THE PROBLEM OF AIR POLLUTION IN INDIA

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Outdoor air pollution is a major environmental health problem affecting everyone in developed and developing countries alike [1]. This problem affects all regions, settings, socioeconomic groups, and age groups. While all people living in a given area breathe from the same air, there are nevertheless important geographical differences in exposure to air pollution. Citizens in Africa, Asia or the Middle East breathe much higher levels of air pollutants that those in living other parts of the world. Some places have air pollution levels that are several times higher than those considered safe by the World Health Organization (WHO) Air quality guidelines [2, p 15].

The current situation leads to whom, that air pollution is increasingly causing chronic noncommunicable diseases (NCD). In 2012, an estimated 6.5 million deaths (11.6% of all global deaths) were associated with indoor and outdoor air pollution together. Ninety-four per cent are due to noncommunicable diseases – notably cardiovascular diseases, stroke, chronic obstructive pulmonary disease and lung cancer. Air pollution also increases the risks for acute respiratory infections [3].

Every year, roughly 5.8 million Indians die from heart and lung diseases, stroke, cancer and diabetes. In other words, 1 in 4 Indians risks dying from an NCD before they reach the age of 70 [4].

Air pollution in India is mainly caused from three sources namely vehicles, industrial and domestic sources. The problem of air pollution is more pronounced in major cities where the prominent source of air pollution is vehicles and small/medium scale industries. These cities include Delhi, Kolkata, Mumbai, Chennai, Ahmedabad, Bangalore, Hyderabad, Pune, Kanpur etc [5].

The reasons for high air pollution in India are as follows [5, p 5-6]:

1. Poor Quality of Fuel. Fuel of poor quality such as coal, diesel, petrol, fuel oil is used in India. Although during the past few years, various measures have been taken to improve the quality of fuel such as reduction of sulphur in diesel, unleaded petrol etc.

2. Old Process Technology. Old process technology is employed in many industries especially in small scale industries resulting in high emission of air pollutants

3. Wrong Siting of Industries. Wrong siting of industries especially close to residential areas results in people getting affected due to air pollution.

4. No Pollution Preventive Step in Early Stage of Industrialization. No pollution preventive steps were taken in early stage of industrialization which has resulted in high levels of air pollutants in many areas.

5. Poor Vehicle Design. Poor vehicle design especially 2-stroke two wheelers result in high emission of air pollutants.

6. Uncontrolled Growth of Vehicle Population. Uncontrolled growth of vehicle population in all major cities/towns has resulted in high levels of air pollution.

7. No Pollution Prevention and Control System in Small/ Medium Scale Industry. No pollution prevention and control system in small/medium scale industry exists resulting in high levels of air pollution.

8. Poor Compliance of Standard in Small/Medium Scale Industries. Poor compliance of standard in small/medium scale industries also result in high levelsof air pollution.

24 critically polluted areas have been identified in India. Among which Singrauli, Korba, Vapi, Greater Cochin, Ankaleshwar, Visakhapatnam, Howrah and

others, where air pollution was caused by emissions from Power Plants, Mining, Aluminium Industry, Mining, Chemical Industries, Oil Refineries, Metallurgical Industries, Steel Plants, Foundry, Rerolling Mills, Fertilizer Industry, Secondary Steel Industry, Coke Oven [5, p 4].

Suspended particulate matter (SPM), sulfur dioxide (SO_2) and oxides of nitrogen (NOx), carbon monoxide (CO) which are main criteria of pollutants in India. The major pollutants have reached the critical level and are rapidly going beyond threshold (bearable limit). For example, particulate matter concentration in Greater Mumbai is higher than the prescribed standards and WHO guidelines, the excess quantity ranged from 1.4 to 2.65 times [6].

Particulate matter consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. The major components of PM are sulphates, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water. The most health-damaging particles are those with a diameter of 10 μm or less, which can penetrate and lodge deep inside the lungs.

There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM_{10} and $PM_{2.5}$) and increased mortality or morbidity, both daily and over time. Conversely, when concentrations of small and fine particulates are reduced, related mortality will also go down – presuming other factors remain the same. Small particulate pollution have health impacts even at very low concentrations – indeed no threshold has been identified below which no damage to health is observed.

Prior to WHO, India is one of the countries in which the average annual fine particle concentration in urban areas for PM_{10} is at 123 μg / m3, and for $PM_{2.5}$ is 65.7 μg / m3, therefore exceeding the levels recommended by WHO in more than 6 and almost 7 times, respectively.

"WHO Air Quality Guidelines" estimate that reducing annual average particulate matter (PM10) concentrations from levels of 70 μg/m3, common in many developing cities, to the WHO guideline level of 20 μg/m3, could reduce air pollution-related deaths by around 15%. However, even in the European Union, where PM concentrations in many cities do comply with Guideline levels, it is estimated that average life expectancy is 8.6 months lower than it would otherwise be, due to PM exposures from human sources [7].

Indian Standards are slightly less stringent as compared to WHO guidelines. However, the world's average PM_{10} levels by region range from 26 to 208 $\mu g/m^3$, with a world's average of 71 $\mu g/m^3$ as per WHO estimates published in 2014 [8].

There are serious risks to health of residents of India not only from exposure to PM, but also from exposure to ozone (O3), nitrogen dioxide (NO2) and sulfur dioxide (SO2).

Ozone is a major factor in asthma morbidity and mortality, while nitrogen dioxide and sulfur dioxide also can play a role in asthma, bronchial symptoms, lung inflammation and reduced lung function.

Several European studies have reported that the daily mortality rises by 0.3% and that for heart diseases by 0.4%, per 10 µg/m3 increase in ozone exposure.

As an air pollutant, NO2 has several correlated activities. At short-term concentrations exceeding 200 µg/m3, it is a toxic gas which causes significant inflammation of the airways. NO2 is the main source of nitrate aerosols, which form an important fraction of PM2.5 and, in the presence of ultraviolet light, of ozone.

The major sources of anthropogenic emissions of NO2 are combustion processes (heating, power generation, and engines in vehicles and ships).

SO2 is a colourless gas with a sharp odour. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur. The main anthropogenic source of SO2 is the burning of sulfur-containing fossil fuels for domestic heating, power generation and motor vehicles.

SO2 can affect the respiratory system and the functions of the lungs, and causes irritation of the eyes. Inflammation of the respiratory tract causes coughing, mucus secretion, aggravation of asthma and chronic bronchitis and makes people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with higher SO2 levels. When SO2 combines with water, it forms sulfuric acid; this is the main component of acid rain which is a cause of deforestation [1].

It should be noted that much has been done to reduce the levels of atmospheric pollutants. But first of all, we want to draw attention to the existing state monitoring system.

The National Air Quality Monitoring Program (NAMP) is Central Pollution Control Board (CPCB) innovative program to monitor the ambient air quality in India. NAMP network consists of three hundred and forty two operating stations covering one hundred and twenty seven cities/towns in twenty six states and four Union Territories of the country. This program also takes care of preventive and corrective measures to control air pollution by identifying the critically polluted areas. NAMP identified four air pollutants i.e., Sulphur Dioxide, Oxides of Nitrogen, Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM/PM10) for regular monitoring at all the locations under its ambit and also integrated with the monitoring of meteorological parameters like wind speed and wind direction, relative humidity (RH) and temperature.

The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have one hundred and four observations in a year. The monitoring is being carried out with the help of Central Pollution Control Board; State Pollution Control Boards; Pollution Control Committees; National Environmental Engineering Research Institute (NEERI), Nagpur. CPCB co-ordinates with these agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring stations. NAMP is being operated through various monitoring agencies. Large number of personnel and equipments are involved in the sampling, chemical analyses, data reporting etc [9, p.13].

Thereby the main air pollutants in India are suspended particulate matter, sulfur dioxide, carbon monoxide and oxides of nitrogen. WHO has also recognized them as a priority pollutants throughout the world. The Government of India is pursuing an active policy to reduce pollution levels, which gives its results. But it is still too early to talk about stabilizing this problem.

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