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Evaluation of Air Quality Parameters from Selected Sampling Stations of Pune City, Maharashtra (India)

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ABSTRACT

Global warming is recognized by almost all atmospheric scientists as a significant environmental problem caused by an increase in levels of certain trace gases in the atmosphere since the beginning of the industrial revolution. While the effects of air pollution on materials, vegetation and animals can be measured, health effects on humans can only be estimated from epidemiological evidence. Air pollution is caused by a combination of gases and particulate pollutants such as carbon dioxide, methane, and nitrogen dioxide emitted from point sources such as factories and motor vehicles that burn fuel. Some gases emissions are visible to the eye and sometimes may even diffuse in to the atmosphere and become invisible. Here, for this study air pollution status from two places of Pune city was checked in the year 2021-22. Here, results show that the values of NOx and RSPM are beyond the permissible limit.

Key words: *Global Warming, Environmental problem, Industrial revolution, Air pollution.*

Introduction

In the developing countries, air pollution is the biggest environmental health problem. Air pollution is caused by a combination of gaseous and particulate pollutants such as carbon dioxide, methane, and nitrogen dioxide emitted from point sources such as factories and motor vehicles that burn fuel (WHO, 2016, 2019). Some gaseous emissions are visible to the eye and sometimes may even diffuse into the atmosphere and become invisible (Tu and Hinchliffe, 1983). Particulate pollution, on the other hand, such as soot and black carbon, is always visible (Basagaña, *et al*., 2018).

We are well known that, air is composed of near about 78% nitrogen, 21% oxygen, 0.9% argon. The remaining elements include carbon dioxide, water vapour, hydrogen and other trace elements (Ostro, 2004). Although, gaseous like carbon dioxide and methane may only exists in small concentrations, their outsized heat trapping potential as greenhouse gases makes them the major factor in accelerating climate change (European Commission, 2019). Air pollution occurs when there is an alteration to the composition of air, either by volume, or in the chemical, physical, or biological properties. The atmosphere is a delicate balance of elements and particles. Any type of imbalance, even in small proportions can be detrimental to living organisms including animals and crops (Chaichan, *et al.,* 2018). Air pollution can cause diseases, allergies, and even death to humans. It can also cause harm to other liv-

ing organisms such as animals and food crops, and may damage the natural environment. Air pollution can be caused by both human activities and natural phenomena.

Types of Pollutants

Short term exposures to SO_2 can harm the human respiratory system and make breathing difficult. People with asthma, particularly children, are sensitive to these effects of SO_2. SO_2 emissions in the air generally lead to the formation of other sulfur oxides (Sox). Sox can react with other compounds in the atmosphere to form small particles (Leaderer, *et al.*, 1990). These particles contribute to particulate matter (PM) pollution. Small particles may penetrate deeply into the lungs and in sufficient quantity can contribute to health problems. Nitrogen oxides are produced in combustion processes, partly from nitrogen compounds in the fuel, but mostly by direct combination of atmospheric oxygen and nitrogen in flames. Nitrogen oxides are produced naturally by lightning, and also to a small extent by microbial processes in soils (Hassan, 2010). Low concentrations initially may cause mild shortness of breath and cough, then after a period of hours to days, victims may suffer bronchospasm and pulmonary edema. Inhalation of very high concentrations can rapidly cause burns, spasms', swelling of tissues in the throat, upper airway obstruction and death.

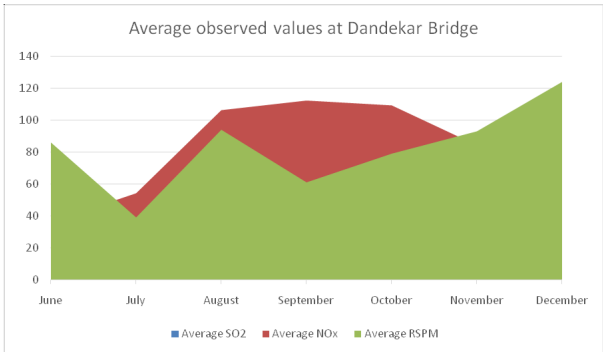
Respirable suspended particulate matter (RSPM) these particles cause the worst damage as they can penetrate deep into the lungs. Particles in the PM 2.5 size range are able to travel deeply in to the respiratory tract, reaching the lungs. Exposure to fine particles can cause short- term health effects such as eye, nose, throat and lungs irritation, coughing, sneezing and runny nose (Hussain, 2012).

Experimental

For this study two sampling stations were selected, like Katraj and Dandekar Bridge. While selecting the sampling stations care was taken that the selected stations will give the maximum results. Because these two points are very crowded at morning between 10.00 am to 01.30 pm and in the evening from 05.30 to 07.30 pm.

Results and Discussion

Due to increased amount of air pollutants emitted in to the atmosphere, the human health and consequently the environment is being continuously getting damaged, particularly due to RSPM. Day by day the level of RSPM is found to be more as compared to National Air Quality Standards in India. So many reasons are there, but some of them for high particulate matter range are the emissions from various auto vehicles, traffic dust, small scale industries, biomass burning, domestic and commercial use of fuels, burning of solid wastes, etc (Miller and Spoolman, 2010). Due to exposures of these factors various health diseases are observed. Basically, respiratory system related problems are observed like,

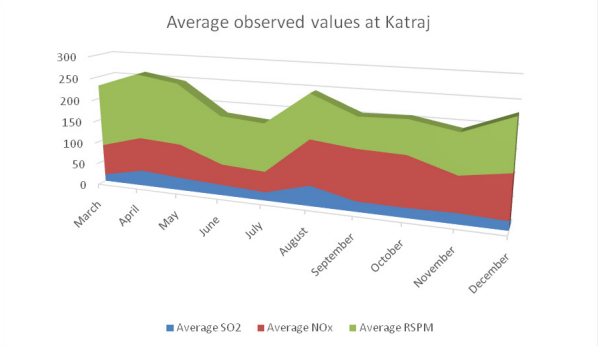


Observation **Table 1.** Data for monthly average reading recorded at Katraj, Pune

Station Name	Year	Month	Average SO_2	Average NOx	Average RSPM
Katraj	2021	**MAX »**	**50**	**40**	**60**
		March	17	57	184
		April	26	77	90
		May	32	65	94
		June	24	36	86
		July	21	54	39
		August	41	106	94
		September	24	112	61
		October	23	109	79
		November	26	84	93
		December	20	56	124

Observation **Table 2.** Data for monthly average reading recorded at Dandekar Bridge, Pune

Station Name	Year	Month	Average SO_2	Average NOx	Average RSPM
Dandekar Bridge	2021	**MAX »**	**50**	**40**	**60**
		March	16	72	142
		April	36	78	148
		May	29	79	139
		June	24	48	110
		July	19	47	108
		August	46	102	98
		September	23	114	68
		October	22	112	74
		November	24	78	88
		December	20	98	112



Chronic health problems, reduction of lung and premature mortality etc. (United States Environmental Protection Agency, 2019). In the current study in the month of March, April and May maximum level of RSPM is observed. Hence, to avoid further complications, this problem should be minimized. In some cases SO_2 and NOx are beyond permissible limit, it may be due traffic jams and other similar conditions.

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