

AIR QUALITY ASSESSMENT

National Air Quality Monitoring Programme (NAMP)

Central Pollution Control Board has been executing a nation-wide National Air Quality Monitoring Programme (NAMP) programme of ambient air quality monitoring. As on date the network consist of 329 operating stations covering 121 cities / towns in 25 States and 4 Union Territories of the country. Four pollutants viz., Sulphur Dioxide (SO₂), Oxides of Nitrogen as NO₂ and Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM/PM₁₀), have been identified for regular monitoring at all the locations. The monitoring of meteorological parameters such as wind speed and direction, relative humidity and temperature was also integrated with the monitoring of air quality. The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have 104 observations in a year. The monitoring is being carried out with the help of Central Pollution Control Board; State Pollution Control Boards; Pollution Control Committees; National Environmental Engineering Research Institute (NEERI), Nagpur. CPCB has regularly co-ordinated with these agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring station. N.A.M.P. is being operated through various monitoring agencies, large number of personnel and equipment are involved in the sampling, chemical analyses, data reporting etc. It increases the probability of variation and personnel biases reflecting in the data, hence the generated data be treated as indicative rather than absolute.

Air Quality Trends (Parameter specific)

Sulphur Dioxide (SO₂): Low levels of SO₂ were observed in all the seventeen cities. A decreasing trend was observed in residential areas of Delhi, Hyderabad, Kanpur, Lucknow, Mumbai and Pune. Decreasing trend may be due to various interventions that have taken place in recent years such as reduction of sulphur in diesel, use of cleaner fuel such as CNG in Delhi and Mumbai etc. Other measures include implementation of Bharat Stage-III emission norms for new vehicles and commensurate fuel quality. Also there has been a change in domestic fuel used from coal to LPG which may have contributed to reduction in ambient levels of SO₂. Trend in annual average concentration of SO₂ in residential areas of Delhi, Mumbai, Chennai and Kolkata is depicted below:

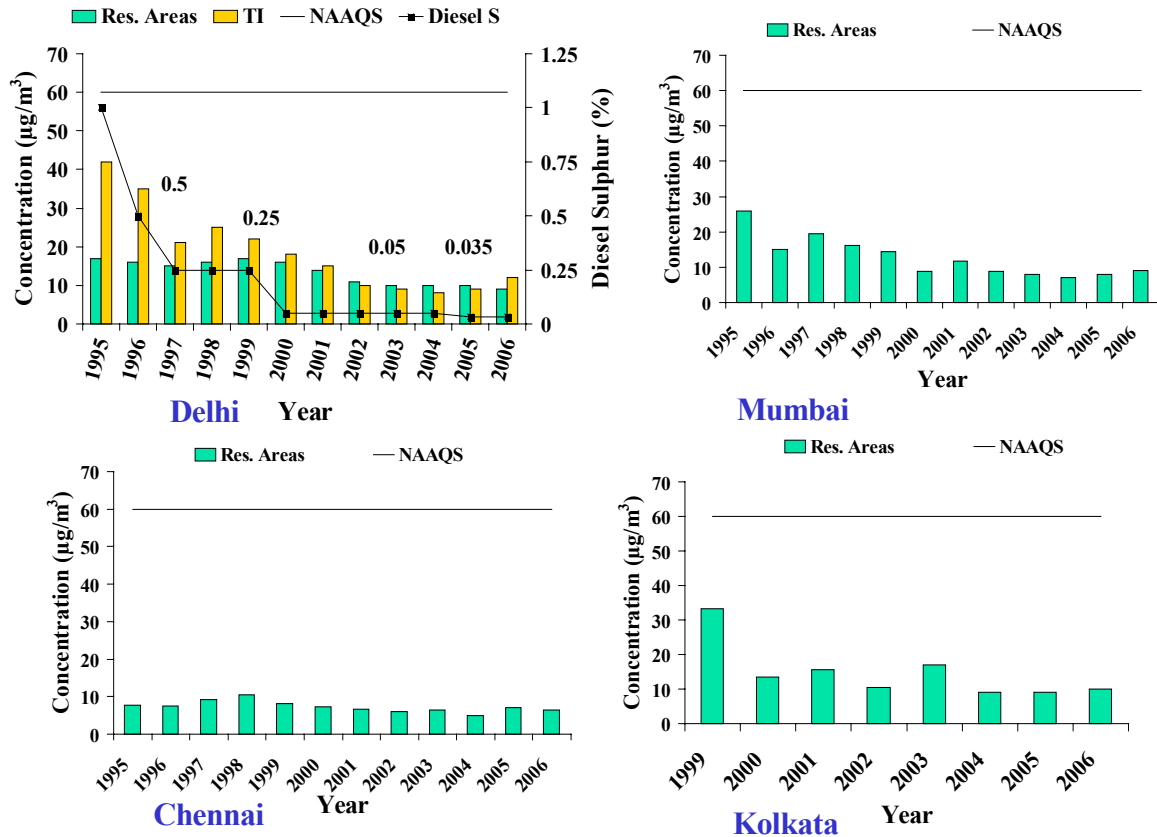


Figure 1: Trends in Annual Average Concentration of SO₂ in residential areas of Delhi, Mumbai, Chennai and Kolkata.

Nitrogen Dioxide (NO₂): NO₂ levels were within the prescribed NAAQS in the cities except Agra, which is categorized as a sensitive land use area, during most of the year. A decreasing trend has been observed in residential areas of Faridabad, Kolkata, Solapur and Pune. Fluctuating trends in NO₂ were observed in residential areas of Bangalore, Hyderabad etc. Vehicles are one of the major sources of NO₂ and their number is increasing exponentially. The reasons for low levels of NO₂ may be various measures taken such as banning of old vehicles, better traffic management etc. The reasons behind reduction in NO₂ may be introduction of improved vehicular technology in the form of Bharat Stage –III vehicles, banning of old vehicles in some cities, improved traffic management etc. Trend in annual average concentration of NO₂ in residential areas of Delhi, Mumbai, Chennai and Kolkata is depicted below:

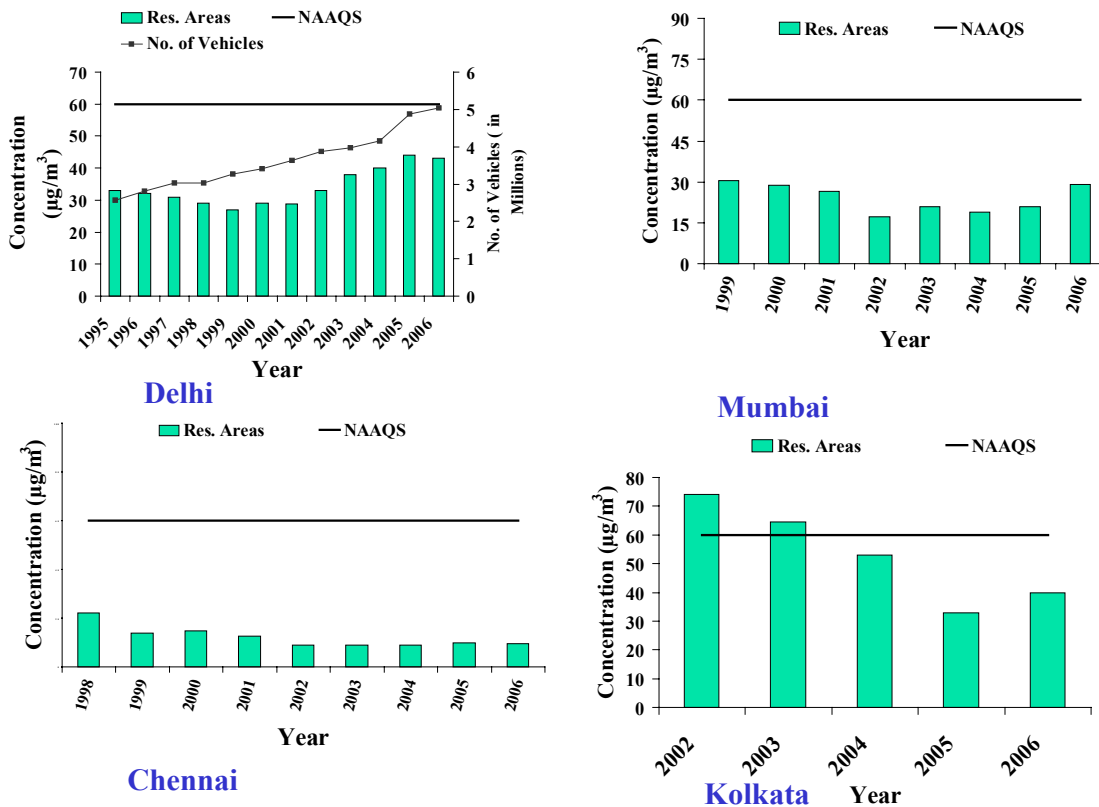


Figure 5: Trends in Annual Average Concentration of NO₂ in residential areas of Delhi, Mumbai, Chennai and Kolkata.

Respirable Suspended Particulate Matter (RSPM): RSPM levels exceed the prescribed NAAQS in most of the cities but a decreasing trend has been observed in residential areas of Ahmedabad, Solapur and Kanpur. The reason of decrease in RSPM levels may be implementation of stricter vehicle emission norms and commensurate fuel quality, use of cleaner fuels, banning of diesel driven vehicles in some cities etc. Fluctuating trends have been observed in residential areas of Chennai, Kolkata etc. Vehicles are one of the major sources of RSPM and their number is increasing exponentially. The reason for high particulate matter levels may be vehicles, engine gensets, small scale industries, biomass incineration, re-suspension of traffic dust, commercial and domestic use of fuels, etc. Trend in annual average concentration of RSPM in residential areas of Delhi, Mumbai, Chennai and Kolkata is depicted ahead:

Trends in Monthly Average Concentration

RSPM levels are observed lower in monsoon months because of precipitation, high wind velocities and changes in general wind direction. Levels of all the air pollutants are observed to be higher in winter months. During the winter months, average mixing height is lower as compared to other seasons and atmospheric

dispersion is typically at a minimum and therefore the pollutants will not be as widely dispersed resulting in higher concentrations.

Trends in Seasonal Air Pollutant Concentration

The concentrations are higher in winter season and lower during monsoon months. A plausible explanation for these results may be found by examining meteorological conditions. During the winter season, average mixing height is lower as compared to other seasons and atmospheric dispersion is typically at a minimum and therefore the pollutants will not be widely dispersed. Lower average mixing height in winter season results in less volume of troposphere available for mixing and hence higher concentrations. Calm conditions in winter season result in less dispersion of pollutants thus building up their levels. The monsoons results in large amount of precipitation, high wind velocities and changes in general wind direction. The large amounts of precipitation reduce atmospheric pollution through wet deposition processes. Further, the wind velocities will allow pollutant transport away from sources and increase mixing processes, thereby resulting in lower levels

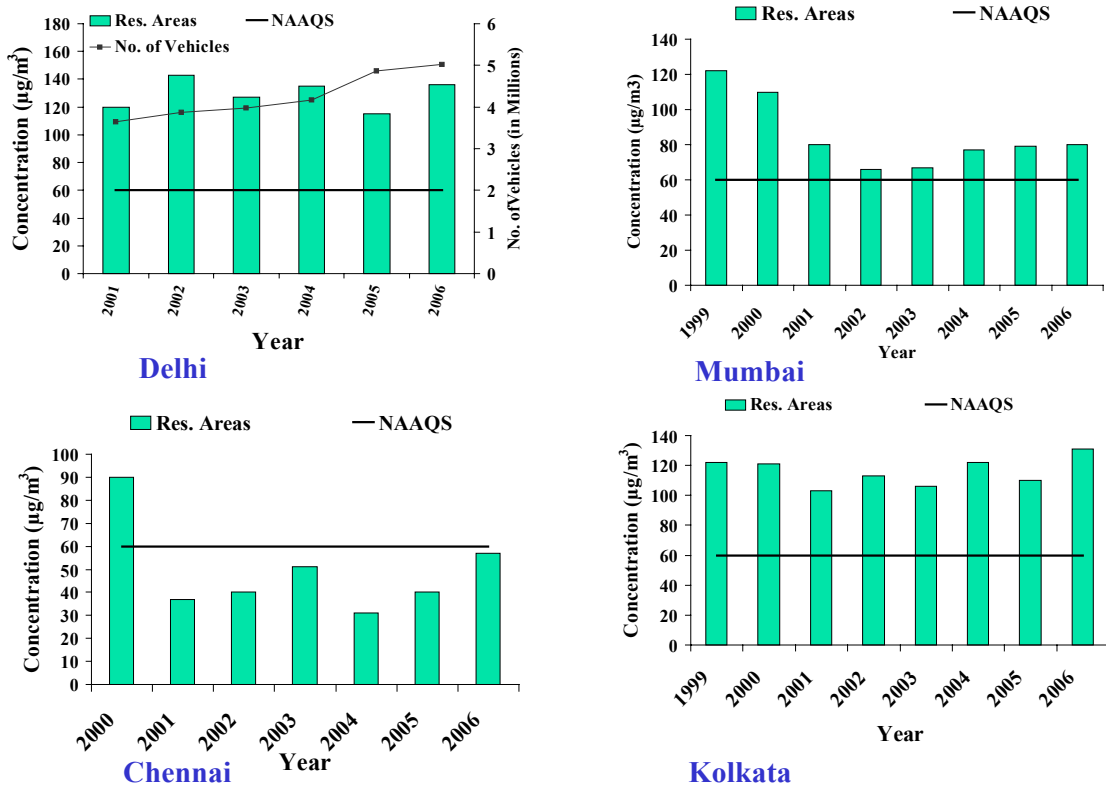


Figure 9: Trends in Annual Average Concentration of RSPM in residential areas of Delhi, Mumbai, Chennai and Kolkata.

Cities with Low, Moderate, High and Critical Levels

Trend in percentage of cities (Res. Areas) with low, moderate, high and critical

levels of SO₂, NO₂, RSPM and SPM is depicted in Figure 19. Percentage of cities with low levels of SO₂ have been reduced over the years thus indicating that SO₂ pollution have decreases over the years.

National Mean Concentration

National mean concentration with 90th percentile and 10th percentile for SO₂, NO₂, RSPM and SPM is depicted in Figure 20. National mean SO₂ concentration has decreased over the years indicating that there has been a decline in SO₂ levels. National mean NO₂ and RSPM concentration has remained stable over the years despite increase in vehicular pollution sources. The reason for this may be various intervention measures that have taken place such as improvement in vehicle technology and other vehicular pollution control measures like alternate fuel etc. National mean SPM concentration has been fluctuating over the years.

Calibration & Evaluation of Ambient Air Quality Monitoring Stations in India

Central Pollution Control Board is coordinating air quality monitoring at 329 stations in 25 States and 4 Union Territories under its Air Quality Monitoring Programme (NAMP). The air pollutants viz., Sulphur Dioxide (SO₂), Oxides of Nitrogen as NO₂ and Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM/PM₁₀) are regularly monitored at these stations. The meteorological parameters such as wind speed and direction, relative humidity and temperature was also integrated with the monitoring of air quality. The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have 104 observations in a year.

CPCB has initiated a programme to calibrate the equipment / instruments for quality assurance of data received and evaluate the Ambient Air Quality Monitoring stations operated under the National Ambient Air Quality Monitoring Programme. The consulting agency have visited all the operating air quality monitoring stations under NAMP. The work includes the following:

- Visit of Cities and Evaluation of Monitoring Stations and Laboratories as per AQSES
- Calibration of HVS/ RDS including servicing and repairs
- Calibration of Manometer using Top Loading Calibrator
- Calibration of Rotameter using Standard Soap Bubble Meter
- Calibration of Balances using standard weights of 10 mg, 100 mg, 1 g and 10 g

State wise Evaluation / Recommendations based on Calibration of of Air Quality Monitoring Equipment

New Delhi

Calibration and Evaluation of AAQ Monitoring stations were carried out in Delhi at three locations viz. Ashok Vihar, Shahazadabagh and Janakpuri. All the three locations has sufficient instruments, analytical facilities, manpower, etc for carrying out monitoring and analysis. During our visit the concerned station incharges have cooperated in completing our work. All the three sites are available for long period, accessible any time through out the year including rainy season, protected from extreme of temperature specially in summer season, alternate power arrangement is available in absence of electricity. Having facilities to rectify problems in the monitoring instruments. The calibration facility for equipments is present at Air Laboratory, CPCB. None of the three stations has meteorological instruments.

Karnataka

Calibration and Evaluation of AAQ Monitoring stations were carried out in Karnataka at seven locations. Five locations were present in Bangalore city and two in Mysore City. All the seven locations has sufficient instruments, manpower, etc for carrying out monitoring. All the seven sites are available for long period, accessible any time through out the year including rainy season, alternate power arrangement is available in absence of electricity. None of five stations in Bangalore is having facilities for carrying out onsite analysis. All the stations are using the Central Environmental Laboratory facilities present in the KSPCB, Similarly K.R.Circle monitoring stations of Mysore is using the Regional Laboratory facility. In case of gaseous sampling NAMP stations in Karnataka are maintaining 0.5 LPM, where as other two states (Delhi, Kerala) are maintaining 1.0 LPM. Following recommendations are suggested:

- Onsite analysis facilities should be provided at all the stations in Bangalore and K.R.Circle, Mysore
- The instruments should be protected against extreme weather conditions
- Meteorological instruments have to be provided for analysis of data
- Training on monitoring has to be provided for Mysore NAMP stations field assistants

Kerala

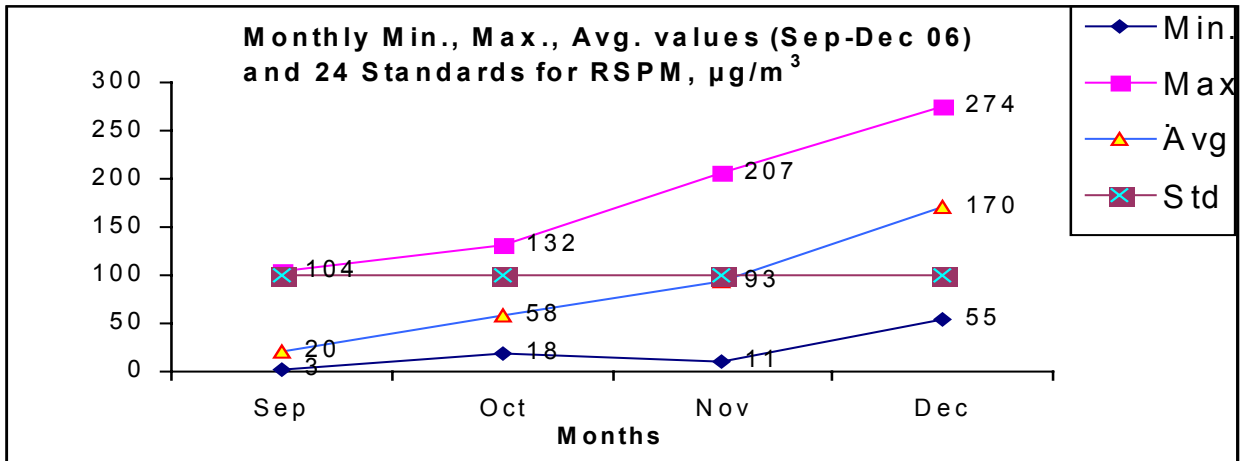
Calibration and Evaluation of Ambient Air Quality Monitoring stations were carried out in Kerala at Five locations. Four locations at Thiruvanthapuram city and one in Palakkad. All the five locations have sufficient instruments for carrying out monitoring. All the five sites are available for long period, accessible any time

through out the year including rainy season, alternate power arrangement is available in absence of electricity. District office sashthamangalam is having Top loading Orifice kit (Envirotech), which can be used by NAMP stations of Kerala for internal calibration. Except Sashthamangalam, rest four stations in Kerala are not having facilities for carrying out onsite analysis. All the stations are using the District Office Laboratory facilities. Following recommendations are suggested:

- Onsite analysis facilities should be provided at four stations in Kerala
- The instruments should be protected against extreme weather con
- Meteorological instruments has to be provided for analysis of data
- Additional manpower is required for monitoring
- Training to be provided in monitoring and analysis
- Correction factor to be considered in calculation of NOx value
- Sufficient glassware is the be provided in the district laboratories

Ambient Air Quality Monitoring at Port Canning, West Bengal bordering Bangladesh

Ambient Air Quality Monitoring Station at Port Canning is being carried out to study trans boundary movement of pollutants in West Bengal Bordering Bangladesh under “Male Declaration”. This study assesses the Air quality parameters like RSPM, NO2, and SO2. The air quality status based on monitoring from September 06 to December 06 is presented ahead:

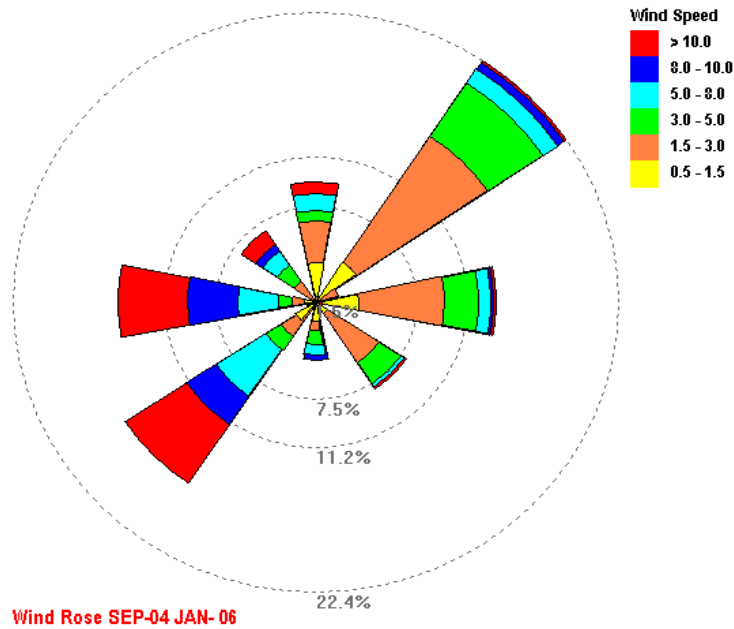


Frequency of Violation of RSPM Standards

Months	No. of	No. of violation of	% Violation of
--------	--------	---------------------	----------------

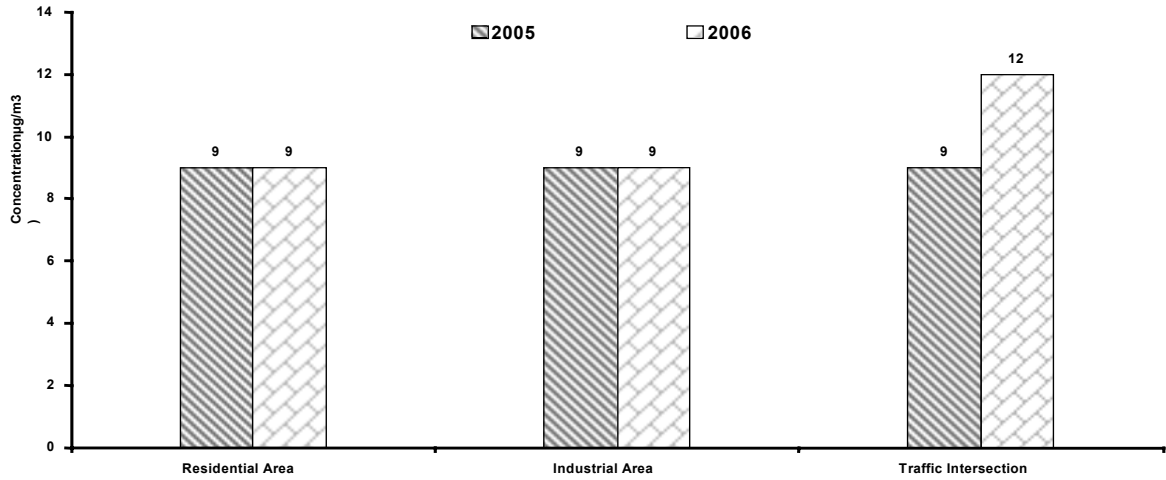
	Observations	standards	standards
Sep (2006)	9	1	11.1
Oct (2006)	12	2	16.7
Nov (2006)	13	9	69.2
Dec (2006)	11	10	90.9

Wind Rose Diagramme based on metreological datda

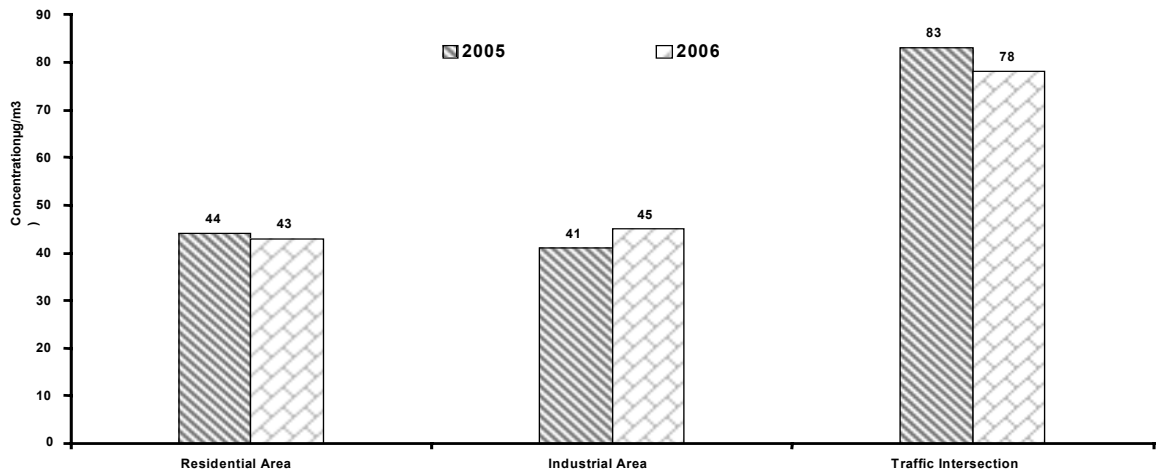


Ambient Air Quality in Delhi

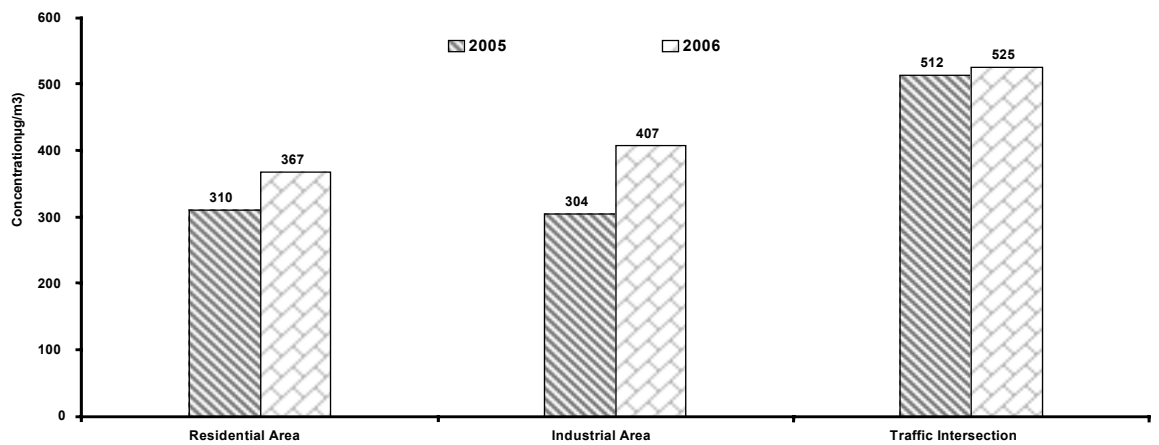
The Central Pollution Control Board has been monitoring ambient air quality at seven locations in Delhi for the past several years. The locations have been categorized based on land use, i.e., residential, industrial and traffic intersection. The of ambient air quality data observed during year 2006 has been compared with data of previous year and presented below.



SULPHUR DIOXIDE CONCENTRATION IN AMBIENT AIR OF DELHI DURING YEAR 2005 AND 2006



NITROGEN DIOXIDE CONCENTRATION IN AMBIENT AIR OF DELHI DURING YEAR 2005 AND 2006



SPM CONCENTRATION IN AMBIENT AIR OF DELHI DURING YEAR 2005 AND 2006

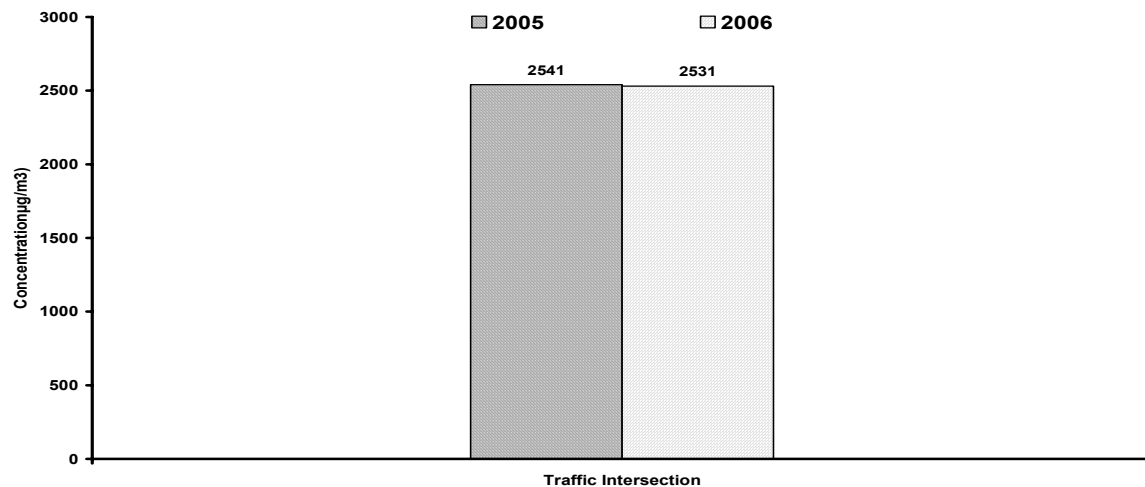
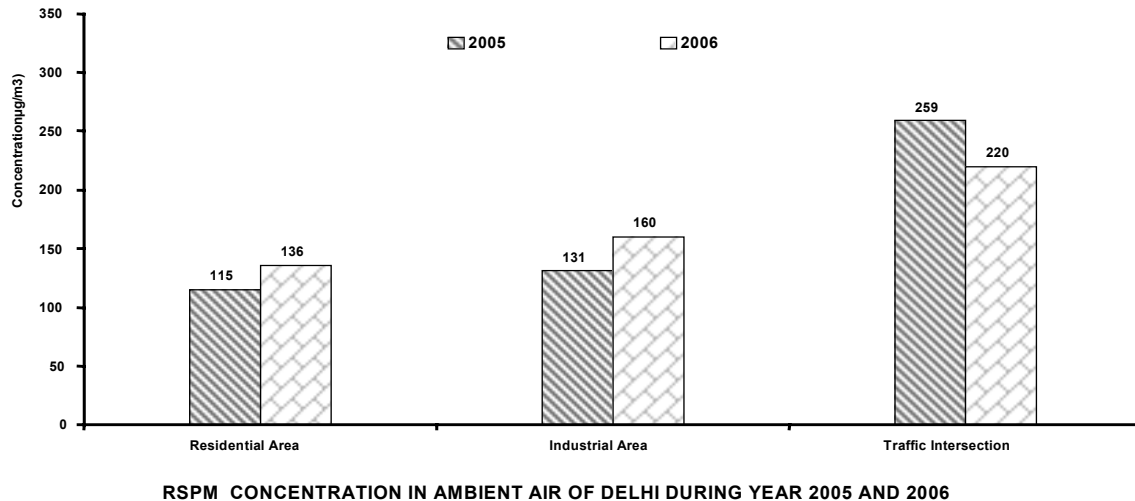


Fig. 5 CARBON MONOXIDE CONCENTRATION IN AMBIENT AIR OF DELHI (2005-2006)

Continuous Ambient Air Quality Monitoring in Delhi

Central Pollution Control Board (CPCB) is undertaking continuous ambient air quality monitoring at three locations in Delhi in addition to manual air quality monitoring. The automatic ambient air quality monitoring stations have been installed at Delhi College of Engineering (DCE) campus, Siri Fort and Bahadur Shah Zafar (BSZ) Marg in Delhi. The data of these stations is uploaded on CPCB website at the interval of 15 minutes automatically through telephonic modem.

Monthly Average NO, NO₂, NO_x, SO₂, CO, O₃ and RSPM at ITO, Siri Fort and DCE (2006)

Parameter	Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg
NO ($\mu\text{g}/\text{m}^3$)	BSZ Marg	62	60	37	62	38	40	-	52	65	176	241	223	96
	SIRIFORT	-	22	11	9	4	39	-	3	16	57	87	65	31
	DCE	14	23	6	6	2	2	-	2	1	5	13	11	8
NO ₂ ($\mu\text{g}/\text{m}^3$)	BSZ Marg	218	204	139	147	132	107	-	31	66	122	183	169	138
	SIRIFORT	-	33	25	35	16	70	-	13	37	47	76	148	50
	DCE	78	102	37	39	27	26	-	8	11	13	48	69	42
NO _x (ppb)	BSZ Marg	166	157	102	129	101	89	-	51	76	206	292	269	149
	SIRIFORT	-	36	22	25	12	60	-	10	33	71	111	132	51
	DCE	53	73	25	26	16	16	-	6	7	10	35	46	28
SO ₂ ($\mu\text{g}/\text{m}^3$)	BSZ Marg	22	24	27	41	28	-	-	4	18	37	32	43	27
	SIRIFORT	-	6	6	7	5	17	-	4	6	15	10	12	9
	DCE	31	41	14	34	17	20	-	-	6	10	8	6	19

Parameter	Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Avg
CO ($\mu\text{g}/\text{m}^3$)	BSZ Marg	3090	-	1430	1490	2880	1850	-	1925	2201	3032	3776	3191	2487
	SIRIFORT	-	-	-	-	-	-	-	610	878	1628	2383	1654	1431
	DCE	1880	2000	1490	1450	2210	2940	-	1329	1377	1650	1949	1554	1803
O ₃ ($\mu\text{g}/\text{m}^3$)	BSZ Marg	16	15	20	24	21	33	-	39	27	26	19	14	23
	SIRIFORT	-	28	32	48	49	138	-	30	46	39	35	31	48
	DCE	287	271	223	288	168	51	-	34	37	40	33	23	132
PM _{2.5} ($\mu\text{g}/\text{m}^3$)	BSZ Marg	191	150	92	85	72	64	-	40	71	171	215	203	123
PM ₁₀ ($\mu\text{g}/\text{m}^3$)	DCE	-	-	-	343	212	258	-	-	-	268	301	-	276

The data reflects following observations:

- During the year 2006, the annual average concentration of Sulphur Dioxide (SO₂) at DCE (19 $\mu\text{g}/\text{m}^3$), Sirifort (09 $\mu\text{g}/\text{m}^3$) and B.S.Z. Marg (27 $\mu\text{g}/\text{m}^3$) was lower than the permissible limit of 60 $\mu\text{g}/\text{m}^3$.
- During the year 2006, the annual average concentration of Nitrogen Dioxide (NO₂) at DCE (42 $\mu\text{g}/\text{m}^3$) and Sirifort (50 $\mu\text{g}/\text{m}^3$) was also lower

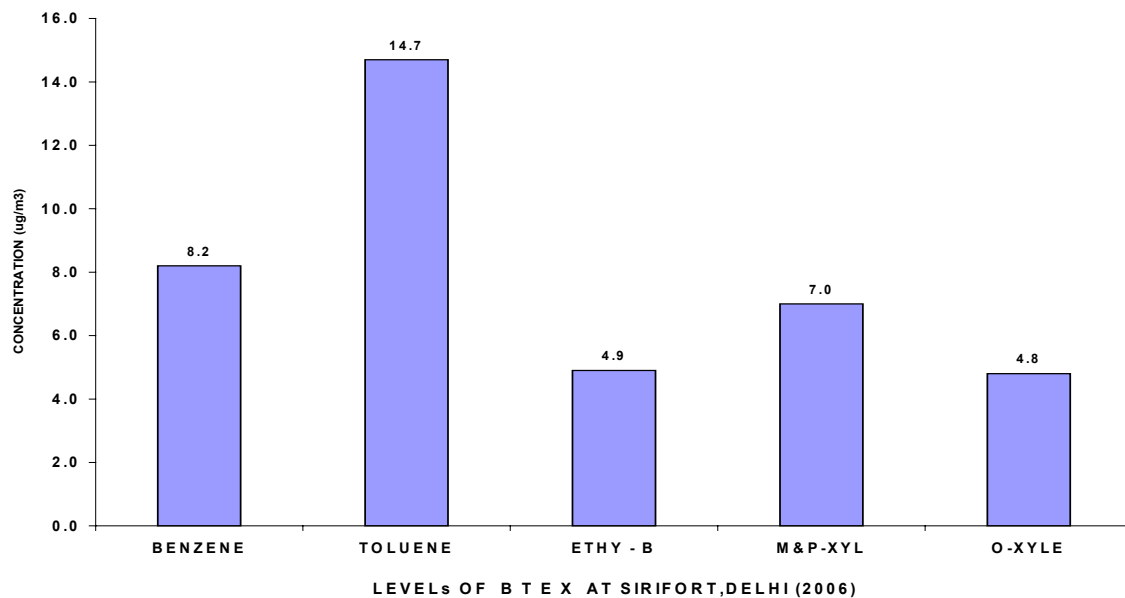
than the permissible limit of $60 \mu\text{g}/\text{m}^3$, whereas it was higher ($138 \mu\text{g}/\text{m}^3$) at B.S.Z. Marg station than permissible limit.

- The concentration of O₃ is higher at DCE as compared to that of B.S.Z. Marg & Sirifort.
- The annual average of PM₁₀ at DCE was found above the permissible limit.

On-Line VOCs Monitoring in Ambient Air of Delhi

Central Pollution Control Board is regularly monitoring VOCs (Benzene, Toluene, Ethyl-Benzene, M&P-Xylene and O - Xylene) in the ambient air at Sirifort using continuous Analyzer (FID). Sirifort monitoring station is located in the premises of electric sub station. The surrounding area is flat plateau with dense residential localities, commercial establishments and a famous sports complex. There is no major immediate source of air pollution in the vicinity of Sirifort monitoring station except for the vehicles plying on a busy road at a distance of approximate 100 meters from the monitoring station. The annually mean concentration of VOCs (Benzene, Toluene, Ethyl-Benzene, M&P-Xylene and O - Xylene) in the ambient air at Siri Fort in Delhi during year 2006 is presented below.

Benzene, Toluene, Ethyl-Benzene, M&P-Xylene and O-Xylene in the Ambient Air at Siri Fort, Delhi



Measurement of BTX in Ambient Air of Bangalore City

The online BTX analyzer was installed in the laboratory of CPCB South Zonal Office at Bangalore and regularly operated for BTX measurements in ambient air. The ambient air is drawn at 10 meters height and the samples are being

analyzed every 15 minutes interval continuously. The data generated between 20th November to 18th December-2006 is tabulated below. During the above period, the 24 hour average concentration observed are depicted below:

24 hr Average Concentration of BTX (observation period 20th Nov to 18th Dec 2006)

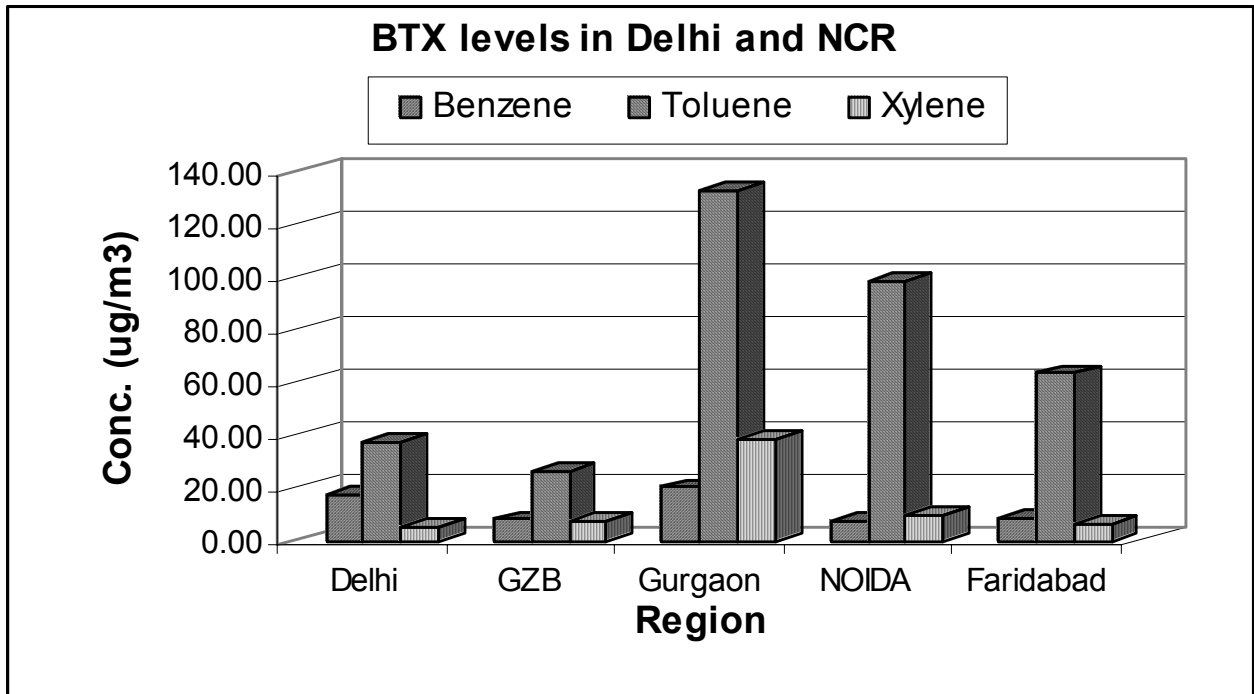
Parameter	Concentration range observed, $\mu\text{g}/\text{m}^3$
Benzene	1.0 – 2.7 $\mu\text{g}/\text{m}^3$
Toluene	0.0 – 9.1 $\mu\text{g}/\text{m}^3$
Ethylene Benzene	0.0 – 4.7 $\mu\text{g}/\text{m}^3$
MP Xylene	0.2 – 9.0 $\mu\text{g}/\text{m}^3$
O Xylene	0.4 – 3.4 $\mu\text{g}/\text{m}^3$

Active BTX Monitoring in National Capital Region

BTX Samples were collected from the National Capital Region including Delhi, Ghaziabad, Noida, Gurgaon and Faridabad during April-May 2006. The monitoring has been undertaken in three sessions in a day viz., 0800-1100 hrs (morning peak hours), 1230-1530 hrs (non-peak hours) and 1700-2000 hrs (evening peak hours) at the following locations:

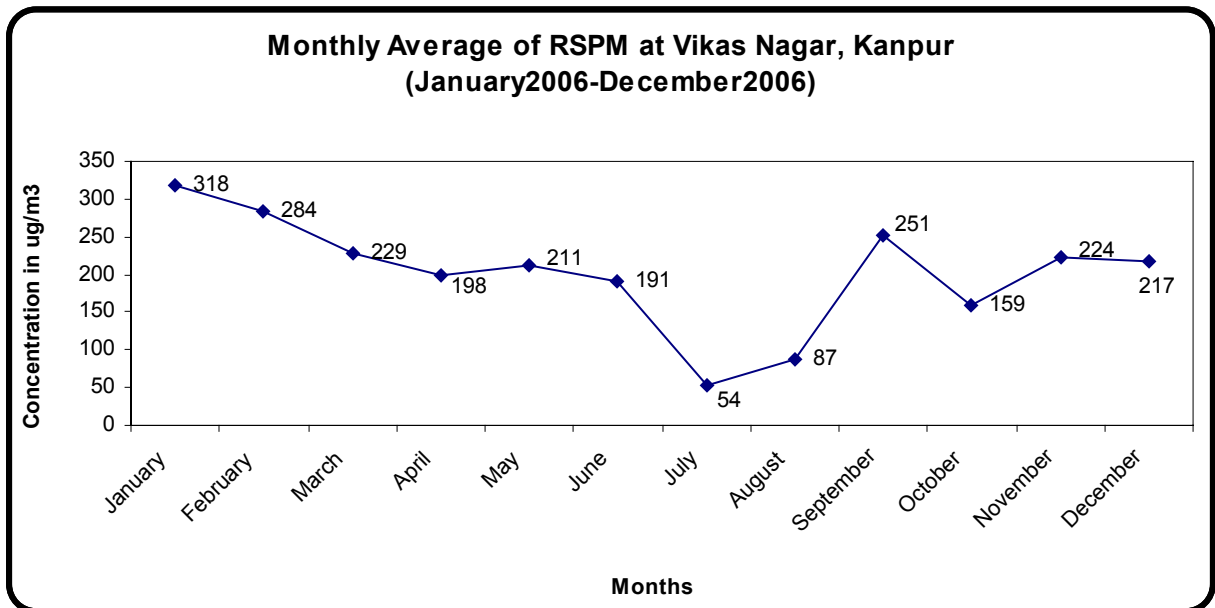
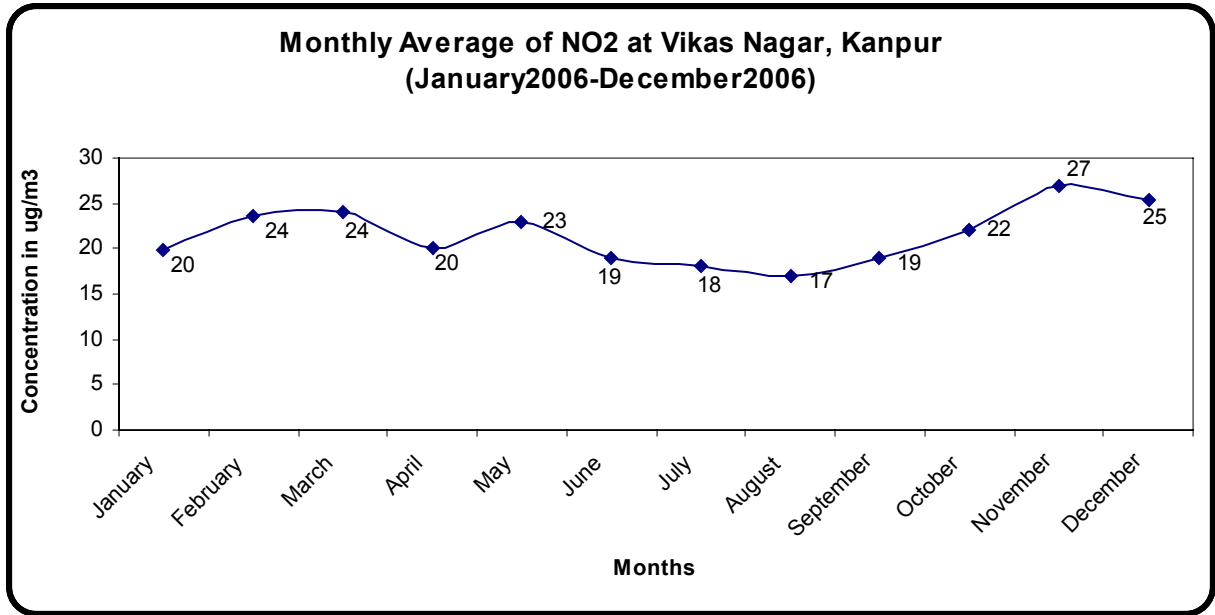
Region	Monitoring station
New Delhi	Palika Bazaar Gate No.1 and ITO Crossing Footbridge
Delhi	Akshardham Temple Main Gate
Ghaziabad	Dabur Crossing, MohanNagar Crossing, and GDA Office Gate
NOIDA	Atta Market, Indian Oil Crossing
Faridabad	Neelam Chowk, Nuchem Ltd. Gate (NH-2)
Gurgaon	MDI Crossing (NH-8) and Udyog Vihar, Phase V

The samples were analysed using GC-FID. The mean benzene concentration at all 12 location during the summer season in the NCR was observed as 12.23 $\mu\text{g}/\text{m}^3$ (United Kingdom's annual running mean standard is 16 $\mu\text{g}/\text{m}^3$). Average Toluene level was 71.47 $\mu\text{g}/\text{m}^3$ and the mean Xylene levels was 13.53 $\mu\text{g}/\text{m}^3$. Benzene, Toluene and Xylene levels have been found highest in Gurgaon in Udyog Vihar industrial area among all the monitored locations in NCR.



Ambient Air Quality Status in Kanpur

Regular monitoring of SO_2 , NO_2 and RSPM is being conducted 24 hour on all working days in Kanpur at Vikas Nagar, which is considered as Residential area. The monitoring and analysis is undertaken through IIT, Kanpur. The data is being disseminated on web site of CPCB. Monthly average of RSPM and NO_2 for year 2006 is presented below.



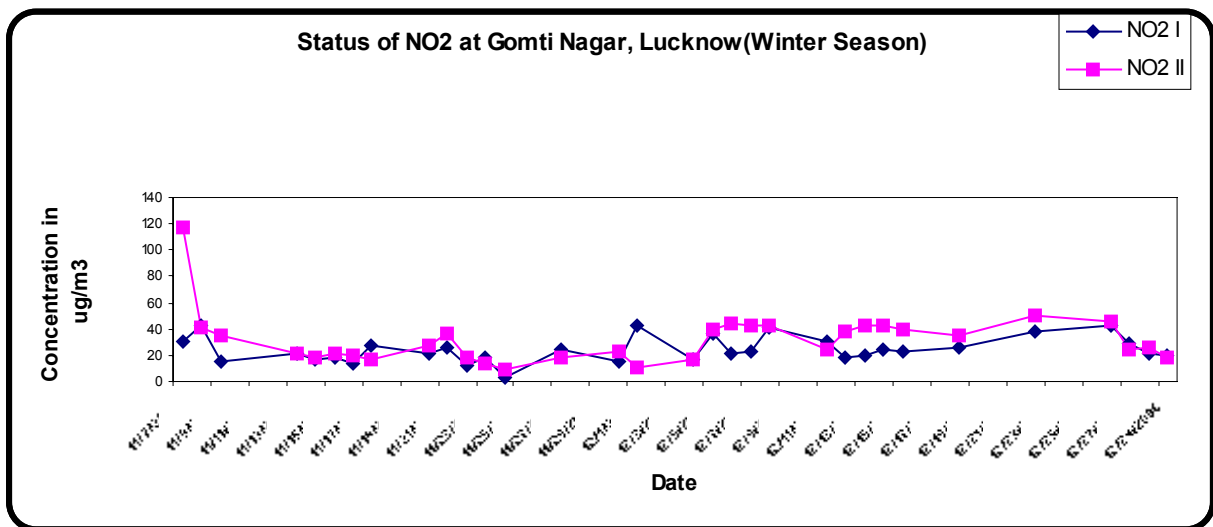
The air quality observations indicate that:

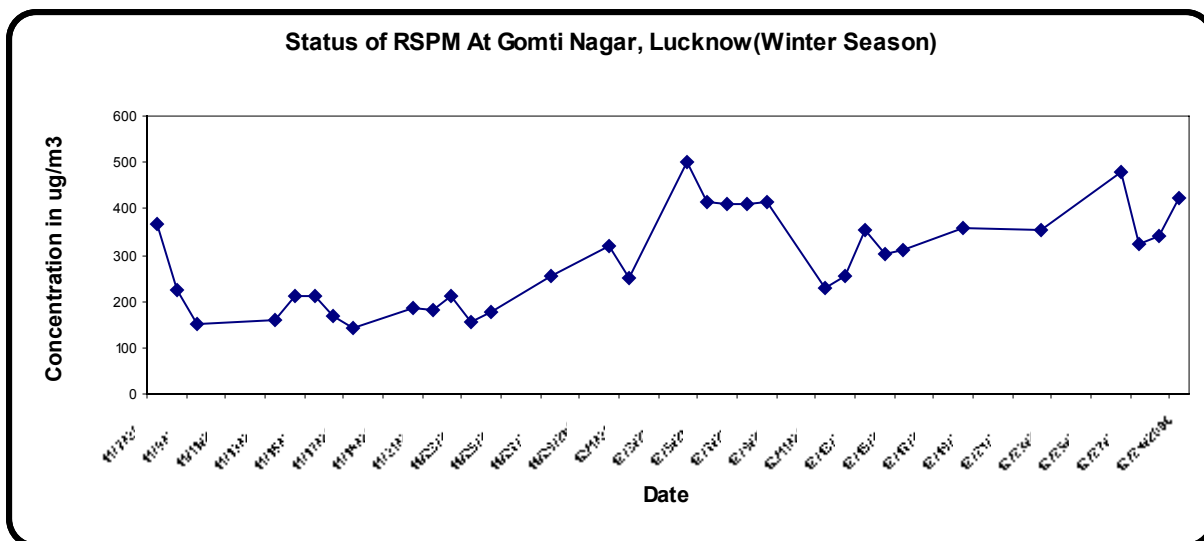
- RSPM concentration was observed high during summer months but highest value was observed in December. During monsoon comparatively lower values were observed. This may be due to wash out of pollutants during rain

- RSPM concentration was observed very high as compared to prescribed standards ie. $100 \mu\text{g}/\text{m}^3$ (24 hr average) throughout the year except during monsoon months, necessitating action on priority for its effective mitigation.
- NO_2 concentration ranged from $17 \mu\text{g}/\text{m}^3$ to $27 \mu\text{g}/\text{m}^3$ which is much lower than standards ie $80 \mu\text{g}/\text{m}^3$ (24 hr Basis). It is observed that there is not much variation in the NO_2 concentration throughout the year
- SO_2 was observed very low throughout the year and is not of any concern.
- Reason for higher RSPM level in Kanpur is due to digging of roads, burning of garbage, heavy vehicular traffic with poor traffic control and Indiscriminate use of generators of all capacity during power cut in the city

Ambient Air Quality Status in Lucknow

Central Pollution Control Board, Zonal Office, Lucknow has undertaken monitoring of Ambient air quality at Gomti Nagar Lucknow, a typical residential area. Monitoring is being conducted for major criteria pollutants like, RSPM, SO_2 and NO_2 for 8 hour duration in day time i.e. 10 am to 6 pm. Profile of NO_2 and RSPM during November and December-2006 is presented below:





Ambient Air Quality Status at Agra

The monitoring of Ambient Air Quality at Agra was initiated by CPCB under specific direction of Hon'ble Supreme Court of India in 2000 and monitoring data submission started in January 2002 for all four stations, viz. Tajmahal, Iti-mad-ud-daulah, Rambagh and Nunhai. During the year 2006, the monitoring of 4 primary pollutants viz. SPM, RSPM, SO₂ and NO₂ was continued. The annual average values, standard deviations and percentage violation for the calendar year 2006 at all four monitoring locations with reference to sensitive area ambient air quality are presented below:

Ambient air quality vis-à-vis standards in Agra

Parameters (24 Hour Standards)	Locations	Total valid monitoring days in 2006	Percent violations of 24 Hour Standards	Annual Average	Annual Standards	Standard Deviation
SO ₂ (30 µg/m ³)	Tajmahal	270	00	6	15	2.7
	Itmad ud daulah	109	00	7		3.4
	Rambagh	112	00	7		2.9
	Nunhai	110	01	7		3.1
NO ₂ (30 µg/m ³)	Tajmahal	269	22	22	15	8.5
	Itmad ud daulah	110	28	24		8.4
	Rambagh	112	31	25		7.4
	Nunhai	110	67	34		9.6

Parameters (24 Hour Standards)	Locations	Total valid monitoring days in 2006	Percent violations of 24 Hour Standards	Annual Average	Annual Standards	Standard Deviation
RSPM (75 µg/m ³)	TajMahal	272	68	133	50	76
	Itmad ud daulah	108	92	214		85
	Rambagh	112	86	278		133
	Nunhai	105	92	306		135
SPM (100 µg/m ³)	TajMahal	270	83	316	70	129
	Itmad ud daulah	105	99	401		148
	Rambagh	106	99	431		132
	Nunhai	108	99	637		259

Notes:

- All the values are in µg/m³ of Ambient Air
- Percentage violation with respect to National Ambient Air Quality Standards (24 Hourly Average)
- Valid monitoring day: Sampling time 16 hours or more in a day

Ambient Air Quality in Delhi during Deepawali 2006

Ambient air quality is being measured during Deepawali days for the past many years. During Deepawali days, the air quality deteriorates alarmingly due to the bursting of crackers. In order of assess the air pollution caused due to bursting of crackers, ambient air quality being measured since past several years. The ambient air quality has been continued to measure during Deepawali 2006 at selected locations.

Sulphur dioxide and nitrogen dioxide levels at all locations have been found within the prescribed ambient air quality standards whereas SPM and RSPM exceeded the ambient air quality standards.

RSPM and SPM levels during 2006 at all locations were found to be lower than that recorded during 2005 except Janakpuri, where RSPM was marginally high.

Sulphur dioxide concentrations recorded an increase at all the locations except BSZ Marg and nitrogen dioxide concentration recorded a decrease at all the locations in year 2006 as compared to year 2005.

Ambient Air Quality in Delhi During Deepawali 2005 and Deepawali 2006
(All Values are in microgram per cubic metre)

Parameter /Year Station	SO ₂		NO ₂		SPM		RSPM	
	2005	2006	2005	2006	2005	2006	2005	2006
B.S.Z Marg (ITO)	21	10	81	51	742	489	378	304
Pitampura (R)	-	27	-	42	-	687	-	388
Sirifort (R)	13	16	46	41	723	519	489	440
Janakpuri (R)	7	31	65	45	916	704	422	426
Nizamuddin (R)	9	19	54	54	1148	485	337	265
Shahazada Bagh (I)	11	26	83	53	1070	586	520	300
Shahdara (I)	24	45	75	37	761	625	407	395

Ambient Air Quality in Kolkata during Deepawali 2006

Survey of ambient air quality was undertaken during Diwali for three days (October 20-22, 2006) indicates sharp increase of RSPM, SO₂ and NO_x on the day of Diwali due to various activities (burning of crackers, gathering of people, increase of traffic volume on Diwali night, mela etc.). RSPM and NO_x exceeded the standards at all the locations except the Central one in the suburb of Kolkata.

Ambient Air Quality at North, South and Suburb of Kolkata during Deepawali 2006

Site	Location	NO _x (ug/m ³)			SO ₂ (ug/m ³)			RSPM (ug/m ³)		
		1 st shift	2 nd shift	3 rd shift	1 st shift	2 nd shift	3 rd shift	1 st shift	2 nd shift	3 rd shift
PRE-DEEPAWALI (20/10/06) FROM 2 PM TO (21/10 /06 UPTO 2 PM)										
A	Behala	28	30	32	13	15	13	148	116	151
B	Jodhpur park	39	17	36	3	4	7	183	72	128
C	J.D.Park	53	39	30	3	1	5	120	111	461
D	Shyam Bazar	41	37	69	3	3	6	174	88	85
E	Canning	16	5	11	3	1	3	26	18	26

DURING DEEPAWALI (21/ 10/ 06) FROM 2 PM TO (22/ 10/ 06 UPTO 2 PM.)										
A	Behala	32	48	22	20	18	14	336	633	87
B	Jodhpur park	46	50	27	8	12	4	216	418	71
C	J.D.Park	28	15	19	17	12	3	196	112	144
D	Shyam Bazar	52	38	27	16	11	12	313	302	60
E	Canning	21	18	14	4	4	1	71	69	35
POST- DEEPAWALI (22/ 10/ 06) FROM 2 PM TO (23/ 10 06 UPTO 2 PM)										
A	Behala	37	41	28	13	11	10	200	231	92
B	Jodhpur park	33	41	28	3	4	4	156	175	78
C	J.D.Park	22	9	21	6	4	6	220	57	63
D	Shyam Bazar	32	62	31	6	5	6	141	143	68
E	Canning	15	18	16	3	4	4	61	92	41

Note: *First shift:* 2pm – 10pm *2nd shift:* 10pm – 06am *3rd shift:* 06am – 2pm.

Atmospheric Mixing Depth Observations in Delhi through Sodar System

Sodar system is being used regularly to collect mixing height data at CPCB Laboratories at Parivesh Bhawan. Most occurring period of free convection, average mixing height in the period of free convection, average mixing height in the period of without free convection, monthly average mixing height, maximum mixing height and minimum mixing height of different months during year 2006 are presented below:

Period of free convection, Averages of Mixing Height and Maximum and Minimum of Mixing Heights (Metres) in different months of the year, 2006

Month	Mostly occurring period of free convection during the month	Min. Mixing Height*	Max. Mixing Height*	Monthly Average Mixing Height (Metres)	Average Mixing Height in period of free convection	Average Mixing Height in period without free convection
January 2006	11 am to 5 pm	293	901	293	695	148
February 2006	10 am or 11 am to 6 pm	318	816	318	674	143
March 2006	8 am or 9 am to 6 pm or 7 pm	378	858	378	696	153

Month	Mostly occurring period of free convection during the month	Min. Mixing Height*	Max. Mixing Height*	Monthly Average Mixing Height (Metres)	Average Mixing Height in period of free convection	Average Mixing Height in period without free convection
May 2006	8 am to 7 pm	430	943	430	710	147
July 2006	8 am to 7 pm	364	922	364	668	128
August 2006	7 am to 6 or 7 pm	451	1113	451	767	145
October 2006	9 am or 10 am to 6 pm	447	1367	447	998	165
November 2006	10 am or 11 am to 5 pm	376	1282	376	940	154
December 2006	10 am or 11 am to 5 pm	348	1134	348	825	164

Note: Adequate data was not available in April, June and September 2006.

* Hourly Averages.

Monthly average of mixing height was observed minimum in January 2006. The graphical diurnal variation of average mixing height on 4th and 19th January 2006 having higher daily average and 28th and 29th January 2006 having lower daily averages are presented below:

