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3.2 Beijing

Situational Analysis and Urban Air Quality Trends

Beijing, the capital of the People's Republic of China (PRC) is an independently administered municipal district, covering a vast 16,808 km². The capital of the world's most populous country, Beijing is one of the fastest growing urban agglomerations. The Beijing Environmental Protection Bureau (EPB) estimates the population of metropolitan Beijing to be 12.5 million, with a floating population estimated to be about 3.5 million.

With its entry into the World Trade Organization in 2001, China has made great progress towards modernization, with Beijing at its political centre. Beijing's economy has had a growth rate of 10 per cent per year from 1996–2000 and is expected to grow at 9 per cent per year for the next five years. However, with such rapid economic development, Beijing is also facing the problems of growing urbanization. Whereas the major sources of air pollution in the past were from the development of industry in the city, nowadays a major source is emissions from the transport sector, and Beijing, in its long-range planning to modernize, has placed a heavy emphasis on motor vehicles as the basis for transportation planning. The most popular mode of transportation is still the bicycle with Beijing having more than 8 million bicycles. However, due to rapid economic development and higher household incomes, in conjunction with a more consumer-based, social status-conscious society, the residents of Beijing are moving towards vehicular transport. Although car ownership has recently increased dramatically – 300 per cent in the past decade – the number of cyclists has not significantly decreased due to the accessibility of bicycles. However, the per capita usage in terms of kilometres travelled has declined. As part of the 2008 Olympic Games Action Plan to curb urban air pollution, Beijing will adopt administrative measures to encourage greater bicycle use (China Daily, 2002).

Industry experts attribute the rapid rise in the number of motor vehicles to more foreign automobiles being imported following cuts in tariffs, abolition of quota systems, falling prices for domestically-made automobiles and rising incomes for Beijing residents.

Compared to other large Asian cities, a WHO/UNEP study found that, in 1992, Beijing had moderate lead (Pb) problems, serious-to-moderate sulphur dioxide (SO₂) problems and a moderate ozone (O₃) problem (UNEP/WHO, 1992). In 1998, the Beijing EPB cited total suspended particles (TSP), SO₂ and nitrogen oxides (NO_x) as the main problem air pollutants. TSP exceeded the local and national standards by 89 per cent, SO₂ by 100 per cent and NO_x by 204 per cent (Beijing EPB, 1999). A 2001 analysis by the Beijing EPB showed that the increased number of motor vehicles in the city mirrored an increase in ambient levels of NO_x. The dominant sources of SO₂ in Beijing are heavy industries and power plants, which make up 72 per cent of total SO₂ emissions. The sharp increase in SO₂ concentrations in industrial areas from 1990 seems to have been caused by industrialization, urbanization and increased consumption of fuel for heating. The growing number of diesel vehicles contributed only a minor amount to the total SO₂ emissions.

According to the State of Environment Report 2000, published by China's State Environment Protection Agency (SEPA), 36.5 per cent of the 338 Chinese cities, for which monitoring data are available, met the national air quality standards applicable to residential areas in 2000 – an increase of 3.4 per cent compared to 1999. Those with “moderate” or “heavy” pollution fell from 40.6 per cent to 33.1 per cent. Leaded gasoline was prohibited nationwide in mid-2000, potentially eliminating 1,500 tons of annual lead emissions. In Beijing, the average concentration of SO₂ is reported to have fallen by 13 per cent compared to 1999; emissions of NO_x have been reduced by 15 per cent, TSP by 14 per cent and carbon monoxide (CO) by 7 per cent. In 1999, O₃ levels exceeded standards for a total of 199 days, however, these levels have since decreased (SEPA, 2001).

Plans for the 2008 Beijing Olympics have catalysed many environmental efforts by Beijing Municipal Government and the national government to clean up Beijing. One of the major beneficiaries of this effort is

Beijing's public transportation sector. Since 2000, Beijing has two subways in operation with a total length of 54 kilometres with the current subway passenger transport volume at 481 million. By the end of 2002, the government has stated that all the buses in the city will be converted to use compressed natural gas (CNG) and liquefied petroleum gas (LPG). According to the Beijing Municipal Authority, there are 648 bus routes in Beijing that transport 10 million people each day. In 2003, Beijing is expected to have 650 bus routes carrying 4.5 billion passengers annually.

Air Quality Monitoring

In order bring its air quality monitoring in line with international practice, Beijing Municipal Environmental Monitoring Centre made three major changes in 1999 in its reporting of ambient air quality. The Centre began reporting air quality on a daily basis at a specific time; it upgraded its particulate measure standard to PM_{10} and changed from measuring nitric oxide (NO) to oxides of nitrogen (NO_x); the sum of NO and nitrogen dioxide (NO_2) because of the harmful health impacts of PM_{10} and NO_x ; and established four new air quality monitoring stations to join the existing eight. Since then, Beijing and the French government have been cooperating on the construction of 16 environmental monitoring stations throughout Beijing. This new monitoring system began operation in 2001. Considering the Beijing comprehensive construction plan for ambient air quality monitoring, at least 20 air quality monitoring stations are operated based on the requirement of one station for each of Beijing's 20

administrative and development districts. The Beijing EPB states that the 24 air quality monitoring stations will provide fairly good coverage of the urban district of Beijing and most of the close-in suburbs. Beijing citizens are able to receive through the news media daily air quality reports from 24 air quality monitoring stations. The China National Environment Monitoring Centre sends reports to the government for use in policy-making and pollution control. Beijing leads the entire nation in this area. Due to narrow coverage, however, the monitoring stations still cannot fully and scientifically reflect the air quality of the whole municipality of Beijing. Currently, daily reports for ambient air quality in Beijing are only from the 12 monitoring stations established since 1999 (Figure 3.2.1). Reports from all 20 monitoring stations are not yet being reported in English.

Impacts of Air Pollution

Major Chinese cities and are among the highest polluted cities in the world and are experiencing levels of TSP and SO_2 two to five times higher than WHO and Chinese standards. Air pollution is one factor which contributed to chronic obstructive pulmonary disease – emphysema and chronic bronchitis – becoming the leading cause of death in China, with a mortality rate five times greater than in most developed nations.

Findings from the 1997 World Bank study on "Blue Skies, Clean Water" have evaluated the large economic and health impacts of air pollution in China. The study concluded that:

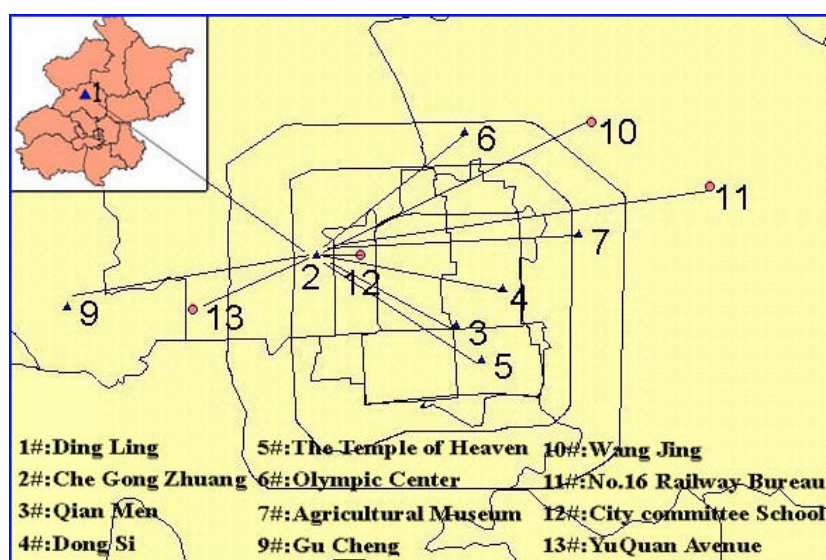


Figure 3.2.1 Map of air quality monitoring substations in Beijing
Source: Beijing EPB (2002)

- Each year, an estimated 178,000 people in major Chinese cities suffer early deaths because of atmospheric pollution in excess of standards.
- Indoor air pollution, primarily from burning coal and biomass for cooking and heating, causes an estimated 111,000 premature deaths each year.
- Some 7.4 million person-work-years are lost annually to air pollution-related health impacts.
- Air and water pollution damages, especially the damage of fine airborne particulates to human health, have been estimated to be at least US \$54 billion annually, or nearly 8 per cent of GDP in 1995.
- Children in Shenyang, Shanghai, Beijing, and other major cities have blood-lead levels averaging 80 per cent higher than levels considered dangerous to mental development.

Enforcement and Control Strategies

SEPA regulates stationary sources as well as ambient air quality, and some regulations on mobile sources. According to targets and countermeasures mentioned in the “Prevention of Atmosphere Pollution of Beijing, 2002” which was passed in principle by the PRC’s State Council, China plans to reduce total emissions of SO₂ by approximately 40 per cent, NO_x by 33 per cent and TSP by 34 per cent from 2002–2007. Figure 3.2.2 presents air quality goals for Beijing by pollutant. Due to the structure of the Chinese Government, SEPA has primary policy making power as well as regulatory enforcement power.

In line with the objectives of SEPA, the Beijing Municipal Government has made concrete plans to abate air pollution; mainly by regulating mobile sources of pollution. Beijing’s government has set high goals and has shown commitment to these by convening several large environmental conferences, some of which the mayor of Beijing has presided over, and by backing their five year plan with scientific research and demonstrations. The Beijing Municipal Government is ordering city vehicles to convert to liquefied petroleum gas (LPG) and compressed natural gas (CNG). In early 1999, officials stated that by 2000, 3,600 buses and 14,000 taxis in Beijing would run on either LPG or CNG fuels and 49 gas stations would offer the cleaner fuels. Assessment of the success of this measure has not been evaluated as yet. The main aim of the Beijing EPB for abating air pollutants is based on the following objectives:

- to change energy production and consumption levels and control pollutants from coal;

- to prevent and control vehicle emissions;
- to reduce dust pollutants (airborne particulate matter); and
- to control industrial pollutants.

Beijing has more air quality management capacity than other cities in the PRC. Information on air quality in Beijing is more accessible than in other cities that were surveyed. Beijing’s environmental expenditure in 1999 was 4.5 per cent of the city’s GDP and 4.5 times the national average. In preparation for the Beijing 2008 Olympic Games, Beijing will invest a total of US \$12.2 billion in environmental protection in the period of 1998–2007. Since 1998, Beijing has invested a total of US \$3.63 billion in spreading the use of clean fuels, controlling gas pollutant emissions, treating wastewater, safe disposal of solid waste and protecting wildlife species. Beijing has adopted strict emission standards since 1999 which require a reduction of emissions by 80 per cent. During the period from 2004 to 2007, Beijing will adopt even stricter standards so as to further reduce emissions by 60 per cent.

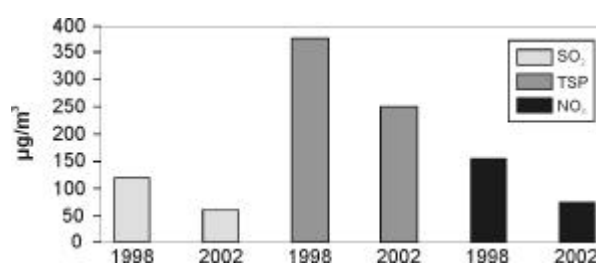


Figure 3.2.2 Air quality goals for Beijing
Source: Beijing EPB (2002)

Conclusions

The main air pollutants of concern in Beijing are TSP, SO₂ and NO_x. Since 1990, there have been sharp increases in SO₂ concentrations in industrial areas and increased levels of ambient NO_x coinciding with the rapid increase in the volume of road transport, particularly private cars. Beijing has more air quality management capacity than other cities in the PRC and has made concrete plans to abate air pollution; mainly by regulating mobile sources of pollution. Plans for the 2008 Beijing Olympics have also catalysed efforts to improve Beijing’s environment. Beijing has adopted strict emission standards since 1999 which require a reduction of emissions by 80 per cent and even stricter standards are planned to further reduce emissions by 60 per cent from 2004 to 2007. Leaded gasoline was prohibited nationwide in mid-2000 and all city vehicles (buses and taxis) are being ordered to convert to

liquefied petroleum gas (LPG) or compressed natural gas (CNG). The number of air quality monitoring stations in Beijing is being increased substantially and citizens now receive, through the news media, daily air quality reports from 24 air quality monitoring stations. Air quality reports are also sent to the government for use in policy-making and pollution control.