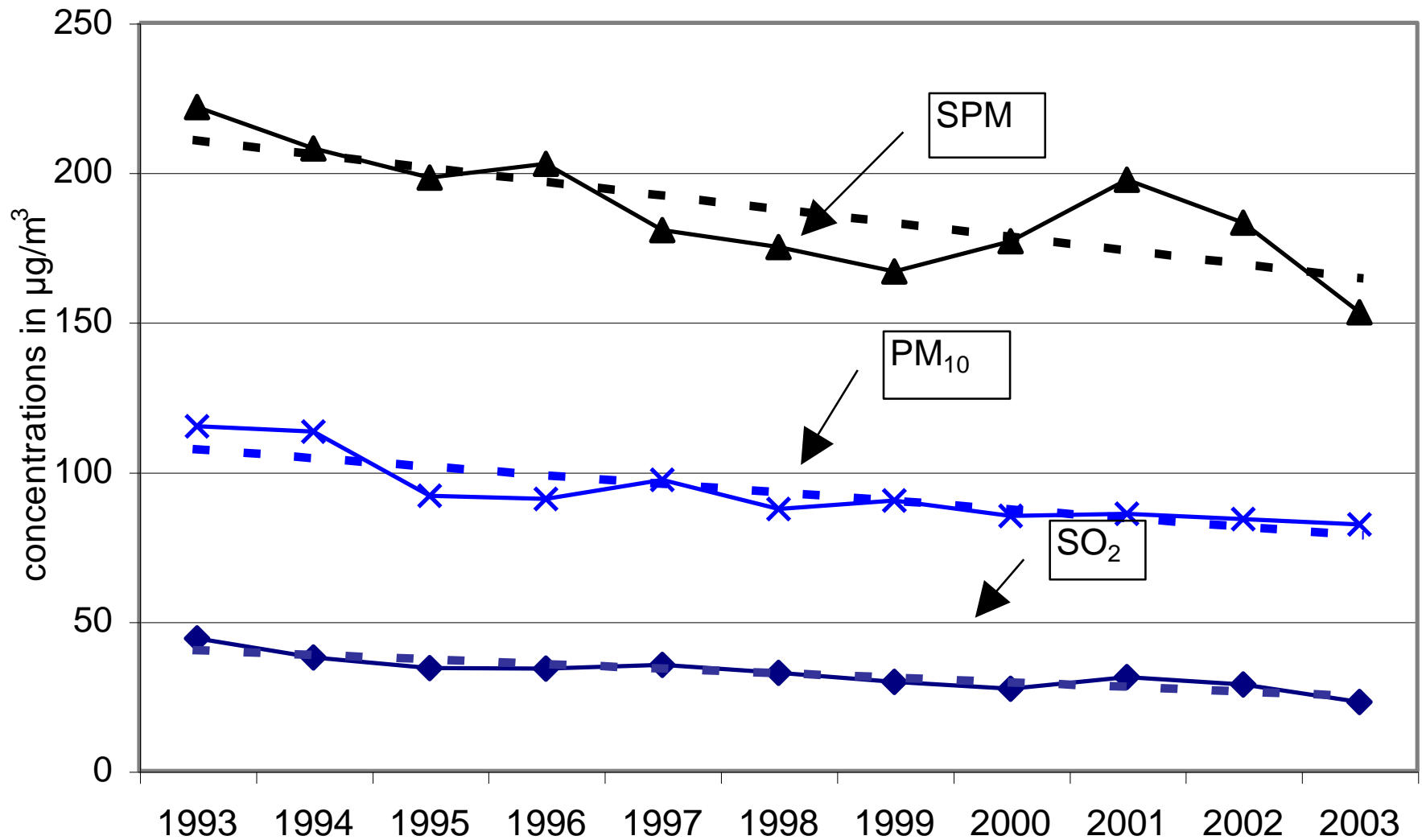
	SO ₂	NO ₂	SPM	PM ₁₀
Bangkok	≥	>	<	<
Beijing	<	?	?	<
Busan	<	>	?	≥
Colombo	>	<	?	≤
Hong Kong	>	<	<	<
Kolkata	<	>	<	<
Manila	?	?	<	?
Mumbai	<	<	<	<
New Delhi	<	<	<	<
Seoul	<	>	<	<
Shanghai	<	<	<	?
Taipei, China	<	<	?	>
Tokyo	<	≤	?	<

- Most of the cities have been able to reduce levels of SO₂ to ‘safe’ levels with the exception of Beijing and Hanoi
- NO₂ levels gradually increasing levels and just above the WHO guidelines
- Almost all cities have been able to reduce levels of SPM and PM10 compared to the ’90s level, however levels continue to remain above the guidelines except those of the more developed cities

Notes: ≥ - about 5% increase
 ≤ - about 5% decrease
 ? – data not available

Source: CAI-Asia Research, 2004

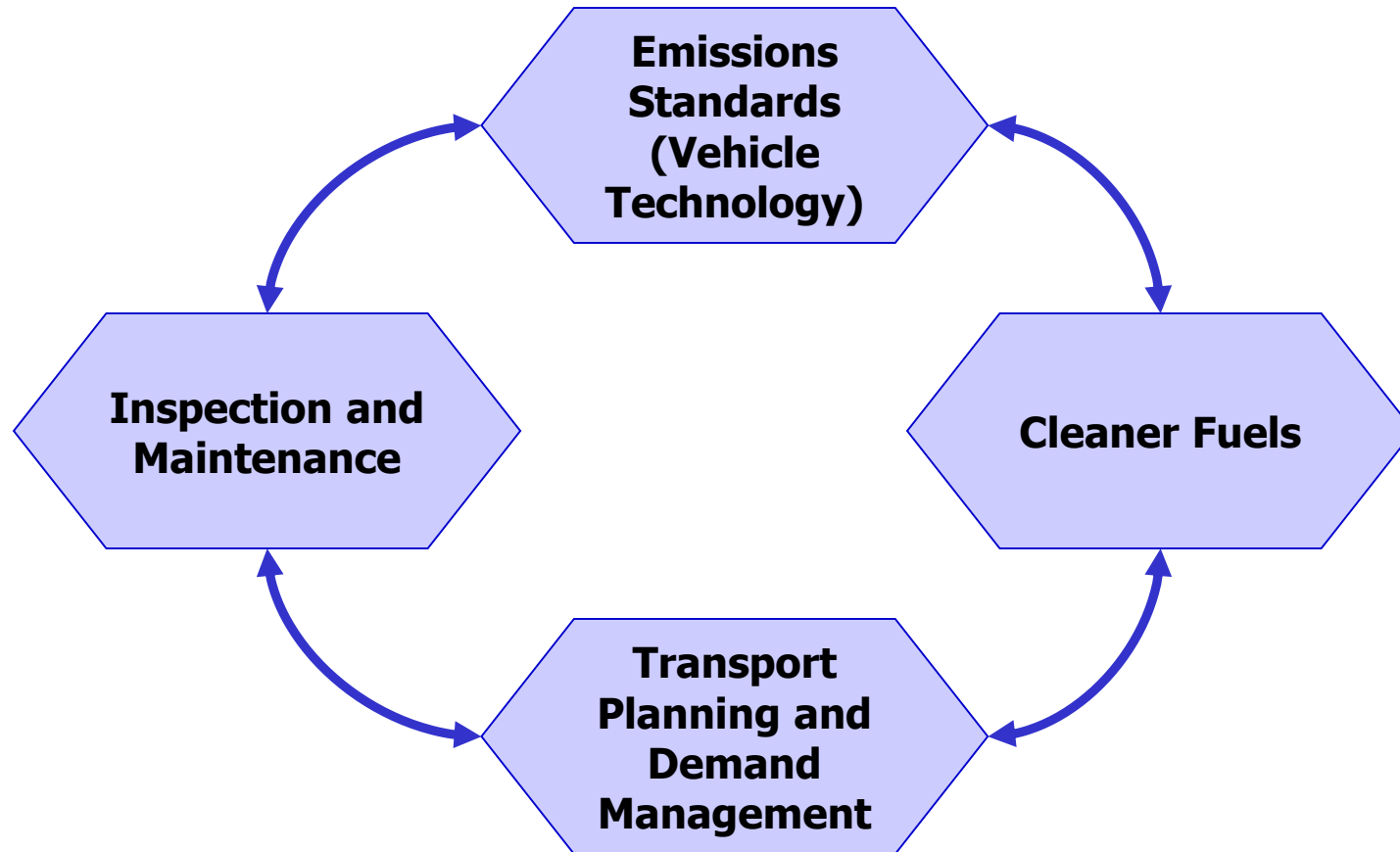
Trends of Aggregated Annual Averages of SPM, PM₁₀, & SO₂ for Asian Cities (1993–2003)



Notes: Based on information gathered through the Stage 2 – Benchmarking Study on Urban Air Quality Management Capability in selected Asian Cities

- Quality assurance and control of air quality monitoring data
- Availability of raw data for policy makers, researchers
- Gaps in monitoring capacity for all pollutants in many of the secondary cities. Lack of good quality monitoring of O₃, NO₂, and VOCs in selected cities
- Absence of good quality source apportionment studies and emission inventories for most cities
- Understanding of impact of harmful impact of AQM and as result inconsistent political will and commitment of decision-makers
- Cooperation between national, regional (within country) and local level
- Credible enforcement mechanisms of legislation
- Capacity of local government authorities

Framework for Reducing Vehicle Emissions



Institutionalizing Stricter Vehicle Emissions Standards (new light duty vehicles)



Country	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	10	
European Union	Euro 1		Euro 2				Euro 3			Euro 4		Euro 5					
Bangladesh ^e											Euro 2						
Bangladesh [†]											Euro 1						
Hong Kong, China		Euro 1		Euro 2			Euro 3				Euro 4						
India ^a							Euro 1		Euro 2			E3					
India ^b					E1	Euro 2				Euro 3							
Indonesia											Euro 2						
Malaysia			Euro 1		Euro 2										E4		
Nepal						Euro 1											
Philippines								Euro 1									
PRC ^a							Euro 1		Euro 2		Euro 3		E4				
PRC ^c							Euro 1		Euro 2	Euro 3			E4				
Singapore ^e	Euro 1						Euro 2										
Singapore [†]	Euro 1						Euro 2				Euro 4						
Sri Lanka									Euro 1								
Taipei, China						US Tier 1										US Tier 2 for diesel ^d	
Thailand	Euro 1						Euro 2		Euro 3				Euro 4				
Viet Nam													Euro 2		E3		

^a Entire country

^b Delhi and other cities; Euro 2 introduced in Mumbai, Kolkata and Chennai in 2001; Euro 2 in Bangalore, Hyderabad, Khampur, Pune and Ahmedabad in 2003, Euro 3 to be introduced in Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad and Ahmedabad in 2005

^c Beijing and Shanghai

^d Gasoline vehicles under consideration

^e for gasoline vehicles

[†] for diesel vehicles

Institutionalizing Fuel Quality Standards



Country	Current Status	Future Directions
Bangladesh	Euro 1 under discussion	No dialogue or plans to move beyond Euro 1
Cambodia	No formal standards, still leaded	No roadmap in place
China	Euro 3 - Beijing and Shanghai Euro 2 - Rest of the country	11 th Five Year Plan laying out road map for Euro 3 and Euro 4 for entire country. Euro 3 has been adopted for light duty vehicles for selected cities in 2005 and 2007 for the country. Euro 4 diesel available in Beijing in 2005.
Hong Kong SAR	Euro 4 in place	ULSD and Euro 5 (diesel) under consideration for 2007
India	Euro 3 for Metro's and Euro 2 for the rest of the country	Euro 4 for Metros and Euro 3 for the rest of country under discussion
Indonesia	Euro 2 (?)	Euro 3 gasoline by 2006 & Euro 3 diesel after 2010
Japan	Euro 4 Equivalent (S 50ppm)	Ultra-low sulfur gasoline and diesel 200; widely available in 2005
Korea		Ultra-low sulfur gasoline and diesel by 2007? As of January 1, 2006, sulfur content of gasoline is 50 ppm and sulfur content of diesel is 30 ppm
Malaysia	Euro 2 by 2005	Euro 4 by 2009-2010
Nepal	Euro 1; still partly leaded	No structured discussion on how to move ahead
Philippines	Euro 1; 500 ppm sulfur diesel	Euro 2 in 2006; Initial discussions on Euro 4 by 2010.
Singapore	Euro 2 in place	Euro 4 diesel in 2006, no plans for gasoline
Sri-Lanka	Euro 1 in place	No roadmap in place
Thailand	Euro 3 Gasoline; Euro 2 for Diesel	Euro 4 for 2009 with discussion ongoing on ULSD in some locations
Vietnam	Euro 3 in 2009 announced and under discussion	Euro 2 in 2007 and Euro 4 in 2010 under discussion and tentatively scheduled for July 2005

- Effective I/M requires combined road safety and Emission checks. Better to have tests separated from repair.
- Many countries in Asia have tried I/M but very few have been effective apart of Singapore and Hong Kong.
- Lack of strong institutional arrangements to enforce inspection and maintenance schemes. Corruption is a major problem in many countries
- Lack of equipment (i.e. mobile analyzers for on-road inspection and chassis dynamometers for comprehensive roadworthiness tests

- How to reduce number of vehicle kilometers traveled while ensuring that demand for mobility required for economic development is satisfied?
- Integrating land-use and transportation planning
 - Plan city expansion based on transport systems
- Promotion of public transport system and NMT in urban areas
- Vehicle quota system and road pricing in Singapore
- BRT in Jakarta
- Efficient multi-modal transportation system in Hong Kong

- Development of a Medium Fuel Quality Strategy for Thailand (2001-2005-2010)
- Current standards for gasoline is Euro 3 and Euro 2 for Diesel, Euro 4 considered for 2009
- Assess changes in specifications for gasoline and diesel fuels to improve air quality, particularly in Bangkok, taken into consideration of EURO 3 and EURO 4 vehicle emission standards
- Importance of consultative process in coming up with a fuel quality roadmap: Government – Auto Industry and Oil Companies.
- Policy making based on good science

- Controlling vehicle ownership – government imposed a high ownership cost (1972-) and introducing a Vehicle Quota System (1990-)
- Controlling vehicle usage – implementing Road Pricing along major and secondary roads (manual: 1975-98; electronic: 1998-)
- Providing an efficient public transport system

- Vertical Shaft Brick Kiln (VSBK) and Fixed Chimney Kiln are more efficient than the traditional types like Moving Bull Trench Kilns and Clamp Kilns
- VSBK is 30 percent more fuel efficient and 90 percent more environmental friendly than a traditional kiln
- Traditional brick kilns are estimated to have produced over 30 percent air pollution in the valley

Success Stories: BRT in Jakarta



- Asia's first fully closed, Bogotá-style Bus Rapid Transit (BRT) corridor
- 12.9km exclusive busway connects the city's Blok M Bus Station to the Kota Railway station
- Fifty-six specially built buses, each with a capacity of 85 passengers
- 18 billion rupiah revenue is still dwarfed by monthly operating costs exceeding 3 billion rupiah
- Subsidized fare of 2,500 rupiah per trip
- Has been able to attract 14% of car users as of July 2004 according to a JICA study

- There are several cities in Asia where citizen groups have been instrumental in getting major changes in AQM, e.g.
 - Phase out of leaded gasoline in Philippines
 - Phase out diesel busses in Delhi
 - Phase out 2 stroke tricycle
- Citizen action requires good access to AQ data
- Legal frameworks which give citizens a voice

- Air pollution is a major problem
- Experiences from other parts of Asia show that AQM is not a hopeless task
- Several countries and cities have been able to improve AQ
- Key-lessons:
 - Good quality monitoring
 - Emission Inventories/ source apportionment studies
 - Strong capacity to analyze data and formulate policies
 - Replicate success stories from elsewhere
 - Political will to enforce emission standards and to allocate budget
 - Consultative approach – involving all stakeholders
 - Legal frameworks which give citizens a voice