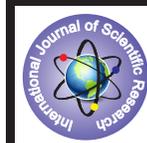


Studies on Atmospheric Pollution Over New Delhi-A Mega City in India



Physics

KEYWORDS :

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ABSTRACT

Air pollutants released from various sources affect directly or indirectly man and his environment. The resulting ground level concentration patterns have to be estimated for a wide variety of air quality analyses for social planning and industrial growth. Air pollutants emitted from different sources are transported, dispersed or deposited by meteorological and topographical conditions. Pollutants are substances which, when present at high enough concentrations, produce harmful effects on people and/or the environment. Air pollution was first perceived as a local problem in urban industrialized areas, hence taller smoke-stacks for industries and power plants were a ready solution. Urban population is growing very rapidly throughout the world, besides the world population is urbanizing much faster than is growing. Air pollutants in New Delhi arise from a wide variety of sources although they are mainly a result of combustion processes. Today, the largest source of pollution in most urban areas is motor vehicles, and to a lesser extent industry. Traffic-generated pollutants include nitrogen oxides, carbon monoxide, volatile organic compounds and particulates. On warm summer days the strong sunlight leads to a buildup of ozone through the oxidation of volatile organic compounds (VOCs) such as benzene in the presence of nitrogen oxides. However, due to the special atmospheric chemistry of ground level ozone, levels are very often lower in urban areas than in the countryside.

THEORY AND METHODOLOGY:

Air pollutants consist of gaseous pollutants, odors, and SPM, (suspended particulate matter) such as dust, fumes, mist, and smoke. The concentration of these in and near the urban areas causes severe pollution to the surroundings. The largest sources of human-created air pollution are energy generation, transportation, and industries that use a great deal of energy sources. Depending on their source and interactions with other components of the air, they can have different chemical compositions and health impacts. Since these pollutants are generally concentrated in and around urban areas, the outdoor urban pollution levels are far higher than in the rural areas. Some of the gases mentioned below can seriously and adversely affect the health of the population and should be given due attention by the concerned authorities.

The gases mentioned below are mainly outdoor air pollutants that can and do occur indoor depending on the source and the circumstances.

Oxides of nitrogen

This gas can make children susceptible to respiratory diseases in the winters.

Carbon monoxide

CO (carbon monoxide) combines with hemoglobin to lessen the amount of oxygen that enters our blood through our lungs. The binding with other haeme proteins causes changes in the function of the affected organs such as the brain and the cardiovascular system, and also the developing foetus. It can impair our concentration, slow our reflexes, and make us confused and sleepy.

Sulphur dioxide

SO₂ (Sulphur dioxide) in the air is caused due to the rise in combustion of fossil fuels. It can oxidize and form Sulphuric acid mist. SO₂ in the air leads to diseases of the lung and other lung disorders such as wheezing and shortness of breath. Long-term effects are more difficult to ascertain as SO₂ exposure is often combined with that of SPM.

Suspended particulate matter (SPM)

Suspended matter consists of dust, fumes, mist and smoke. The main chemical component of SPM that is of major concern is lead, others being nickel, arsenic, and those present in diesel

exhaust. These particles when breathed in, lodge in our lung tissues and cause lung damage and respiratory problems. The importance of SPM as a major pollutant needs special emphasis as a) it affects more people globally than any other pollutant on a continuing basis; b) there is more monitoring data available on this than any other pollutant; and c) more epidemiological evidence has been collected on the exposure to this than to any other pollutant.

DATA BASE:

The data is collected from Central Pollution Control Board (CPCB) New Delhi, for the period from 2000-2004 in industrial and residential areas for the selected Mega City-New Delhi.

ANALYSIS AND RESULTS:

The concentration of SO₂, NO₂ and SPM in mega city i.e., Delhi, is analyzed. The pollution levels in this mega city of India have been exceeded the WHO air quality guidelines (Faiz and Strum, 2000(1)). The data is collected for industrial and a residential area at different locations in the city is shown in Table 1 and National Ambient Air Quality Standards (NAAQS) of SO₂, NO₂ and SPM are shown in Table 2. Behavior of SO₂, NO₂ and SPM in the selected mega cities are discussed below.

New Delhi

Delhi, being one of the metros and the capital city of India, is rapidly expanding center of government, trade, commerce and industry and is the fourth most polluted city in the world. The annual average concentration of SO₂ in Delhi is shown in Figure-1 and is observed that it is present in low level from NAAQS standards from 2000 to 2003. Maximum value of 18.20 µgm-3 is observed near Nizamuddin in 2000 and a minimum value of 6.40 µgm-3 is observed at Siri Fort in 2003. From this it is noted that there is no much increase in SO₂ concentration from 2000 to 2003. In 2004, (not shown in fig) the SO₂ concentration is 12µgm-3, 7µgm-3, and 11µgm-3 in Mayapuri industrial area, Sarojini market and Town Hall is observed whereas NO₂ concentration is present between low levels to moderate from 2000 to 2004. Near ESI industrial area in Delhi the concentration of NO₂ is 57 µgm-3 whereas at Town Hall residential area it is 64µgm-3. Compared to industrial area always maximum concentration of NO₂ is observed in residential areas from 2000 to 2004. In the year 2001, maximum of 70 µgm-3 of NO₂ is observed. Coming to SPM, the concentration is ranging from moderate to high level according to NAAQS standards. A maximum of 534 µgm-3

in 2002 and 478 μgm^{-3} in 2003, 508 μgm^{-3} in 2004 are observed at Town Hall. At other locations also the SPM levels are high in Delhi (2,3). This increase in concentrations of the pollutants is due to increase in using motor vehicles and setting up of industries in the city.

CONCLUSIONS:

The analysis of data collected from CPCB, Delhi during 2000 to 2004 in the four mega cities shows that the concentration levels have been increased from 2000 to 2004 due to dense population and rapid industrialization. In mega cities, industries, automobiles, domestic fuel consumption and the use of domestic appliances contribute to the emissions while gases from garbage dumps contaminate the air. Due to increase in pollutants the temperatures inside the cities are higher around 40 C to 60 C compared to the surrounding rural areas. Hence Government has to take up some severe precautions to bring down the concentration of pollutants and reduce the use of energy consumable goods.

Table 1: Data collected locations in four mega cities

DELHI
Shahzada Bagh (I)
Shahadra (I)
ESI (I)
Nizamuddin (R)
Ashok Vihar (R)
Janak Puri (R)
Siri Fort (R)
Netaji Nagar (R)
Town Hall (R)

Pollution Level	Industrial	
	SO ₂ & NO _x	SPM
Low (L)	0-40	0-180
Moderate (M)	40-80	180-360
High (H)	80-120	360-540
Critical (C)	>120	>540

Table 2: National Ambient Air Quality Standards

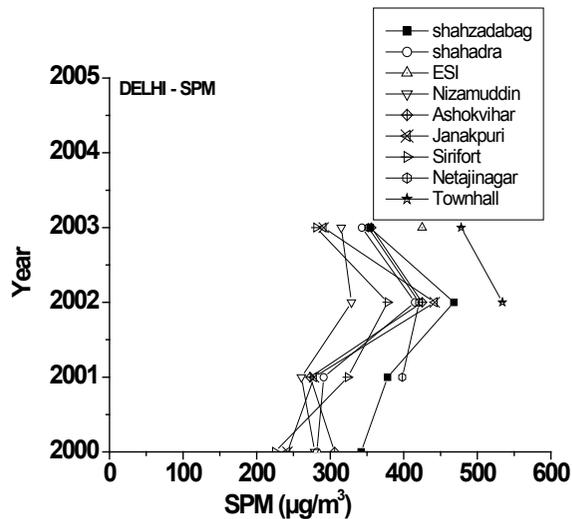
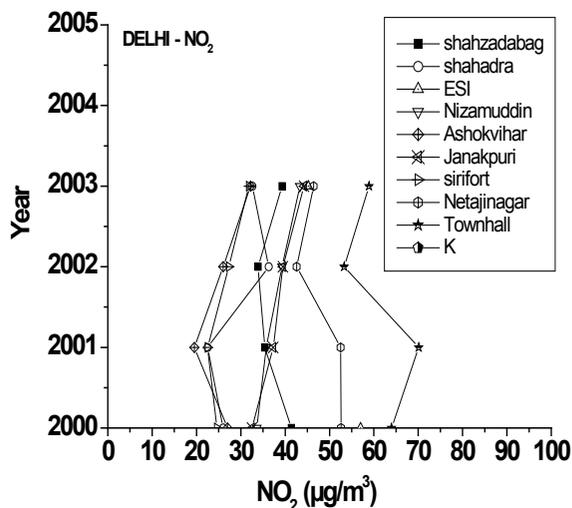
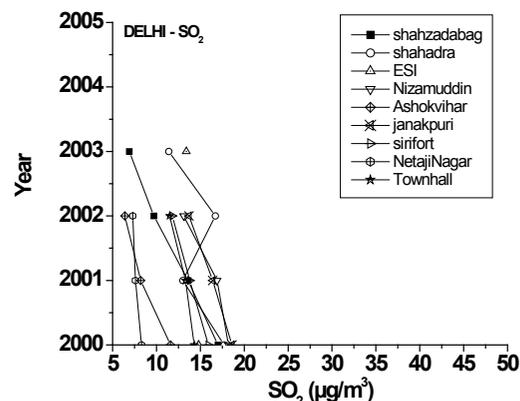


Figure -1: Concentration of SO2, NO2 and SPM from 2000-2004 in DELHI

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