



Studies on Atmospheric Pollution Over Calcutta-An East Coastal Mega City in India

KEYWORDS

Pollutants, volatile organic compounds, particulates, motor vehicles, countryside, atmospheric chemistry, urban areas, Suspended particulate matter (SPM), industrial sector, countryside etc.,

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ABSTRACT Atmosphere as varied and vast as the universe itself is a natural phenomenon all pervasive. The process of atmospheric studies has been there ever since the existence of human race. From ancient times when men were living in caves looked up at the skies in anticipation till the modern times of prediction, atmosphere continues to be an area of serious studies. Air pollutants released from various sources affect directly or indirectly man and his environment. 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.

Introduction:

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 mega cities 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. However, due to the special atmospheric chemistry of ground level ozone, levels are very often lower in urban areas than in the countryside.

Geographical Feature of Kolkata:

Kolkata, the capital of West Bengal on the river Hooghly, is the most important seaport on the East coast of India, and is situated at 22° 35 N and 88° 21 E. It is densely populated and is a major industrial centre. Jute manufacturing dominates the industrial sector, while engineering, cotton textiles, and chemicals are also important. With increased industrial activity, rapid urbanization and with wide transport network, Kolkata has become one of the busiest hubs of industrial and commercial sectors in the country. The climate of the selected mega city, Kolkata, is neither very hot nor very cold. It is mild.

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[3,7]. 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 af-

fect the health of the population and should be given due attention by the concerned authorities.

The gases like oxides of nitrogen, CO, SO₂, SPM etc., are mainly outdoor air pollutants that can and do occur indoor depending on the source and the circumstances.

a. Oxides of nitrogen:

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

b. 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[5,6].

c. 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.

d. Suspended particulate matter:

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 [4,5]. 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 coastal Mega City-Kolkata.

Analysis and Results:

The concentration of SO₂, NO₂ and SPM in Kolkata mega city of India are analyzed from 2000 to 2004. The pollution levels in this mega city of India have been exceeded the WHO air quality guidelines [1]. The data is collected for one industrial and two residential area at different locations in the city, which are Cossipore (I), Lal Bazzar (R) and CESE (Gariahot) (R). The National Ambient Air Quality Standards (NAAQS) of SO₂, NO₂ and SPM are shown in Table. Behavior of SO₂, NO₂ and SPM in the selected mega city are discussed as follows:

Kolkata is one of the important mega cities in India with different techno-socio-economic settings. The population in this city has increased in tremendous way during the past decade⁽⁴⁾. Hence the number of vehicles and industries has increased to the greater extent. Previously, Kolkata inhabitants were of different cultural habits than that of other mega cities. But now the residents of Kolkata have started consuming more energy. Hence the city records highest levels of concentration of pollution. Data collected from CPCB, Delhi as shown in the Figure indicate that the concentration levels of SO₂ is present in lower level ranging from 10µgm⁻³ to 25.30µgm⁻³ from Cossipore industrial area during 2000 to 2004. It is observed from the figure that the concentration of SO₂ is maximum near industrial area i.e Cossipore compared to Lal Bazzar and CESE (Gariahot) residential area. During the years 2000 to 2004, the concentration of NO₂ has increased from low to high conditions i.e., from 44.20µgm⁻³ to 96.40µgm⁻³ in industrial area Cossipore and 26.70µgm⁻³ to 86.80µgm⁻³ in residential areas like Lal Bazzar and CESE (Gariahot). Similarly, the SPM level has increased in concentrations from moderate to high during the selected years. Maximum of 405µgm⁻³ is observed in Cossipore industrial area. Compared to residential areas the high levels of concentration are observed in industrial areas.

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 4^o C to 6^o C compared to the surrounding rural areas. Hence Government and the people has to take up some severe precautions to bring down the concentration of pollutants and reduce the use of energy consumable goods.

Table :National Ambient Air Quality Standards

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

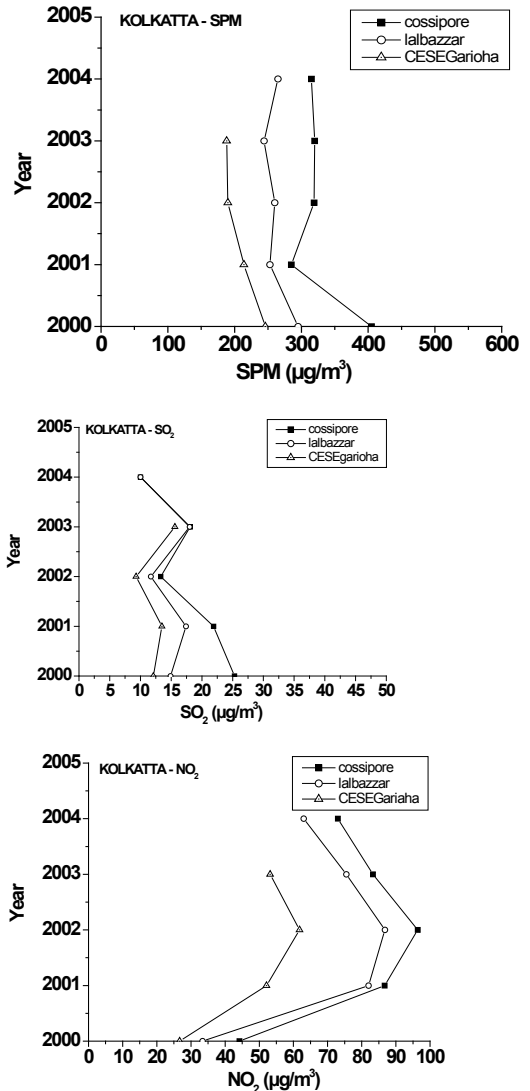


Figure: Concentration of SO₂, NO₂ and SPM from 2000-2004 in KOLKATA

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