

BRIEF REPORT ON  
CONTINUOUS AMBIENT AIR QUALITY DATA  
OF RAJASTHAN  
(APRIL-JUNE, 2018)



**Rajasthan State Pollution Control Board**

राजस्थान राज्य प्रदूषण नियंत्रण मण्डल

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## CAAQMS- Quarterly Report

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## 1. INTRODUCTION

In India, especially in Rajasthan level of particulate matter is found higher than the prescribed limit due to its location in the Semi Arid climate zone.

Area close to an industrial operation, heavy transport activity as well as construction and demolition activities may experience episodic degradation in the quality of the air; however, these episodes tend to be of short duration and are rarely at levels that exceed the air quality standards. Rajasthan State Pollution Control Board is conducting ambient air quality monitoring in different cities of Rajasthan to meet out the objectives of:

- To determine the status and trends of ambient air quality
- To ascertain whether the prescribed ambient air quality standards have been violated
- To identify non-attainment cities
- To obtain the knowledge and understanding necessary for developing preventive and corrective measures

### **Continuous Ambient Air Quality Monitoring**

Rajasthan State Pollution Control Board had installed and commissioned 02 nos of Continuous Ambient Air Quality Monitoring Station (CAAQMS) in July, 2012. These stations are located at Jaipur and Jodhpur in Rajasthan to evaluate the Ambient Air Quality Status of million plus cities of the State.

Recognizing the need to monitor real time and peak concentration levels of critical pollutants avoiding the time lag, State Board further increased the number of Continuous Ambient Air Quality Monitoring Stations (CAAQMS) in July, 2017. Presently, CAAQMS are located in Jaipur (03 Nos.), and one each in Ajmer, Alwar, Bhiwadi, Jodhpur, Kota, Pali and Udaipur.

### **Monitored parameters**

Particulate matters (PM<sub>10</sub> and PM<sub>2.5</sub>) and gaseous pollutants (NO<sub>x</sub>, SO<sub>2</sub>, CO, VOC, O<sub>3</sub>, NH<sub>3</sub>) along with meteorological parameters like Temperature,



Relative Humidity, Wind Speed, Wind Direction, and Solar Radiation etc are continuously captured with the help of CAAQMS.

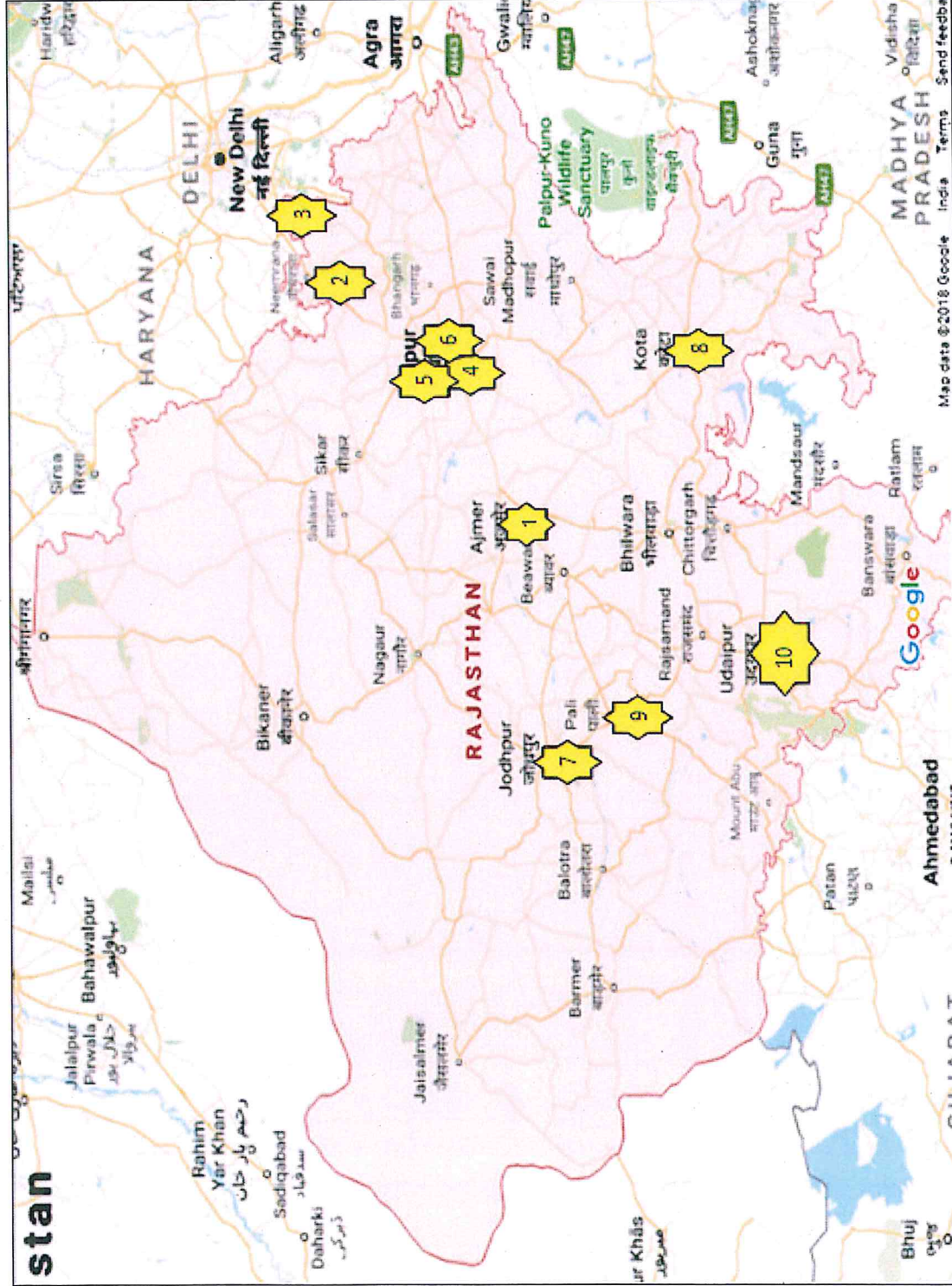
**Display Board**

1. Central display board for the public awareness, located at Rambag Circle, Jaipur to display the real time captured data of all the 10 nos.
2. Individual display board at all CAAQMS.

**Table1: Locations of CAAQMS**

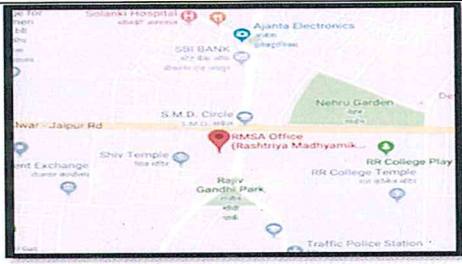
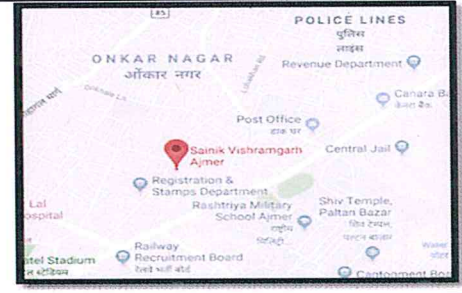



S. No.	Name of city	No. of Station(s)
1	Ajmer	1
2	Alwar	1
3	Bhiwadi	1
4	Jaipur	3
5	Jodhpur	1
6	Kota	1
7	Pali	1
8	Udaipur	1


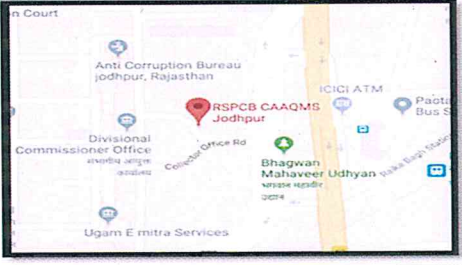
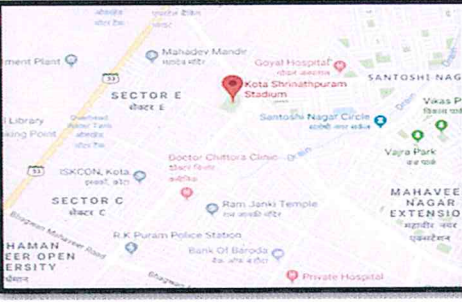
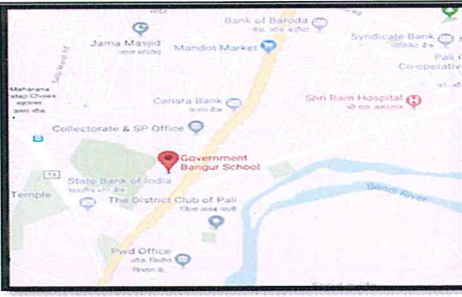

In continuation to earlier quarterly brief report, this report presents the monitoring results of 10 Continuous Ambient Air Quality Monitoring Stations located in 08 cities of Rajasthan from April, 2018 to June, 2018 to evaluate the Ambient Air Quality Status.



Location No.	Location Detail
1.	Sainik Vishrangarh, Todarmal Marg, Civil Lines, Ajmer.
2.	Rashtriya Madhymik Shikshaparisad, Opposite SMD Circle, Alwar.
3.	Water supply Complex, RUICO, Industrial Area, Bhiwadi.
4.	Police Commissionerate Office, M.I. Road, Jaipur
5.	Regional Science Park, Shastri Nagar, Jaipur.
6.	Psychiatric Center, Janta Colony, Adrash Nagar, Raja Park, Jaipur.
7.	Collectrate Office, Jodhpur.
8.	Shreenathpuram New Stadium, Near Gad circle, Kota.
9.	Bangar PG college campus, Indira Colony Vistar, Pali.
10.	Department of Mines & Geology, near Court chauk, Udaipur.

2 MONITORING SITE

<p>➤ <b><u>Alwar :-</u></b></p> <ul style="list-style-type: none"> <li>• CAAQMS is located in the premises of Rashtriya Madhyamik Shikshaparisad, Opposite SMD Circle, Alwar.</li> <li>• The coordinates of the station are 27°33'13.6"N, 76°36'40.1"E.</li> </ul>	
<p>➤ <b><u>Ajmer :-</u></b></p> <ul style="list-style-type: none"> <li>• CAAQMS is located in the premises of Sainik Vishrangarh, Todarmal Marg, Civil Lines, Ajmer.</li> <li>• The coordinates of the station are 26°28'21.7"N, 74°38'43.5"E.</li> </ul>	
<p>➤ <b><u>Bhiwadi :-</u></b></p> <ul style="list-style-type: none"> <li>• CAAQMS is located in the premises of Water supply Complex, RIICO, Industrial Area, Bhiwadi.</li> <li>• The coordinates of the station are 28°11'57.3"N, 76°50'50.1"E.</li> </ul>	
<p>➤ <b><u>Police Commissionerate Office:-</u></b></p> <ul style="list-style-type: none"> <li>• CAAQMS is located in the premises of Police Commissionerate Office, M.I. Road, Jaipur.</li> <li>• The coordinates of the station are 26°55'01.8"N, 75°48'07.3"E.</li> </ul>	
<p>➤ <b><u>Regional Science Park:-</u></b></p> <ul style="list-style-type: none"> <li>• CAAQMS is located in the premises of Regional Science Park, Shastri Nagar, Jaipur.</li> <li>• The coordinates of the station are 26°56'24.5"N, 75°47'52.9"E.</li> </ul>	

<p>➤ <b>Psychiatric Center:-</b></p> <ul style="list-style-type: none"> <li>CAAQMS is located in the premises of Psychiatric Center, Janta Colony, Adrash Nagar, Raja Park, Jaipur.</li> <li>The coordinates of the station are 26°54'10.5"N, 75°50'18.7"E.</li> </ul>	
<p>➤ <b>Jodhpur :-</b></p> <ul style="list-style-type: none"> <li>CAAQMS is located in the premises of Collectrate Office, Jodhpur.</li> <li>The coordinates of the station are 26°17'31.44"N, 73°02'16.49"E.</li> </ul>	
<p>➤ <b>Kota :-</b></p> <ul style="list-style-type: none"> <li>CAAQMS is located in the premises of Shreenathpuram New Stadium, Near Gad circle, Kota.</li> <li>The coordinates of the station are 25°08'38.5"N, 75°49'13.7"E.</li> </ul>	
<p>➤ <b>Pali :-</b></p> <ul style="list-style-type: none"> <li>CAAQMS is located in the premises of Bangar PG college campus, Indra Colony Vistar, Pali.</li> <li>The coordinates of the station are 25°46'15.1"N, 73°20'24.3"E.</li> </ul>	
<p>➤ <b>Udaipur:-</b></p> <ul style="list-style-type: none"> <li>CAAQMS is located in the premises of Department of Mines &amp; Geology, near Court chauk, Udaipur.</li> <li>The coordinates of the station are at 24°35'15.6"N, 73°41'50.9"E.</li> </ul>	



### 3. MEASUREMENT PRINCIPLE

The measurement of particulate matter is carried out by Environnement S.A. MP101M Analyzer which determines particulate mass concentrations in ambient air. The Principle of measurement of PM10 and PM2.5 is Beta Ray Attenuation Measurement. Due to different sampling hood size, PM10 and PM2.5 are measured differently.

CO concentration is measured by the Environnement S.A. Model No-CO12M analyzer. The working principle of this analyzer is non-dispersive infrared absorption using gas filter correlation and optical / electronic technology.

The Oxides of Nitrogen (NO, NO<sub>2</sub> and NO<sub>x</sub>) are measured by the Environnement S.A. AC32M analyzer. The AC32M analyzer uses gas-phase chemiluminescence's detection to perform continuous analysis of nitric oxide (NO), Total Oxides of Nitrogen (NO<sub>x</sub>), Nitrogen Dioxide (NO<sub>2</sub>) and Ammonia (NH<sub>3</sub>) with an additional NH<sub>3</sub> Converter (CNH3-S2). The principle of ESA AF22M Analyzer for the measurement of Sulphur Dioxide in ambient air is the UV fluorescent spectroscopy method. The Analyser is based on the principle that fluorescent radiation produced by SO<sub>2</sub> molecules when excited by UV radiation between 210 and 240 nm, the subsequent fluorescent emission is a linear process that is proportional to the SO<sub>2</sub> concentration.

Ozone ambient air measurements use the proven UV (ultraviolet) absorption technique. The model O342M Ozone Analyzer determines ozone concentrations by measuring the amount of ultraviolet light that the ozone absorbs. The ultraviolet light is detected by a photodiode that responds to ultraviolet energy.

The Volatile Organic Carbon like Benzene is measured by Environnement S.A. VOC71M analyser. The instrument is a gas chromatograph with a built-in pre-concentration system.

**Table 2: Measurement Principle**

S. No	Parameter	Description	Principle	Make
1	PM <sub>10</sub>	Respirable Suspended Particulate Matter (RSPM) <10µm particle size	Beta Ray Attenuation	Environnement S.A.
2	PM <sub>2.5</sub>	Respirable Suspended Particulate Matter (RSPM) <2.5µm particle size		
3	CO	Carbon Monoxide	Non Dispersive Infra Red	
4	SO <sub>2</sub>	Sulphur Dioxide	Pulsed Fluorescence	
5	NO	Nitric Oxide	Gas Phase Chemiluminescence	
6	NO <sub>2</sub>	Nitrogen Dioxide		
7	NO <sub>x</sub>	Oxides of Nitrogen		
8	NH <sub>3</sub>	Ammonia Converter		
9	O <sub>3</sub>	Ozone	UV Photometry	
10	VOCs	Volatile Organic Compounds	Gas Chromatography	
11	AT	Ambient Temperature	Thermistor	L.S.A.
12	RH	Relative Humidity	Capacitor	
13	BP	Barometric Pressure	Pressure Transducer	
14	RG	Rain Gauge	Tipping Bucket	
15	SR	Solar Radiation	Photo Cell	
16	WS	Horizontal Wind Speed	Anemometer	
17	WD	Wind Direction	Potentiometer	

**4. NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)**

The ambient air quality objectives/standards are very important in framing Environment Policy. As per CPCB guidelines the air quality standards are summerised in Table 3: -

**Table 3: National Ambient Air Quality Standards**

Pollutants	Time-weighted average	Concentration in		Method of measurement
		Industrial, Residential, Rural & other Areas	Ecologically Sensitive Areas (Notified by Central Govt.)	
PM <sub>10</sub>	Annual Average	60 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	Beta Attenuation Gravimetric TOEM
	24hours	100 µg/m <sup>3</sup>	100µg/m <sup>3</sup>	
PM <sub>2.5</sub>	Annual Average	40 µg/m <sup>3</sup>	40µg/m <sup>3</sup>	Beta Attenuation Gravimetric TOEM
	24hours	60 µg/m <sup>3</sup>	60µg/m <sup>3</sup>	
Carbon Monoxide (CO)	8hours	2.0 mg/m <sup>3</sup>	2.0 mg/m <sup>3</sup>	Non Dispersive Infra Red (NDIR) Spectroscopy
	1 hour	4.0 mg/m <sup>3</sup>	4.0 mg/m <sup>3</sup>	
Sulphur Dioxide (SO <sub>2</sub> )	Annual Average	50 µg/m <sup>3</sup>	20 µg/m <sup>3</sup>	Ultraviolet Fluorescence
	24hours	80 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Average	40 µg/m <sup>3</sup>	30 µg/m <sup>3</sup>	Jacob & Hochheiser Modified (Na-Arsenite) Method - Gas Phase Chemiluminescence
	24hours	80 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	
Ammonia (NH <sub>3</sub> )	Annual Average	100 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	Jacob & Hochheiser Modified (Na-Arsenite) Method Gas Phase
	24hours	400 µg/m <sup>3</sup>	400 µg/m <sup>3</sup>	
Ozone (O <sub>3</sub> )	8 hour Average	100 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	UV Photometric Chemiluminescence Chemical Method
	1hours	180 µg/m <sup>3</sup>	180 µg/m <sup>3</sup>	
Benzene (C <sub>6</sub> H <sub>6</sub> )	Annual Average	05 µg/m <sup>3</sup>	05 µg/m <sup>3</sup>	Gas Chromatography based continuous analyzer
	24hours	-	-	

Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

**5. RESULT AND DISCUSSION**

**5.1 DATA ANALYSIS OF PARTICULATE MATTER (PM<sub>10</sub> and PM<sub>2.5</sub>)**

Monthly average concentrations of particulate matter viz. PM<sub>10</sub> and PM<sub>2.5</sub> of 10 CAAQMS have been summarized in Table 4 and presented in Graph 1 for a period from April to June 2018.

**Table 4: Concentration of Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)**

Pollutant	PM <sub>10</sub>			PM <sub>2.5</sub>		
	April 2018	May 2018	June 2018	April 2018	May 2018	June 2018
Jaipur- Police Commissioner Office	143.41	153.58	149.33	65.37	79.45	64.65
Jaipur- Psychiatric Centre	155.60	179.99	174.23	49.34	57.50	62.21
Jaipur- Regional Science Centre	156.17	176.34	174.68	54.14	57.41	62.91
Ajmer	105.15	101.20	127.75	46.33	51.46	50.57
Alwar	77.25	92.01	93.69	40.51	48.67	46.52
Bhiwadi	356.40	366.93	318.07	159.88	145.26	108.11
Jodhpur	282.09	313.10	266.43	129.55	146.71	122.20
Kota	162.14	195.86	146.01	62.45	78.81	60.44
Pali	193.63	219.85	148.02	105.82	120.04	84.87
Udaipur	161.06	166.40	104.44	60.24	65.94	49.78

Higher value of PM<sub>10</sub> were captured at CAAQMS Bhiwadi in May (366.93 µg/m<sup>3</sup>) and June (318.07 µg/m<sup>3</sup>). At CAAQMS Jodhpur PM<sub>10</sub> was captured to be 313 µg/m<sup>3</sup> in the month of May which is higher value of month April and June. Rest of cities shows lower concentration of PM<sub>10</sub> in contrast to Bhiwadi.



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In the month of April, PM<sub>2.5</sub> value as reported at CAAQMS Bhiwadi was highest (159.88 µg/m<sup>3</sup>) followed by Jodhpur (146.71µg/m<sup>3</sup>) for the month of May.

Monthly average of particulate matter at CAAQMS Bhiwadi and Jodhpur were found higher than rest of the CAAQMS when compared to National Ambient Air Quality Standards for 24 Hrs (100 µg/m<sup>3</sup>) and Annual average (60 µg/m<sup>3</sup>), which is due to industrial impact and heavy vehicular movement since CAAQMS at Bhiwadi is located at RIICO Industrial area and CAAQMS at Jodhpur is located near to heavy traffic congested area

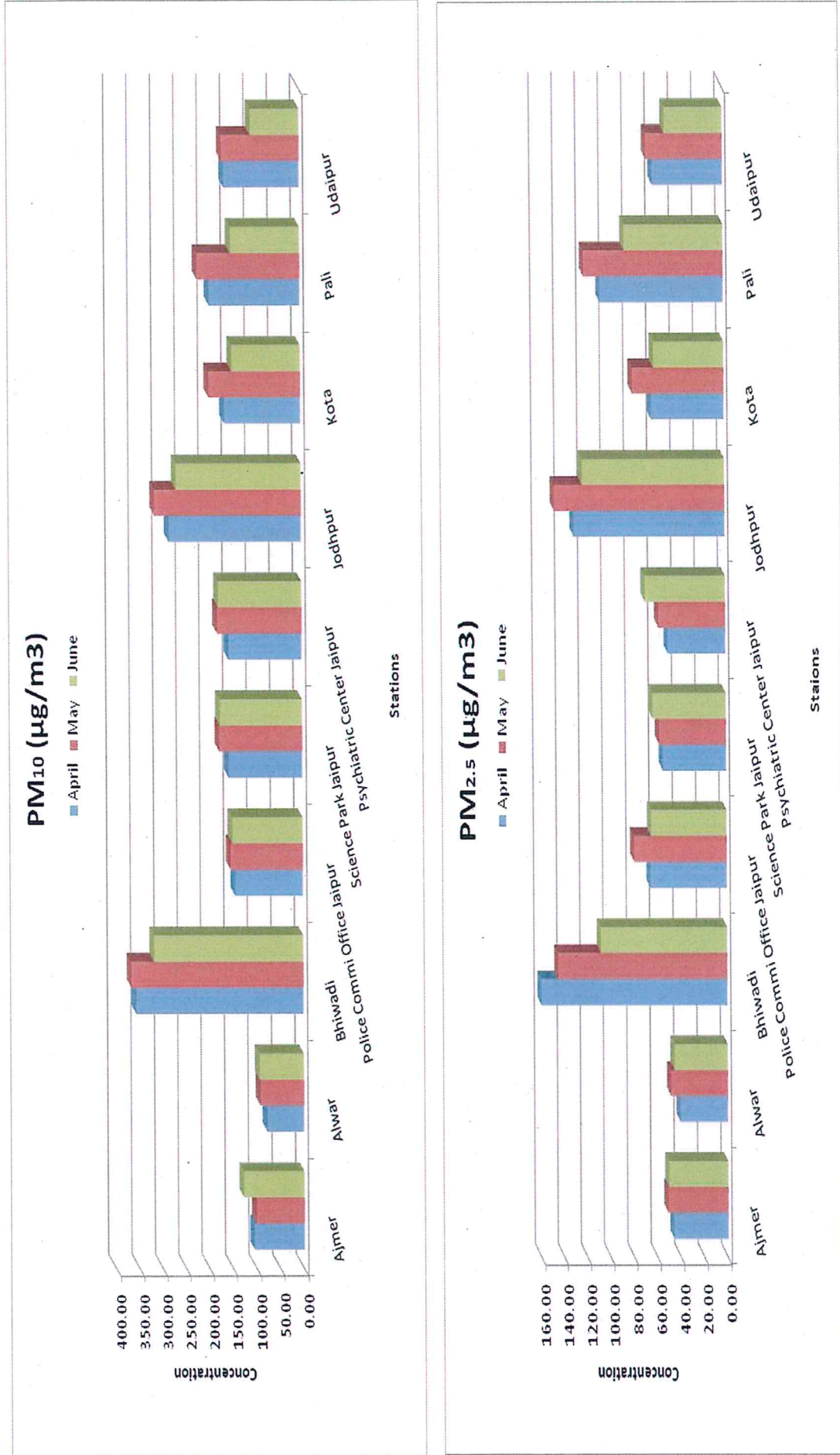
The high values of PM<sub>10</sub> and PM<sub>2.5</sub> are observed at most of the CAAQMS located in different part of India during April to June 2018.

As per CPCB published report high value of Particulate matter has been captured in all the CAAQMS located at Delhi. Monthly average value of PM<sub>10</sub> at CAAQMS located at ITO, DTU and Siri Fort, Delhi were found 210-179-270 µg/m<sup>3</sup>, 298-265-289 µg/m<sup>3</sup> and 324-277-260 µg/m<sup>3</sup> respectively from April to June, 2018 whereas PM<sub>2.5</sub> was found 86-92-150 µg/m<sup>3</sup>, 89-90-72 µg/m<sup>3</sup> and 76-75-64 µg/m<sup>3</sup> for the same locations respectively.



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Graph 1: Monthly concentration of PM<sub>10</sub>/PM<sub>2.5</sub>



**5.2 DATA ANALYSIS OF GASEOUS POLLUTANTS (CO, SO<sub>2</sub>, NO<sub>2</sub>, NH<sub>3</sub>)**

Monthly average concentrations of gaseous pollutants namely CO and SO<sub>2</sub> have been summarized in Table 5 and presented in Graph 3 for a period of three month i.e. April to June 2018.

**Table 5: Concentration of Gaseous Pollutants (CO, SO<sub>2</sub>)**

Pollutant	CO			SO <sub>2</sub>		
	April 2018	May 2018	June 2018	April 2018	May 2018	June 2018
Jaipur- Police Commissioner Office	1.17	1.20	0.81	13.17	10.52	10.19
Jaipur- Psychiatric Centre	0.69	0.85	0.68	8.29	9.45	6.56
Jaipur- Regional Science Centre	0.62	0.54	0.55	5.39	10.95	12.77
Ajmer	0.68	0.56	0.53	8.39	8.31	5.72
Alwar	0.93	0.80	0.72	11.23	11.13	11.60
Bhiwadi	0.63	0.63	0.52	66.94	50.63	26.29
Jodhpur	0.86	0.93	0.91	7.01	7.05	6.44
Kota	0.72	0.64	0.63	11.50	10.90	4.32
Pali	0.43	0.48	0.40	16.49	16.67	11.28
Udaipur	1.15	1.15	0.93	10.73	12.53	14.17

Monthly average of CO at all the CAAQMS was observed less for hourly (4 µg/m<sup>3</sup>) and eight hourly (2 µg/m<sup>3</sup>) National Ambient Air Quality Standard while SO<sub>2</sub> values were also found to be within limit of 24 hourly (80 µg/m<sup>3</sup>) and Annually (50 µg/m<sup>3</sup>) at all the CAAQMS except CAAQMS Bhiwadi for the month of April and May, whereas the captured value of SO<sub>2</sub> was observed higher than annual standard but lower than 24 hourly standards due to impact of industries and heavy vehicles.

**Table 6: Concentration of Gaseous Pollutants (NO<sub>2</sub>, NH<sub>3</sub>)**

Pollutant	NO <sub>2</sub>			NH <sub>3</sub>		
	April 2018	May 2018	June 2018	April 2018	May 2018	June 2018
Jaipur- Police Commissioner Office	43.40	39.63	22.47	25.77	16.35	11.86
Jaipur- Psychiatric Centre	29.48	28.92	19.45	16.75	13.84	15.71
Jaipur- Regional Science Centre	39.14	29.03	18.13	30.87	24.3	28.00
Ajmer	31.02	21.04	17.16	27.92	22.22	21.64
Alwar	27.52	29.51	18.63	17.10	44.37	32.02
Bhiwadi	84.59	71.70	26.72	12.08	15.90	12.72
Jodhpur	32.01	21.89	23.20	24.39	23.25	18.15
Kota	9.47	8.95	10.32	6.86	3.56	10.44
Pali	8.82	14.66	16.79	36.84	23.25	19.78
Udaipur	25.89	25.10	27.29	23.13	14.48	21.88

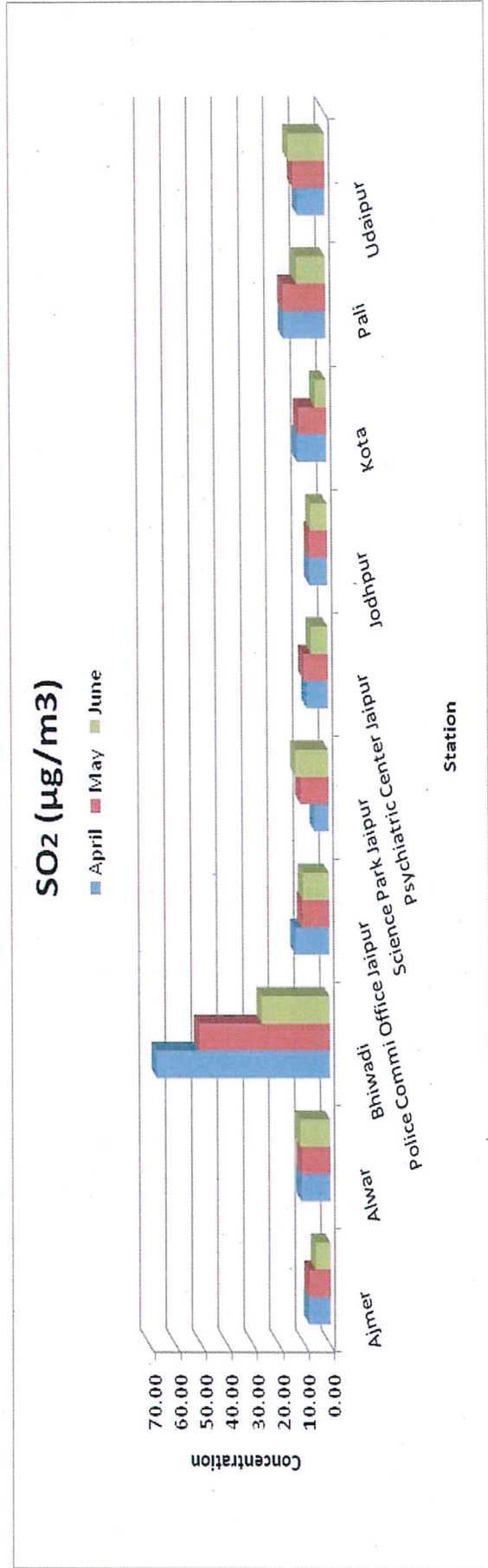
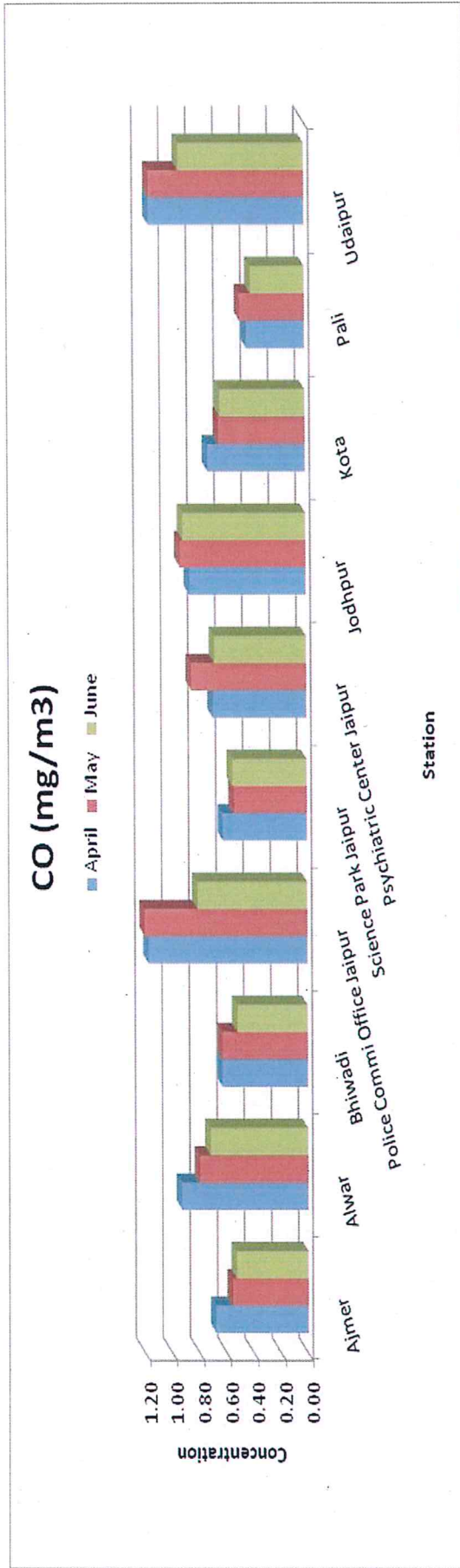
Monthly average concentrations of gaseous pollutants namely NO<sub>2</sub> and NH<sub>3</sub> have been summarized in Table 6 and presented in Graph 3 for a period from April to June 2018.

High value of NO<sub>2</sub> is captured in April and May at CAAQMS Bhiwadi whereas in month of June, observed values of NO<sub>2</sub> were lower rather than the Annual standard for CAAQMS Bhiwadi. In the month of April slightly higher value of NO<sub>2</sub> was captured at CAAQMS, Police Commissioner Office, Jaipur.

At all CAAQMS values of NH<sub>3</sub> was observed lower than the limit as prescribed for National Ambient Air Quality Standard.

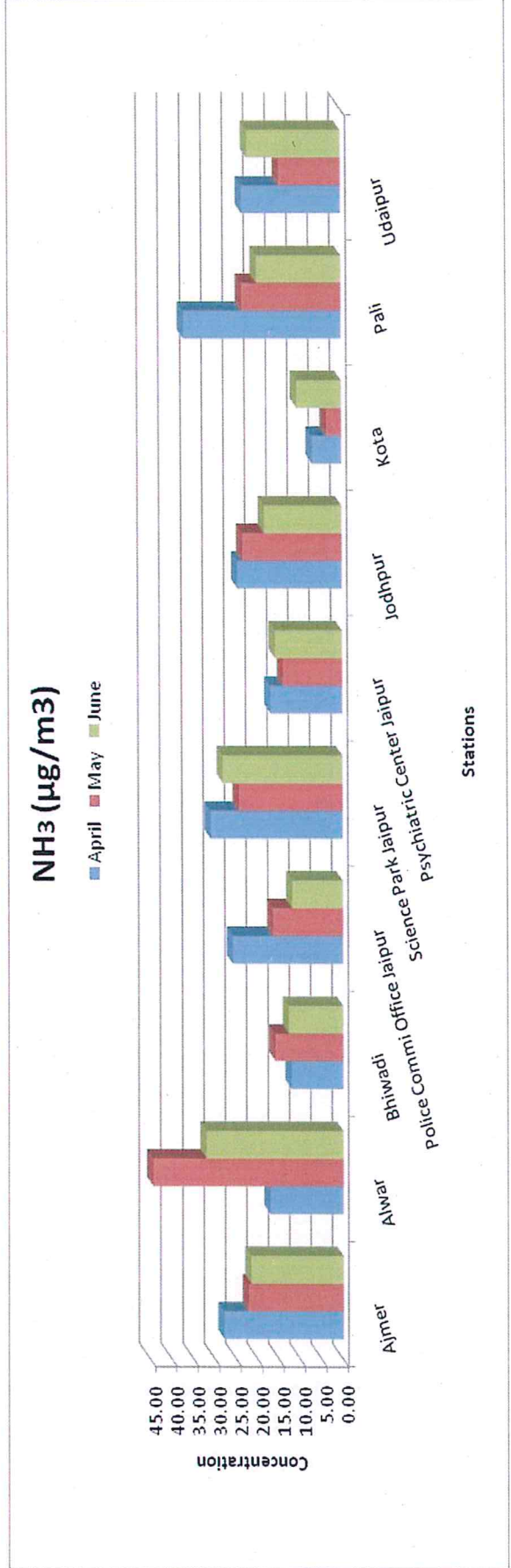
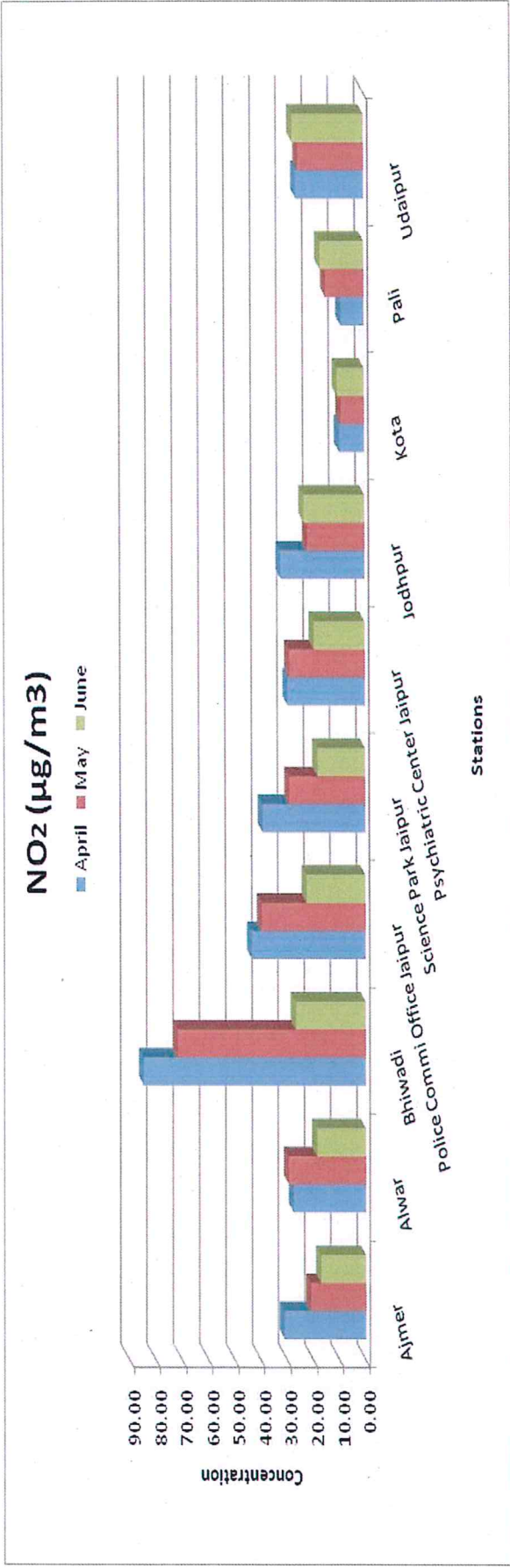


**Graph 3: Monthly concentration of CO, SO<sub>2</sub>, NO<sub>2</sub>, NH<sub>3</sub>**





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## 6. WIND ROSE

A wind rose depicts the frequency of incidence of winds in each of the particular wind direction sectors and wind speed modules for a predetermined site and time period. The most regular structure comprises of a circle from which eight or sixteen lines come out, one for each direction. The length of each line is similar to the occurrence of wind from that direction and the occurrence of calm conditions is entered in the centre. Wind roses may be depicted in several ways. Some point out the range of wind speeds from each direction, and some indicate wind direction with other meteorological conditions.

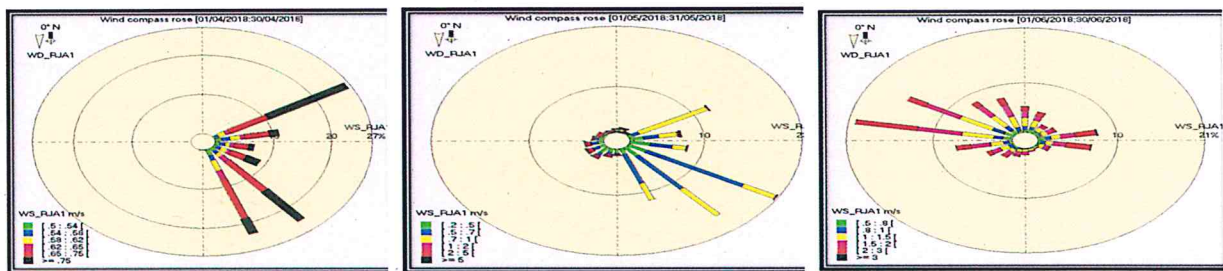
There are a lot of variations in the construction of wind roses. Some point out the range of wind speeds from each direction, and some indicate wind direction with other meteorological conditions.

Wind rose may be constructed from the data obtained over a given time period such as a particular month or season or a year. In constructing or interpreting wind roses, it is necessary to keep in mind the meteorological convention that wind direction refers to the direction from which the wind is blowing. A line or bar extending to the north on the wind rose indicates the frequency of winds blowing from the north. The wind rose diagram is prepared using an appropriate scale to represent percentage frequencies of wind directions and appropriate index shades; lines etc., to represent various wind speeds.

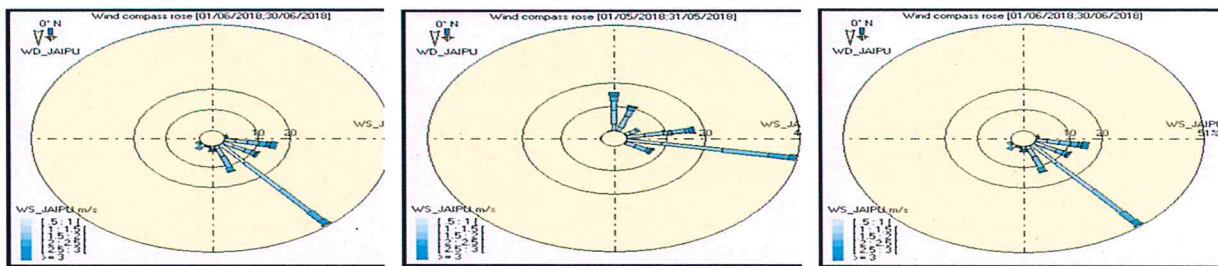
A wind rose gives a very concise but information-laden view of how wind speed and direction are usually spread at particular site. Obtainable in a circular design, the wind rose shows the occurrence of winds blowing from specific directions. The extent of each "spoke" around the circle is associated to the occurrence of period that the wind blows from a particular direction. Every concentric circle represents a dissimilar frequency, emanating from zero at the centre to growing frequencies at the external circles. Each spike in a wind rose

is broken into separate frequency category which provides additional information regarding percentage of time in which wind blows in a definite direction and at definite speed ranges. All wind roses evolved, use 16 basic directions, such as north (N), (NNE), (NE), etc Wind Rose of Police Commissioner Office, Regional Science Centre and Psychiatric Centre are summarized in Graph 5, 6, and 7.

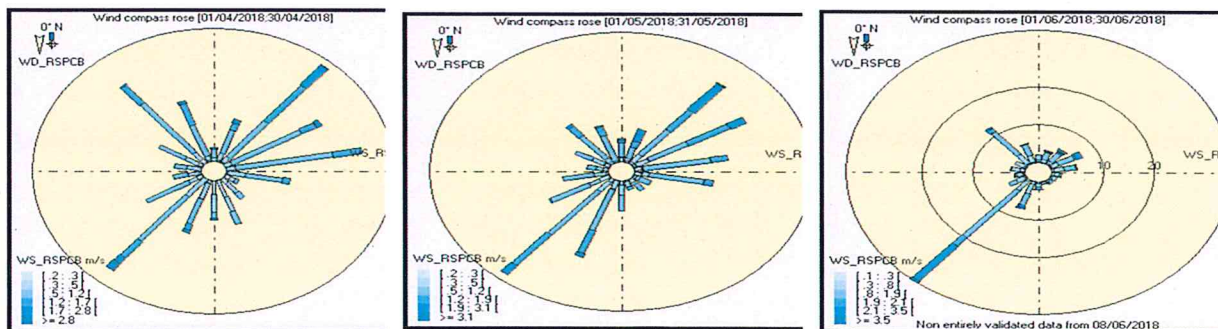
**Graph 4: Wind Rose of Police Commissioner Office, Jaipur**



**Graph 5: Wind Rose of Regional Science Centre, Jaipur**



**Graph 6: Wind Rose of Psychiatric Centre, Jaipur**



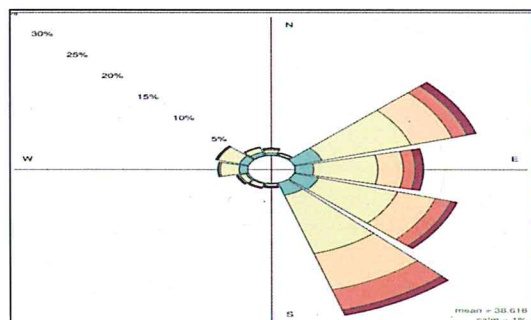
## 7. POLLUTION ROSE

Pollution rose is a circular histogram plot which displays directional data with reference to concentration of pollutant and frequency of each class. The pollution rose is basically another means of illustrating the frequency distribution of wind direction temporally correlated with a selected pollutant.

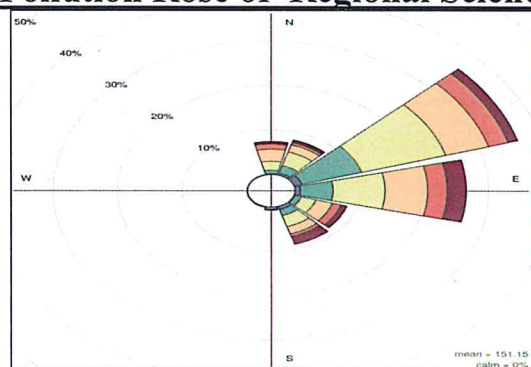
Pollution rose graphics were produced for Particular Matter for Continuous Ambient Monitoring Sites. Each rose provides a visual indication of the predominant wind direction and associated concentration in which the wind was blowing.

In the pollution rose diagram, location of the plotted symbol in relation to the centre of the diagram indicates the direction from which the wind was predominantly travelling which is correlated with the concentration of pollutant. Symbol's distance from the centre of the plot represents the resultant value of pollutant .

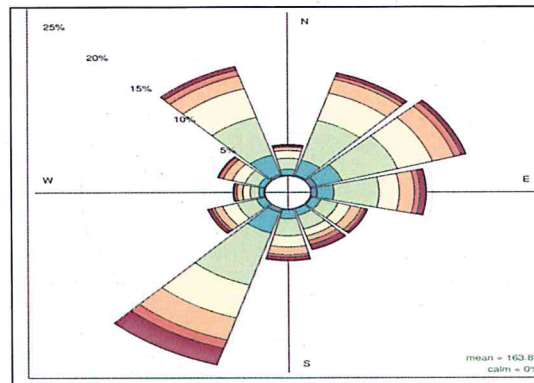
**Graph 7: Pollution Rose of Police Commissioner Office, Jaipur**



**Graph 8: Pollution Rose of Regional Science Centre, Jaipur**



**Graph 9: Pollution Rose of Psychiatric Centre, Jaipur**



Symbols located close to the centre of the diagram indicate a slower resultant wind speed (and perhaps stagnation); symbols located further away from the centre indicate higher wind speeds, more probability of pollutant transport over a longer distance.

The colour of the symbols reflect the average concentration of Particulate Matter. Some colour symbols in reference to concentration are summarized as below:-

- Dark Green symbols indicate a 24-hour average concentration of 10-50  $\mu\text{g}/\text{m}^3$  or less;
- Light Green symbols indicate a 24-hour average concentration of 50-100  $\mu\text{g}/\text{m}^3$
- Yellow symbols indicate a 24-hour average concentration of 100-150  $\mu\text{g}/\text{m}^3$
- Orange symbols indicate 24-hour average concentrations between 150-200  $\mu\text{g}/\text{m}^3$ .
- Red symbols identify 24-hour average concentrations between 200-250  $\mu\text{g}/\text{m}^3$  and
- Brown symbols identify concentrations greater than 250  $\mu\text{g}/\text{m}^3$  (>250).

Pollution rose of Jaipur city on the basis captured data of 03 nos. CAAQMS are being displayed in Graph 7-9. The Yellow, Orange, Red and Brown symbol shows exceedance of the 24-hour  $\text{PM}_{10}$  NAAQS. This indicates impact of local source of environment pollution at all three CAAQMS like vehicles movement near and far to Pink Square Mall (Psychiatric Centre) , traffic congestions due

to road intersection at Regional Science Park and impact of DG sets installed close to Police Commissioner Office site and heavy traffic load.

## **8. CONCLUSION**

Monthly average from April, May and June 2018 reveals that both the particulate pollutants, PM<sub>10</sub> and PM<sub>2.5</sub> are mostly above permissible limits at all CAAQMS. Result of the study for Rajasthan is similar with research for other cities of India as the concentration of particulate matter is also high in other cities. High particulate concentration is due to heavy transport activity near to CAAQMS area, apart from industrial emissions, dust from paved roads. It can be summarised that major air pollution at the CAAQMS site is primarily because of traffic.

Traffic diversions, provision of alternate routes, restricting heavy vehicles movement through residential roads, arranging for periodic vehicle maintenance and encouraging public transport instead of private vehicles are worthy considerations to control air pollution due to transportation. In addition to above, public awareness for environment protection should be created and green plantation along highway and within industries should be encouraged.

## **Acknowledgement**

We would like to express our gratitude to Regional officers and Scientific Staff for their efforts in successful operation of CAAQMS under the jurisdiction.

We would also like to thank the team of M/s ESA India Pvt Ltd who are satisfactorily maintaining & operating CAAQMS at all sites.