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Analysis of Ambient Air Quality of Akola City

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A B S T R A C T

Certain compounds hurt the climate, the environment, and human health when they are present in the air. Human activity is the primary cause of the addition of these substances. It takes routine monitoring, the identification of pollution sources, and the implementation of preventive actions to maintain the quality of the air. This study's goal is to pinpoint the trend in Akola's air pollution and look into the causes behind it. The state pollution control board website provided the data for the analysis, which was taken straight from there and used without alteration. For the longest length of time, three criterion pollutants—nitrogen dioxide (NO2), sulfur dioxide (SO2), and respirable particulate matter (PM10)—have been measured routinely and have been the subject of air quality analysis research.

Keywords: Pollution standards, emission control, and Vehicle emissions.

1. Introduction

Air pollution is the result of specific pollutants building up in the atmosphere that have a negative impact on plant, animal, and human health as well as the ecosystem. Numerous methods are employed to add these chemicals: fumigants, insecticides, and other substances are released on purpose; hydrocarbons are produced during fuel combustion; and solvents, etc., leak out when they are utilized. A few of these substances undergo reactions in the atmosphere that alter their composition. Natural air quality maintenance occurs because these compounds quickly disperse after emission. The fact that pollutants are being added at a rate significantly faster than they are being removed has led to the current air pollution situation.

Air and its influence are ubiquitous. There are countless negative effects of polluted air on human health as well as structures, monuments, vegetation, ecosystems, and more. Particulate matter in polluted air has been related to climate matter absorb or place. Reports on its effects on health have surfaced globally. According to World Health Organization (WHO) data, air pollution caused 3.7 million premature deaths globally in 2012. However, in Indian cities like Delhi3, Hisar4, and Hyderabad5, there has been evidence of a positive correlation between air pollution and health effects.

To safeguard the public's health against air pollution, each nation has established air quality rules that specify the concentration of contaminants in the air. Central Pollution Control Board (CPCB) of India in its Notification 20096 has identified twelve criteria pollutants: lead, benzene, ammonia, sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, particulate matter (PM10, PM2.5), arsenic, nickel, and benzo(a)pyrrene (BaP Particulate phase only). These pollutants will be measured nationally through the National Air Quality Monitoring Program.

2. Methodology

A. Air Pollution Measurement in Akola

Under the National Ambient Air Quality Program (NAMP), air pollutants are regularly measured by the monitoring stations depicted in Figure 1. The MPCB also publishes the annual average of pollutants on its website, including SO2, NO2, and particulate matter with aerodynamic diameters less than 10mm, also known as PM10 or RSPM. These data from Equation 1 have been used to compute the Exceedence Factor for six stations. These stations were chosen because their measurements span the longest time period (2006–2015) and because they reflect a combination of sensitive, industrial, and mixed areas.

B. Assessment of Air Quality Trend:

Akola – LRT Commerce College

Table No. 6: Data for Monthly average reading recorded at LRT Commerce College. - Akola

Station Name	Year	Month	Average of SO_2	Average of NOx	Average of RSPM
			50	40	60
LRT Commerce College	2019	Apr	13	13	66
		May	13	11	66
		Jun	13	14	66
		Jul	14	14	63
		Aug	15	14	65
		Sep	14	16	64
		Oct	14	14	64
		Nov	12	13	65
		Dec	14	16	66
	2020	Jan	13	13	66
		Feb	13	14	67
		Mar	11	11	51

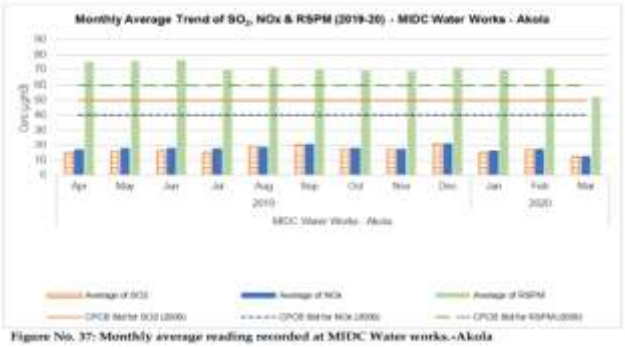

Figure No. 37: Monthly average reading recorded at MIDC Water works.-Akola

Figure No. 38: Monthly average reading recorded at LRT Commerce College. – Akola

Akola - College of Engg & Technology

Table No. 10: Data for Monthly average reading recorded at College of Engg & Technology Akola (Architecture Branch)-Akola

Station Name	Year	Month	Average of SO_2	Average of NOx	Average of RSPM
			50	40	60
Akola- College of Engg & Technology	2019	Apr	14	14	69
		May	14	15	69
		Jun	14	15	68
		Jul	15	15	65
		Aug	15	15	66
		Sep	17	18	66
		Oct	15	15	64
		Nov	15	15	66
		Dec	17	17	69
	2020	Jan	14	15	68
		Feb	15	16	68
		Mar	12	12	51

Akola -MIDC Water Works

Table No. 8: Data for Monthly average reading recorded at MIDC Water works.-Akola

Station Name	Year	Month	Average of SO_2	Average of NOx	Average of RSPM
			50	40	60
MIDC Water Works - Akola	2019	Apr	15	17	75
		May	16	18	76
		Jun	16	18	77
		Jul	15	17	70
		Aug	19	19	71
		Sep	21	21	70
		Oct	17	18	69
		Nov	17	17	69
		Dec	21	21	71
	2020	Jan	15	16	69
		Feb	17	17	71
		Mar	12	12	52

Figure No. 39: Monthly average reading recorded at College of Engg & Technology Akola (Architecture Branch)-Akola

C. Analysis of Factors Contributing to Air Pollution

Air pollution concentrations are not solely determined by emission levels. A number of variables come into play, including the weather, chemical changes in the atmosphere, and the movement of pollutants from outside of Europe. This implies that a decrease in a pollutant's emissions does not always result in a corresponding decrease in its concentrations. We are unaware of the causes of the rising pollution levels because we are unable to see pollutants in the air with the naked eye. We must first examine the fundamental causes of air pollution in order to comprehend its sources.

1. The Industry for Fossil Fuels:Fossil fuels, such as coal, oil, and gasoline, are burned to produce energy for transportation or electricity, which accounts for most air pollution. The large amount of carbon monoxide released indicates how much fossil fuel is burned. This also releases other dangerous air pollutants. The heart's ability to pump enough oxygen is lowered when breathing in air that has been contaminated by pollutants from burning fossil fuels and natural gas, which can cause respiratory illnesses.

2. Industrial Emission: More than we can possibly comprehend, the air quality is impacted by the various pollutants that are released into the atmosphere by industrial activity. Sulfur dioxide, carbon monoxide, nitrogen dioxide, and particulate matter 2.5 and 10 are among the main pollutants released by industries that primarily rely on coal and wood for their energy needs. The health effects of industrial pollution can vary from breathing difficulties to eye and throat irritation, and in some cases, it can even result in chronic illness.

3. Air Pollution Inside Buildings:Indoor air pollution can be caused by the use of toxic products, also known as volatile organic compounds (VOCs), poor ventilation, uneven temperature, and high humidity levels. These factors can occur in a comfortable home, office, or school. Ignorant factors such as smoking tobacco indoors or failing to treat a mold-infected wall can lead to indoor air pollution. Using a wood stove or a space heater can raise the humidity, which can quickly have a negative impact on someone's health.

4. Wildfires: Air pollution and wildfires are both rising as a result of climate change. Burning agricultural waste and stubble also makes a significant contribution to wildfires. It results in an increase in PM2.5 in the atmosphere, which combines with other dangerous elements like pollen and chemical gas to form smog.

3. Observation and Result:

According to estimates, household air pollution from biomass cooking fuel is responsible for thousands of cases of chronic bronchitis, tuberculosis, cataracts in adult women, and stillbirths in Akola. Few studies have examined the associations between biomass cooking fuel and other factors associated with stillbirths, but many have linked it to unfavorable pregnancy outcomes like preterm births, low birth weights, and post-neonatal infant mortality. Data from India's 2003–04 District Level Household Survey II has shown a correlation between stillbirths and women's use of kerosene and biomass as cooking fuels. Access to cleaner cooking fuels could prevent nearly 12% of these stillbirths. Using a high volume sampler machine, the monitoring process involved sampling pollutants every eight hours for almost nine months. As can be observed, the range of SPM concentrations is 39.93 µg/m³ to 147.56 µg/m³. Additionally, it is evident that the ranges for SO2 and NO2 concentrations are 19.25 µg/m³ to 38.16 µg/m³ and 6.68 µg/m³ to 9.84 µg/m³, respectively. It was found that winds blowing from WNW-NW directions were typically associated with high SO2 concentrations, while winds blowing from W-NW directions were typically associated with high SPM concentrations. SPM, SO2, and NO2 were analyzed for eight hours during the nearly nine months that the sampling was conducted. It was discovered that the average concentrations of SPM, SO2, and NO2 were, respectively, 91.61 µg/m³, 27.18 µg/m³, and 8.14 µg/m³. The CPCB recommends that the concentration of pollutants be kept within 200 µg/m³ for SPM and 80 µg/m³ for SO2 and NO2.

4. Conclusion

In order to determine the concentrations of the three main pollutants—SPM, SOx, and NOx—at the study site, air quality monitoring was done. Along with RSPM, SO2, and NO2, these vehicles also release HC and CO, and it is anticipated that their concentration in the air has increased proportionately. Air pollution has been lessened thanks to the implementation of Bharat Stage VI. If appropriate precautions are taken during construction and the following guidelines are followed, a high concentration of RSPM level caused by construction activity can be managed:

1. Verify the traffic signals accurately.
2. Adequate traffic control measures, including installing signal timers at each signal.
3. Reroute all traffic to a different subway.
4. The city of Akola was dubbed "No Horn city."
5. Adopting dust control measures could effectively control particulate emissions.

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