

Study of Air quality Status of some cities of Rajasthan

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Abstract: An attempt has been made in this investigation to ascertain air quality on major roads of Ajmer city in the form of Air Quality Index (AQI). Monitoring stations were set up at fifteen strategic locations on all arterial roads of the study area after gaining knowledge about their traffic characteristics and analyzing the air samples from various monitoring locations the results are being compared with permissible standards as specified in Gazette of India Notification Extraordinary Part III, Section -4, Year 2009 and subsequently computed the air quality index. The results reveal that gaseous pollutants such as SO₂ and NO_x are within the permissible limits and particulate matter is the predominant cause of air pollution in the study area. More than half the total numbers of locations have heavy air pollution while another half suffer from air pollution.

Key words: Ajmer city, Ambient air quality, Air Quality index.

I. Introduction

The presence of high density of population and industries and vehicles lead to vehicular domestic and industrial emissions that subsequently affect the urban environmental conditions adversely.

Air quality scenario in most of the Indian cities presents a grim picture as more than 90 % of the national monitoring stations have recorded particulate concentrations exceeding the WHO recommended guidelines (TERI 2003).

Urban transport is the single largest cause of air pollution in Indian cities (IIR 2006). In the light of above facts an attempt has been made in this investigation to study the air pollution due to urban transport in Ajmer city.

Study area

Ajmer is located in the center of Rajasthan (INDIA) between 25° 38' and 26° 58' north Latitude and 73° 54' and 75° 22' east longitude covering a geographical area of about 8481sq. km. hemmed in all sides by Aravalli hills. About 7 miles from the city is Pushkar lake created by the touch of lord Brahma. The Dargah of khawaja Moinuddin chisti is holiest shrine next to Mecca in the world. Ajmer has hot dry summer and cold bracing winter.

The winter extends from November to February and summer extends from March to June Followed by rainy season till mid September. The temperature varies from 6 °c in winter and 49 °c in summer. The normal annual rainfall is 527.3mm. The total population of the District is 2180526 persons. Around 5.56 % of total area available for land utilization is Covered under forest. Ajmer is abode of certain flora and fauna that are particularly endemic to semi-arid and are specially adapted to survive in the dry waterless region of the state.

The city is well connected by rail and road transportation network to rest of the country.

NH 8 pass through the city. The city lies on Ahmedabad Delhi route. The transport system of Ajmer is mainly road based. Roads witness heavy traffic during peak hours. Lack of lane discipline, Heterogeneity of traffic, Inadequate public transport system and exponential increase in personal mode of transport, Traffic is increasing day by day and size of roads remains the same these are some reasons for congestion on roads. Two wheeler Is the predominant vehicle mode in the city (70 % total registration), followed by four wheelers (30%). Tampo and buses constitute 1%.

II. Materials and Methods

Monitoring stations were set up at 15 strategic locations on all arterial roads of the study area after gaining knowledge about their traffic characteristics the monitoring was conducted by a team of central laboratory of the S P C B (State Pollution Controll Board).

Analyzed the air samples from various monitoring locations. Sampling was done in summer months (March - June 2013) with a view to cover the peak traffic hours of morning (9 AM - 1 PM) and evening (4-7PM) of the day. The APM 460 NL respirable dust sampler manufactured by Envirotech Ins. Pvt. Ltd. Was used for sampling purpose. The samplers were installed in the breathing zone (1.5 m). The flow rate of air was kept in the range of 1.0-1.3 m³/min. The size classification of the particulate was achieved through a cyclone installed in the sampler which separates the respirable (PM₁₀) and non respirable fractions. The particle size less than 10 microns were collected on the filter papers; where as SPM larger than 10 microns was collected in the separate sampling bottle, also called as dust collector.

Further the air was passed through the impingers, housed in separate enclosure containing absorbing solution for SO₂ and NO₂ in series at a flow rate 1.00 l/min. A constant temperature was also maintained during sampling with the help of an icebox and sample were stored at a temperature below 5 °C.

Modified West and Gaeke method has been used for computing SO₂ while Jacob and Hochheiser (Modified Na – Arsenite method) has been used for computing NO_x in the collected samples.

The air quality parameters such as suspended particulate matter (SPM), Respirable suspended particulate matter (RSPM), SO₂ and NO_x have been studied in this investigation and the results are presented in the subsequent paragraphs, in sequel. The details of locations and the values of Air Quality parameters along with their Air Quality Index is presented in Appendix -I.

III. Results And Discussion

A. Suspended Particulate Matter (SPM) Suspended matter is of a major concern and they typically consist of dust, fumes and smoke. These particles when breathed in cause lung damage and respiratory problems.

It is therefore considered important to study this air quality parameter and the results are presented in table 1. It is evident from the table 1 that SPM level is between 100-200 µg/m³. It is observed further that Madar gate has maximum SPM level of 300 µg/m³.

Table I: Distribution of SPM level in Ajmer City

Serial No.	SPM µg/m ³	No. of samples
1.	<100	0
2.	100-200	0
3.	200-300	14
4.	300-400	1
Total		15

B. Respirable suspended particulate matter (RSPM)

Respirable suspended particulate matter (RSPM) is the suspended particles less than 10µm.

As these particulates are small enough to be breathed in readily, they are even more detrimental to human health as compared to suspended particulate matter.

The particulate matter less than 2.5 µm or less are specifically more harmful as Cannot be expelled from the body, therefore they cause long term ailments such as lung cancer, asthma and acute respiratory symptoms, chronic bronchitis, some type of birth defects, as well as premature deaths.

Given the above facts, it was considered to examine this air quality parameter and the results are presented in table 2.

The ambient air of the study area ranged between µg/m³.

It is observed from table 2 location have RSPM level between 100-150 µg/m³

Table2 Distribution of RSPM Level in Ajmer City

Serial No.	RSPM µg/m ³	No. of samples
1.	<100	0
2.	100-200	14
3.	200-300	1
4.	300-400	0
Total		15

C. Sulphur di oxide(SO₂)

Sulphur di oxide in the ambient air causes irritation of the eyes, nose, throat and skin.

Its irritant properties are caused due to the rapidity with which it forms sulfurous acid on contact with moist membranes. Its prolonged exposure causes varied kinds of acute respiratory symptoms such as aggravated coughing inflammation of respiratory tract etc. Having the above knowledge it was considered important to study this air quality parameter and results are presented in table 3.

SO₂ level in the ambient air of the study area ranged between The maximum SO₂ concentration is observed near Railway station, Madar gate. Where the level of conc. Is 6 µg/m³.

Table 3. Distribution of Sulphur dioxide level in Ajmer City

Serial No.	Sulphur dioxide µg/m ³	No. of Samples
1.	<4	2
2.	4.00-6.00	13
3.	6.00-8.00	0
Total		15

D. Nitrogen Oxide (NO_x)

Nitrogen oxides are released to the air from the exhaust of motor vehicles and burning of fossil fuel.

NO_x reacts with ammonia, moisture and other compounds to form nitric acid vapor and related particles.

It damages lung tissue, it causes respiratory diseases and aggravated heart diseases. The maximum NO_x concentration is observed near Railway station, Madar gate. Where level of concentration is 36 µg/m³.

Table 4 :Distribution of oxides of Nitrogen level in Ajmer City

Serial No.	Nox µ g/m ³	No. of Samples
1.	20.00-40.00	15
2.	40.00-60.00	00
3.	60.00-80.00	00
		15

E. Air quality index

The cumulative effect of conc of individual pollutants in ambient air is often expressed through b a single value in the form of Air Quality Index (AQI). The index is computed by using the following equation $AQI = \frac{1}{4} \{ (SPM \text{ actual}/SPM \text{ standard}) + (RSPM \text{ actual}/RSPM \text{ standard}) + (SO_2 \text{ actual}/SO_2 \text{ standard}) \} \times 100$.

The AQI values so derived was divided into five categories (Rao and Rao 1989) ie 0-25= clean air, 26-50=light air pollution, 51-75=Moderate air pollution, 76-100=Heavy air are pollution and above 100 signifies severe air pollution, and the results are presented in table 5. Computation results reveal that AQI values in the study area range from 61-100. It is observed from the table 5 that all the locations have air quality index values of more than 60 Which indicates moderate air pollution in those location.

Table 5. Range and distribution of Air Quality in Ajmer City.

Serial No	Range	Category	No. of locations
1.	0-25	Clean air	0
2.	26-50	Light air pollution	0
3.	51-75	Moderate air pollution	10
4.	76-100	Heavy air pollution	5
5.	>100	Severe air pollution	0

IV. Conclusion

An attempt has been made in this investigation to ascertain air quality in major roads of Ajmer city Monitoring stations were set up at 15 locations. Knowledge was taken about their traffic characteristic. The results are being compared with permissible standards as specified in Gazette of India Notification Extraordinary Part III, section 4, year 2009 and subsequently computed air quality index.

The results reveal that more than half the total number of locations have air pollution. It is largely due to high SPM and RSPM levels.

Nevertheless study quantifies the pollution level arising due to growing number of vehicles. Vehicles are the prominent source of air pollution in the study area.

Appendix I

S.No.	Place of collection	RSPM	SPM	So ₂	No ₂	AQI
	Standard	100µg/m ³	200µg/m ³	80µg/m ³	80µg/m ³	
1.	Parbatsar	120	240	3.7	30.00	70.53
2.	Alwar gate	110	220	5.1	31.0	66.28
3.	Chandra bardai	110	210	5.1	30.0	91.093
4.	Govt. college	120	210	5.5	35.0	68.90
5.	Madar gate	200	300	6.0	36.0	100.625
6.	Gandhi Circle	125	250	5.0	35.0	75.00
7.	Kachahari road	120	250	5.0	30.0	72.1875
8.	Khailand market	120	250	4.1	32.0	72.5
9.	Bus stand	175	300	4.00	34.0	93.125
10.	Bajrangarh	130	300	6.0	31.0	81.56
11.	Vaishali nagar	120	250	6.0	30.0	72.50
12.	Shastri nagar	120	250	5.5	30.0	72.34375
13.	B.K. Kaul	110	210	4.2	30.0	63.755
14.	Hari Bhau	110	215	4.1	28.0	64.40
15.	Sophia college	105	205	3.1	28.0	61.59

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