

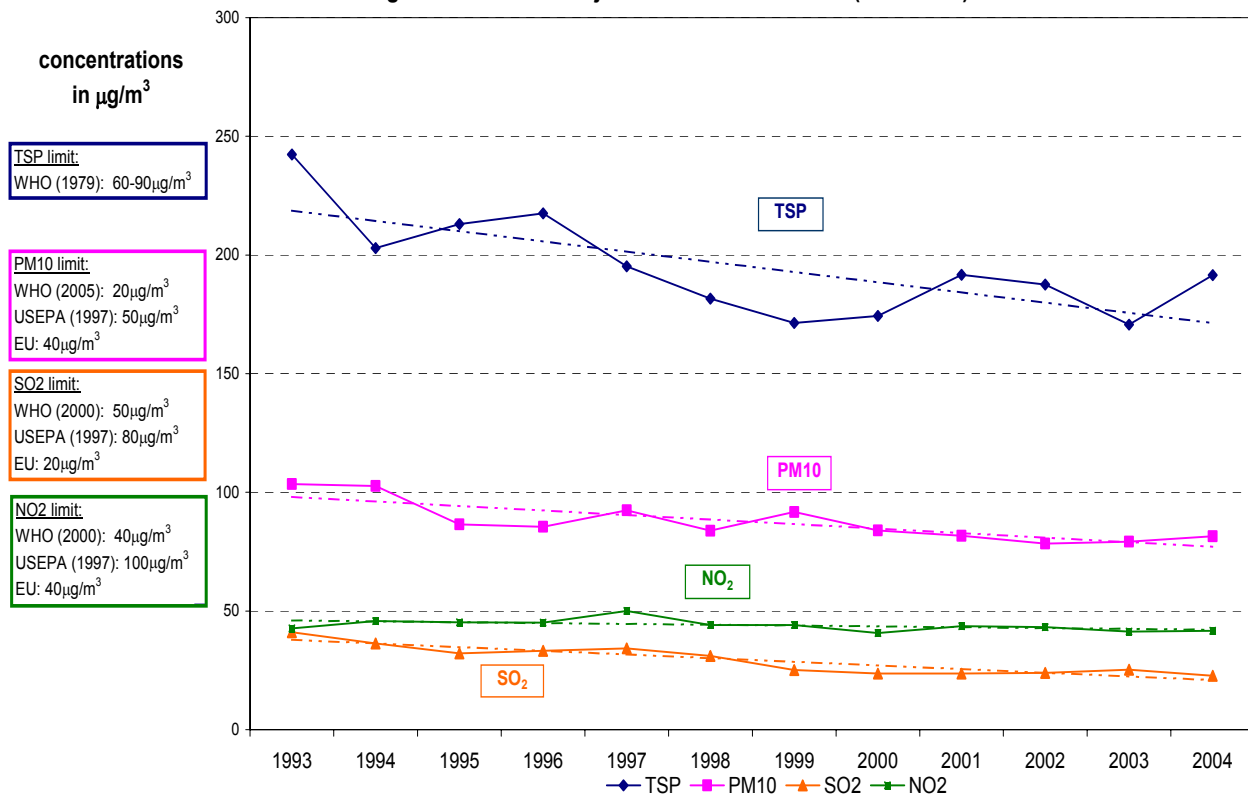
## Air Quality in Asian Cities

1. Air pollution continues to pose a significant threat to the environment, quality of life and health of the urban population in Asia. Many Asian cities have developed some form of air quality management (AQM) system to address the increasing levels of urban air pollution. However, the sophistication and completeness of the AQM system may not be adequate to effectively address the air pollution problem.

2. An ongoing study<sup>1</sup> by the Clean Air Initiative for Asian Cities, summarizing air quality data from 20 cities in Asia for the period 1993 to 2004 shows that, on average, there has been a moderate to slight decrease in pollution levels for sulfur dioxide (SO<sub>2</sub>), total suspended particulate matter (SPM), and fine particulates, also known as PM<sub>10</sub>. Although particulate matter remains at levels harmful to human health, SO<sub>2</sub> levels are now, on average, below the guideline values set by the World Health Organization – proving that air quality management policies and measures can work in Asia. Ambient concentrations of NO<sub>2</sub> are seen to remain at gradually increasing levels and just above the WHO guidelines. These air quality data collected by CAI-Asia from various government agencies and other sources have been validated by the appropriate government agency in each city.

3. A macro-analysis of air pollution trends in twenty Asian cities shows that, in general, TSP and PM<sub>10</sub> have decreased from 1993 to 2004, but ambient levels remain above limits set by the World Health Organization (WHO), US Environmental Protection Agency and the WHO - European Union (Figure 1). The aggregated data for SO<sub>2</sub> clearly shows that this problem have been sufficiently dealt with by most Asian cities considering that the levels in the recent years fall within WHO guidelines. The aggregated data for NO<sub>2</sub> shows that the levels have been stabilized around WHO guideline of 40µg/m<sup>3</sup>, withstanding the continued increase in motorization especially of two and three wheelers in the region.

**Figure 1. Trends of Major Criteria Air Pollutants (1993-2004)**



<sup>1</sup> CAI-Asia, in cooperation with the UNEP and WHO supported project, Air Pollution in the Major and Mega-cities of Asia, is conducting the 2<sup>nd</sup> Stage of the Benchmarking Study on Air Quality Management Capability of selected Asian cities. Cities included in the study: Bangkok, Beijing, Busan, Colombo, Dhaka, Delhi, Hanoi, Ho Chi Minh, Hong Kong, Jakarta, Kathmandu, Kolkata, Mumbai, Manila, Seoul, Shanghai, Singapore, Surabaya, Taipei and Tokyo.

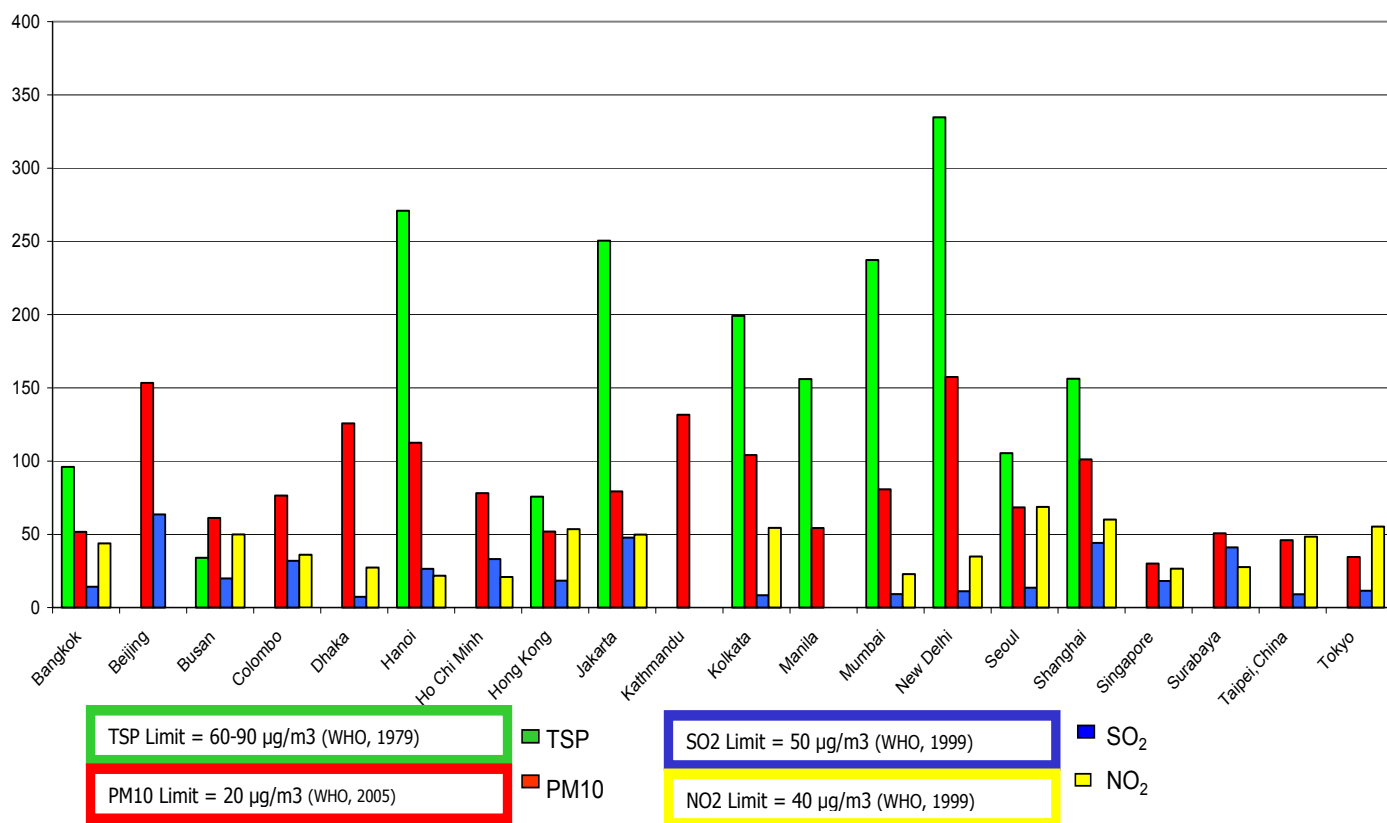
4. In 2000, the WHO<sup>2</sup> abandoned the standards for particulates because time-series epidemiological studies then were unable to define a threshold below which no health effects occur; even at low levels of particulate matter, short-term exposure is associated with health effects. Ambient concentrations of PM<sub>10</sub> were then compared with limits set by USEPA (50µg/m<sup>3</sup>). In the 2005 update<sup>3</sup> of the WHO air quality guidelines, however, the WHO has indicated an annual PM<sub>10</sub> guideline of 20µg/m<sup>3</sup> since this is the lowest level at which total, cardiopulmonary and lung cancer mortality has been shown to increase.

5. An analysis of the levels of ambient concentrations of pollutants on a per city basis, indicate that particulate matter (TSP and PM<sub>10</sub>) are main pollutants of concern for most of the cities (Figure 2). PM<sub>10</sub> average for 2000-2004 is lowest in Singapore at 30µg/m<sup>3</sup>, meeting the 50µg/m<sup>3</sup> standards set by USEPA (Singapore adopts USEPA standards). This value, however, will fail now when compared with the WHO 2005 updated guideline. All recent levels of PM<sub>10</sub> in the 20 cities in the study then, fail to meet WHO standards.

6. All of the eighteen cities with SO<sub>2</sub> data, except for Beijing, meet the WHO guidelines confirming the overall average trend (Figure1) that SO<sub>2</sub> has been sufficiently dealt with by Asian cities.

7. Seventeen out of the twenty cities in the study have NO<sub>2</sub> data, eight of which (47%) meet the WHO guideline while the remaining nine cities (53%) exceeding the 40µg/m<sup>3</sup> guideline. This may indicate that NO<sub>2</sub> is an emerging pollutant of concern for Asia.

**Figure 2. Average Annual Air Pollution Concentrations (2000 - 2004) in Selected Asian Cities**



<sup>2</sup> WHO, 1999. World Health Organization Guidelines for Air Quality, Geneva, 2000

<sup>3</sup> WHO, 2005. WHO Air Quality Guidelines Global Update 2005. Report on a Working Group Meeting, Bonn Germany. 18-20 October 2005.