

A STUDY ON AIR POLLUTION AND ITS IMPACT ON HUMAN HEALTH IN CHENNAI CITY

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ABSTRACT: Human activities since preindustrial time have resulted in large increase in air pollution. Air pollutants are substances which when present in the atmosphere adversely affect the human health, animals, plants, or microbial life; damage materials, or interfere with the normal activities of life. In this paper, the air quality index in four places of Chennai such as Anna Nagar, Adyar, T.Nagar, Kilpauk was calculated. The pilot survey was conducted based on the questionnaires from various categories of people such as vendors, auto drivers and passers by. The impact on human health is then presented in this paper.

Key words: Air quality Index, Ambient air Quality, RSPM, and SPM.

I. INTRODUCTION

India is the one of the largest developing country and its economic expansion over the past decades has been one of the strongest in the world history. Such an economic expansion increases uses of fossil fuels and automobile emissions. These pollutants affect human health which causes many diseases (AlliraniThiyagarajan, 2003). Many government agencies provide concentration of each pollutant levels in ambient air periodically. Normal citizen may not understand the data and to interpret how the quality of air is. An air quality index is one of the important tools available for analyzing and representing air quality status uniformly. The Air Quality Index (AQI) can be used as a measure to assess the relative change in the ambient air concentrations. The ambient air quality data obtained by the TamilNadu Pollution Control Board, Chennai during 2007 to 2012 is used for the present analysis. Sub indices are also categorized to make the index more meaningful and informative. In this paper AQI is calculated using three pollutants -Respirable Suspended Particulate Matter (RSPM), Sulphur dioxide (SO₂) and Oxides of nitrogen (NO_x). The survey is conducted and results are analysed.

II. METHODOLOGY

Ambient air quality is measured by Tamilnadu Pollution Control Board (TNPCB) through National Ambient Air Quality Monitoring Programme (NAMP). The data available at TNPCB from the year 2007 to year 2012 is used for computing air quality index (AQI).

The AQI is calculated worldwide as per the following function

$$I = \frac{I_{high} - I_{low}}{C_{high} - C_{low}} (C - C_{low}) + I_{low} \quad \text{----- (1)}$$

Where, I is the Air Quality Index, C is the pollutant concentration, C_{low} is the concentration breakpoint that is ≤ C, C_{high} is the concentration breakpoint that is ≥ C, I_{low} is the index breakpoint corresponding to C_{low} and I_{high} is the index breakpoint corresponding to C_{high}.

Table1 : AQI proposed for India (Sharma et al., 2003)

S.No.	Index	Category	SO ₂ (24 hr avg) (µg/m ³)	NO ₂ (1-hr avg) (µg/m ³)	SPM (24-hr avg.) (µg/m ³)	PM ₁₀ (24-hr avg.) (µg/m ³)
1	0-100	Good	0-80	0-80	0-200	0-100
2	101-200	Moderate	81-367	81-180	201-260	101-150
3	201-300	Poor	368-786	181-564	261-400	151-350

4	301-400	Very poor	787-1572	565-1272	401-800	351-420
5	401-500	Severe	>1572	>1272	>800	>420

The value given in Table 1 are used to compute the AQI. The AQI values computed for four areas of Chennai city are given in Table 2 to 5. From the results, it is observed that the air quality decreases significantly over the years.

To assess the impact of air quality on the health of people, a pilot survey was conducted based on the questionnaires.

III. IMPACT OF AIR POLLUTION ON HEALTH OF PEOPLE

To find out impact on human health a Pilot survey was conducted at five places of Chennai such as Anna Nagar, Adyar, Kilpauk, T. Nagar, V. Nagar and 91 questionnaires were collected as below.

1. Anna nagar - 16 nos
2. Adyar- 21 nos
3. Kilpauk - 14 nos
4. V. Nagar -20 nos
5. T Nagar - 20 nos

IV. RESULTS AND DISCUSSION:

1. Air Quality Index:

The following discussion summarises the information that can be drawn from the calculated indices. AQI for four places of Chennai city are given in Tables 2 to 5

Table 2 :Air quality Index for T.Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	124	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	144	164	83	255	271
DECEMBER	143	162	204	129	253	107

Table 3: Air Quality Index for Kilpauk

	2007	2008	2009	2010	2011	2012
JANUARY	164	156	156	95	44	92
FEBRUARY	99	139	121	94	115	271
MARCH	117	149	113	190	135	541
APRIL	100	95	95	98	162	301
MAY	91	123	143	76	113	301

JUNE	81	103	86	99	81	212
JULY	129	79	119	78	127	162
AUGUST	52	87	94	87	176	170
SEPTEMBER	147	200	119	97	137	168
OCTOBER	154	135	99	93	125	160
NOVEMBER	200	165	149	63	86	170
DECEMBER	182	128	119	79	170	115

Table 4: Air Quality Index for Anna Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	147	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	159	164	83	255	271
DECEMBER	143	167	204	129	253	107

Table 5: Air Quality Index for Adyar

	2007	2008	2009	2010	2011	2012
JANUARY	54	61	61	30	44	53
FEBRUARY	45	61	74	37	29	76
MARCH	39	44	43	40	36	91
APRIL	31	39	36	31	41	58
MAY	36	49	51	43	59	77
JUNE	31	41	25	36	34	78
JULY	40	27	19	29	44	65
AUGUST	31	24	39	33	55	57
SEPTEMBER	32	44	33	27	55	71
OCTOBER	53	67	50	28	86	71
NOVEMBER	43	53	60	34	75	83
DECEMBER	63	61	65	45	92	72

If the index is 0 to 100 the air quality is good, if the index is 101-200, the air quality is moderate, if the index is 201-300, the air quality is poor, if it is 301-400, the air quality is very poor, if it is 401-500, the air quality is severe.

The air quality in T. Nagar and Anna Nagar lies between moderate and poor status. The air quality in Kilpauk lies between very poor and severe status. AQI remains good in Adyar. From the above tables AQI got worsened from the year 2007 to 2012.

2.Impacts on Human Health

Table 6: Gender of respondents.

	Frequency	Percent	Valid Percent	Cumulative Percent
MALE	81	89.0	89.0	89.0
FEMALE	10	11.0	11.0	100.0
Total	91	100.0	100.0	

Table 7: Occupation of respondents.

	Frequency	Percent	Valid Percent	Cumulative Percent
DRIVER	31	34.1	34.1	34.1
VENDOR	47	51.6	51.6	85.7
PASSERBY	13	14.3	14.3	100.0
Total	91	100.0	100.0	

Table 8: Age of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
<=30	24	26.4	26.4	26.4
31-40	30	33.0	33.0	59.3
41-50	21	23.1	23.1	82.4
>50	16	17.6	17.6	100.0
Total	91	100.0	100.0	

Table 9: Person with disease

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid no disease	45	49.5	49.5	49.5
Disease	46	50.5	50.5	100.0
Total	91	100.0	100.0	

V. CONCLUSION

An air quality index estimation procedure for the four areas of Chennai is presented. The index is then calculated for all the four places. The results reveal that the index suggested can be used to generate a public awareness about the acute and chronic health problems. The findings of the study reveal that Kilpauk is the most polluted place in Chennai city. To make the index more meaningful, more pollutants can also be added as and when standards are made available. Measures have to be taken by government to improve ambient air quality taking in view of the public health. These measures include usage of clean fuel such as CNG, closure of high polluting industrial units, phasing out of older vehicles, periodic check on vehicle pollution certificates and encouraging people to use public transport means like metro rails and high capacity buses. The survey results prove that most of the people affected by air pollution resulted in chronic diseases.

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