A study of air quality index in Tamil Nadu and Delhi region

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ABSTRACT

Air pollution has emerged as one of the challenging problems before mankind in the past few decades. In this study, we are going to study the effects of air pollution in an urban and rural area. By collecting pollution data from the pollution control board. This study is being conducted to compare the pollution level from Tamil Nadu and Delhi. In this study, we are going to study the difference between air population in Tamil Nadu and Delhi region and the cause of pollution in this area. In this study, we are going to collect the pollution data from national ambient air quality monitoring program form the already existing set of data and analyses the cause of pollution and the main pollutants in Tamil Nadu and Delhi. In this study, we examine the influence some of the main pollutants such as Particulate matter (PM10 and PM2.5) Ozone (O3) Nitrogen dioxide (NO2). We will examine the cause of these pollutions in Tamil Nadu and Delhi main aim of this study is to distinguish between the cause of pollution in this area.

Keywords— Air quality, Air pollution, Air quality index, Delhi, Tamil Nadu

1. INTRODUCTION

India is one of the largest developing countries and its economic expansion over the past decades has been one of the strongest in world history. Such economic expansion increases the use of fossil fuels and automobile emissions. Air pollution may be defined as any atmospheric condition in which certain substances are present in such concentrations that they can produce undesirable effects on man and his environment. These substances include gases (sulphur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, etc.), particulate matter (smoke, dust, fumes, and aerosols), radioactive materials and many others. Most of these substances are naturally present in the atmosphere in low (background) concentrations and are usually considered to be harmless.

2. LITERATURE REVIEW

An air quality standard is a description of a level of air quality that is adopted by a regulatory authority as enforceable. The basis of development of standards is to provide a rational for protecting public health from adverse effects of air pollutants, to eliminate or reduce exposure to hazardous air pollutants, and to guide national/ local authorities for pollution control decisions. With these objectives, the Central Pollution Control Board (CPCB) notified Indian National Ambient Air Quality Standards for 12 parameters [2].

Table 1: Indian national ambient air quality standards

Pollutant	$PM_{2.5}$	PM_{10}	SO_2	NO_2	O_3		$CO(MG/m^3)$		Pb	NH_3
Averaging time (hr)	24	24	24	24	1	8	1	8	24	24
Standard	60	100	80	80	180	100	4	2	1	400

Air Quality Index (AQI)

The Air Quality Index (AQI) is a reporting system and an important tool for risk communication. It informs the public about the level of ambient air quality, and the potential health risk it would impose, particularly on vulnerable groups such as children, the elderly, and those with existing cardiovascular and respiratory diseases. People use the AQI to make decisions on outdoor activities; for example, schools and sports organizations may check the latest AQI figures to decide whether outdoor sporting events should be conducted on a certain day.

3. METHODOLOGY

Ambient air quality is measured by the Tamil Nadu Pollution Control Board (TNPCB) through the National Ambient Air Quality Monitoring Programme (NAMP). The data available at TNPCB from the year 2018 used for computing Air Quality Index (AQI). The AQI is calculated worldwide as per the following function,

$$I = \frac{Iigh - Ilow}{Chigh - Clow}(C - Clow) + Ilow$$

Where I is the Air Quality Index, C is the pollutant concentration, Clow is the concentration breakpoint that is ≤C, Chigh is the concentration breakpoint that is ≥ C, Ilow is the index breakpoint corresponding to Clow and Ihigh is the index breakpoint corresponding to Chigh.

The ambient air samples are collected through high volume samplers by running 24 hours and twice a week. Thus in each station, not less than 108 samplings are done in a year. PM_{10}, SO_2 and NO_2 are monitored. Out of these 28 stations, 10 stations were selected to calculate historical AQI so as to know the air quality of the cities and towns.

The list of location from which the data has been collected in from both the states of Tamil Nadu and Delhi These data set has been collected from the Ambient Air Quality is being monitored by CPCB in association with Tamil Nadu Pollution Control Board (TNPCB). The location in Delhi is monitor by the central pollution control board.

Table 2: list of location in Tamil Nadu

S. no	Sampling station location	State	Land use pattern
1	NEERI, CSIR Campus Taramani	Tamil Nadu	Idustrial area
2	G. D. Matric Hr. Sec. School	Tamil Nadu	Residential area
3	Poniarajapuram, DEL, Coimbatore	Tamil Nadu	Commercial area
4	Adiyar, Chennai	Tamil Nadu	Residential area
5	Kilpauk, Chennai	Tamil Nadu	Residential area
6	Thiyagaraya Nagar, Chennai	Tamil Nadu	Commercial area
7	Anna Nagar, Chennai	Tamil Nadu	Residential area
8	Fenner (I) Ltd. Kochadai	Tamil Nadu	Commercial area
9	Kunnathur Chatram Avvai Girls HS School	Tamil Nadu	Commercial area

Table 2: List of location in Delhi

S. no	Sampling station location	State	Land use pattern
1	N.Y. School, Sarojini Nagar, Delhi	Delhi	Commercial area
2	Janakpuri	Delhi	Residential area
3	Mayapuri Industrial Area	Delhi	Idustrial area
4	Nizamuddin	Delhi	Residential area
5	Pitampura	Delhi	Residential area
6	Shahadra	Delhi	Residential area
7	Shahzada Bagh	Delhi	Residential area
8	Siri Fort	Delhi	Commercial area
9	Town Hall, Ayurvedic Dispensary, Chandni Chowk	Delhi	Commercial area

4. RESULTS AND DISCUSSION
The following discussion summarizes the information that can be drawn from the calculated indices. AQI for places of Chennai city and Delhi.

Table 4: Pollution data from central pollution control board (CPCB) for Delhi for the year 2018

State	Location	NO2 (µg/m3)	PM10 µg/m3	PM2.5 µg/m3	AQI
Delhi	N.Y. School, Sarojini Nagar, Delhi	88	152	101	93
Delhi	Janakpuri	51	292	114	132
Delhi	Mayapuri Industrial Area	97	257	99	124
Delhi	Nizamuddin	56	240	83	120
Delhi	Pritampura	43	199	117	115
Delhi	Shahadra	45	289	101	128
Delhi	Shahzada Bagh	63	292	90	133
Delhi	Siri Fort	53	252	103	125
Delhi	Town Hall, Ayurvedic Dispensary, Chandni Chowk	112	191	104	162

Table 5: Pollution data from central pollution control bord (CPCB) for Tamil Nadu for the year 2018

State	Location	NO2 (µg/m3)	PM10 µg/m3	PM2.5 µg/m3	AQI
Tamil Nadu	NEERI, CSIR Campus Taramani	19	84	32	54
Tamil Nadu	G.D. Matric Hr. Sec. School	20	43	31	46
Tamil Nadu	Poniarajapuram, DEL, Coimbatore	25	48	32	48
Tamil Nadu	Kilpauk, Chennai	13	73	30	56
Tamil Nadu	Thiyagaraya Nagar, Chennai	18	81	52	77

Tamil Nadu	Anna Nagar, Chennai	16	119	40	80
Tamil Nadu	Fenner (I) Ltd. Kochadai	24	68	31	45
Tamil Nadu	Adiyar, Chennai	17	49	35	47
Tamil Nadu	Kunnathur Chatram Avvai Girls HS School	27	80	35	50

The air quality index level in Tamil Nadu falls in between the range of 40-80 the level of pollution in Tamil Nadu Is moderate and is generally considered safe. The most people will not be affected the main group which will be affected will be People with respiratory disease are the group most at risk.

The air quality index level in Delhi falls in between the range of 90-180 the level of pollution in Delhi Is unhealthy and will affect the general population. The most people will not be affected the main group which will be affected will be People with respiratory disease are the group most at risk and Increasing likelihood of respiratory symptoms and aggravation of lung disease, such as asthma.
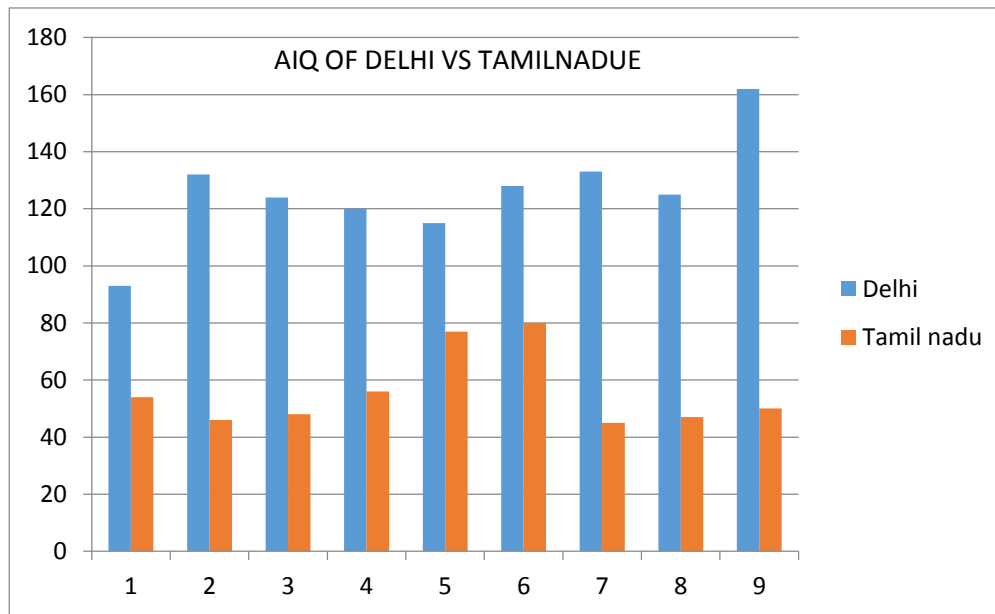

Fig. 1: AQI of Delhi vs. Tamil Nadu

5. CONCLUSION

AQI of Tamil Nadu and Delhi reveals that PM_{10} is the main contributor for a higher value of the index. NO_2 are well within the NAAQ standards for 24 hours. The higher value of PM_{10} is mainly due to vehicular pollution. Vehicular emissions are of particular concern because these are ground level sources and thus have the maximum impact on the general population in Tamil Nadu. Also, vehicles contribute significantly to the total air pollution load in many urban areas. The Delhi AQI is highly polluted and PM_{10} is the main contributor for a higher value of the index. NO_2 does not fall within the NAAQ standards for 24 hours this is also a major cause of pollution. The higher value of PM_{10} is mainly due to vehicular pollution. Vehicular emissions are of particular concern because these are ground level sources and thus have the and another source of pollution is the emission from factories and corps burring in the offseason and by which the pollution level is one of the most polluted in the world. It is to be noted that AQI system is based on maximum operator function by selecting the maximum of sub-indices of various pollutants as overall AQI. Ideally, eight parameters (i.e.,) PM_{10}, $PM_{2.5}$, NO_2, and having short-term standards should be considered for near real-time dissemination of AQI

6. REFERENCES

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