NATIONAL AMBIENT AIR QUALITY MONITORING
NAAQMS/ 35 /2011-2012

NATIONAL AMBIENT AIR QUALITY STATUS & TRENDS IN INDIA-2010

CENTRAL POLLUTION CONTROL BOARD
MINISTRY OF ENVIRONMENT & FORESTS

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FOREWORD

Central Pollution Control Board (CPCB) has established the National Ambient Air Quality Monitoring (NAMP) Network, covering 209 cities/towns of the country in compliance with the mandate under the Air (Prevention and Control of Pollution) Act, 1981 to collect compile and disseminate information on air quality.

The ambient air quality is monitored collectively by Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs), Pollution Control Committees (PCCs), and National Environmental Engineering Research Institute (NEERI). The data, thus generated, is transmitted to CPCB for scrutiny, analysis, compilation and its publication. The present Report contains ambient air quality data for the calendar year 2010 and trend analysis of major urban centres such as metropolitan cities since 2000. Air pollution status of various pollutants is described in terms of Low, Moderate, High and Critical category, vis-a-vis the notified ambient air standards. The status is depicted in the form of tables and figures as well.

The contributions made by my colleagues Dr. Sanjeev Agrawal, Scientist `D', Sh. Tarun Darbari, Scientist 'B', Dr. Sanghita Roychoudhury, RA, Dr. Jitendra Kumar Nagar, RA and Ms. Razia Sultan, DEO, for compiling and presenting the data, under the supervision of Dr. D.D. Basu, Scientist 'E' and Sh. J.S. Kamyotra, Member Secretary is appreciable. Efforts made by CPCB Head Office / ZO'sCPCB/SPCB's/PCC's and other collaborating agencies are acknowledged.

The co-operation of all the monitoring agencies is gratefully acknowledged in successfully achieving this major task. Hopefully, the report will be useful to all concerned.

Date : 12st March, 2012

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ABBREVIATION

Abbreviation	Meaning
AD	Adequate data (locations where ≥50 days of monitoring was done in a year)
As	Arsenic
B(a)P	Benzo (a) Pyrene
C	Critical pollution category
C_6H_6	Benzene
CO	Carbon monoxide
CPCB	Central Pollution Control Board
CPCB ZO	CPCB Zonal Offices
EDB	Environmental Data Bank
ES	Ecologically sensitive
ESA	Ecologically sensitive area
EF	Exceedence factor
H	High pollution category
H_2S	Hydrogen Sulphide
ID	Inadequate data (locations < 50 days of monitoring was done in a year)
L	Low pollution category
M	Moderate pollution category
NAAQS	National Ambient Air Quality Standards
NAMP	National Air Quality Monitoring Programme
ND	No data (Monitoring not done or data not received for the particular parameter)
NEERI	National Environmental Engineering Research Institute
NH_3	Ammonia
NH_3	Ammonia
Ni	Nickel
NM	No monitoring
NO_2	Nitrogen Dioxide
O_3	Ozone
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCC	Pollution Control Committees
PM_{10}	Particulate matter of size ≤ 10μm
$PM_{2.5}$	Particulate matter of size ≤ 2.5μm
QA/QC	Quality assurance and Quality control
RSPM	Respiratory Suspended Particulate Matter
SO_2	Sulphur dioxide
SPCB	State Pollution Control Boards
SPM	Suspended Particulate Matter

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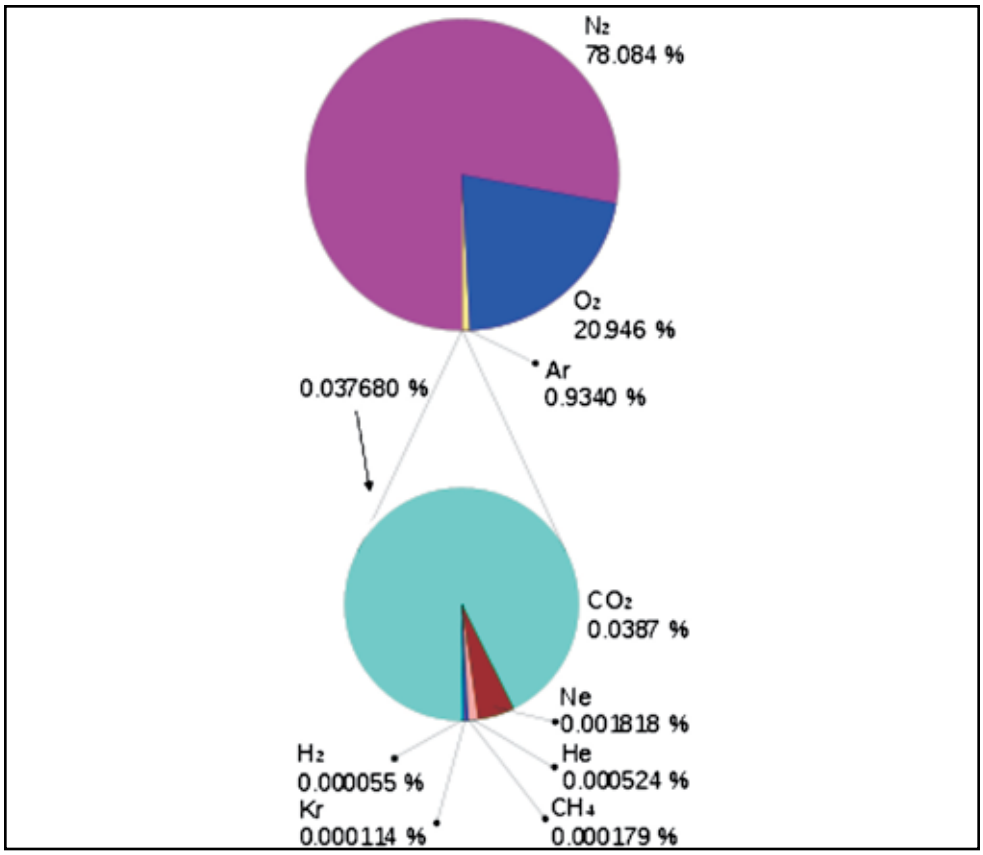
The atmosphere of Earth is a layer of gases surrounding the planet Earth that is retained by Earth's gravity. Air is mainly composed of Nitrogen and Oxygen (99% by volume) and other gases including water vapor contribute to about 1%. (Figure 1.1). Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981. According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 'air pollution' has been defined as 'the presence in the atmosphere of any air pollutant.' As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 'air pollutant' has been defined as 'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment'. Therefore ambient air quality standard is developed as a policy guideline that regulates the effect of human activity upon the environment so that pollutant emission into the air can be regulated. Standards may specify a desired state or limit alterations

Figure 1.1: Composition of air



1.1 National Ambient Air Quality Standards (NAAQS)

The objectives of air quality standards are:

- To indicate the levels of air quality necessary with an adequate margin of safety to protect the public health, vegetation and property;
- To assist in establishing priorities for abatement and control of pollutant level;
- To provide uniform yardstick for assessing air quality at national level;
- To indicate the need and extent of monitoring programme.

The revised National Ambient Air Quality Standards notified on November 2009 is depicted below (Table 1.1).

Table 1.1: Revised National Ambient Air Quality Standards (NAAQS)

[NAAQS Notification dated 18th November, 2009]

S. No.	Pollutants	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (notified by Central Government)	
1	Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual*	50	20	1. Improved West and Gaeke 2. Ultraviolet Fluorescence
		24 Hours**	80	80	
2	Nitrogen Dioxide (NO_2), $\mu g/m^3$	Annual*	40	30	1. Modified Jacob & Hochheiser (Na-Arsenite) 2. Chemiluminescence
		24 Hours**	80	80	
3	Particulate Matter (Size <10μm) or PM_{10} $\mu g/m^3$	Annual*	60	60	1. Gravimetric 2. TEOM 3. Beta attenuation
		24 Hours**	100	100	
4	Particulate Matter (Size <2.5 μm) or $PM_{2.5}$ $\mu g/m^3$	Annual*	40	40	1. Gravimetric 2. TEOM 3. Beta attenuation
		24 Hours **	60	60	
5	Ozone (O_3), $\mu g/m^3$	8 hours**	100	100	1. UV photometric 2. Chemiluminescence 3. Chemical Method
		1 hours **	180	180	
6	Lead (Pb), $\mu g/m^3$	Annual *	0.50	0.50	1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper 2. ED-XRF using Teflon filter
		24 Hour**	1.0	1.0	
7	Carbon Monoxide (CO), mg/m^3	8 Hours **	02	02	Non dispersive Infra Red (NDIR) Spectroscopy
		1 Hour**	04	04	
8	Ammonia (NH_3), $\mu g/m^3$	Annual*	100	100	1. Chemiluminescence 2. Indophernol blue method
		24 Hour**	400	400	
9	Benzene (C_6H_6) , $\mu g/m^3$	Annual *	05	05	1. Gas chromatography based continuous analyzer 2. Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP)-particulate phase only, ng/m^3	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m^3	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m^3	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

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

*** 24 hourly 08 hourly or 01 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.*

NOTE: *Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.*

1.2 Air Pollutants, their sources and effects

In order to combat air pollution it is required to identify the pollutants, its source of emission and investigate the effects of living and the environment. The Central Pollution Control Board has therefore identified and revised the National Ambient Air Quality Standards on April 11, 1994 which was notified in Gazette of India, Extra-ordinary Part-II Section 3, sub section (ii), dated May 20, 1994 (Table 1.1). The pollutants enlisted in the National Ambient Air Quality Standards and their sources and effects are summarized in Annexure I

1.3 National Air Quality Monitoring Programme (N.A.M.P.)

1.3.1. Present status of NAMP : Central Pollution Control Board initiated National Ambient Air Quality Monitoring (NAAQM) programme in the year 1984 with 7 stations at Agra and Anpara. Subsequently the programme was renamed as National Air Quality Monitoring Programme (NAMP).

Steadily the air quality monitoring network got strengthened by increasing the number of monitoring stations from 28 to 365 during 1985 – 2009. During the financial year 2010 – 11, 93 new stations were added and the number of stations under operation was raised to 456 covering 190 cities in 26 states and 5 Union Territories as on 31st March 2011. The growth in number of stations under operation is depicted in Figure 1.2. Figures 1.3 & 1.4 depict the status of operating against the sanctioned monitoring stations in different states and UTs respectively. As on 31st October 2011 the number of stations under operation has been further raised to 503 distributed in 209 cities, 26 states and 5 UTs.

Figure 1.2: Growth in number of stations under operation in NAMP (As on 31st March 2011

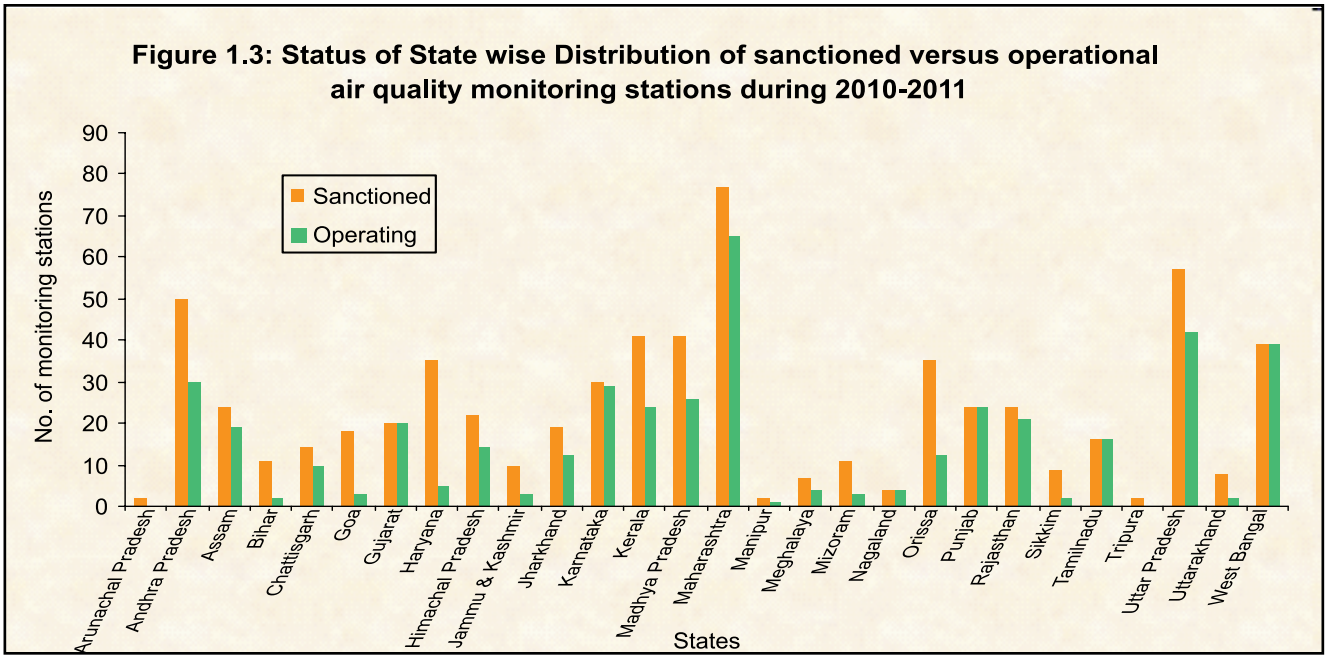
Table 1.2. Details of Air Quality Monitoring Stations under operation in India as on 31st March 2011

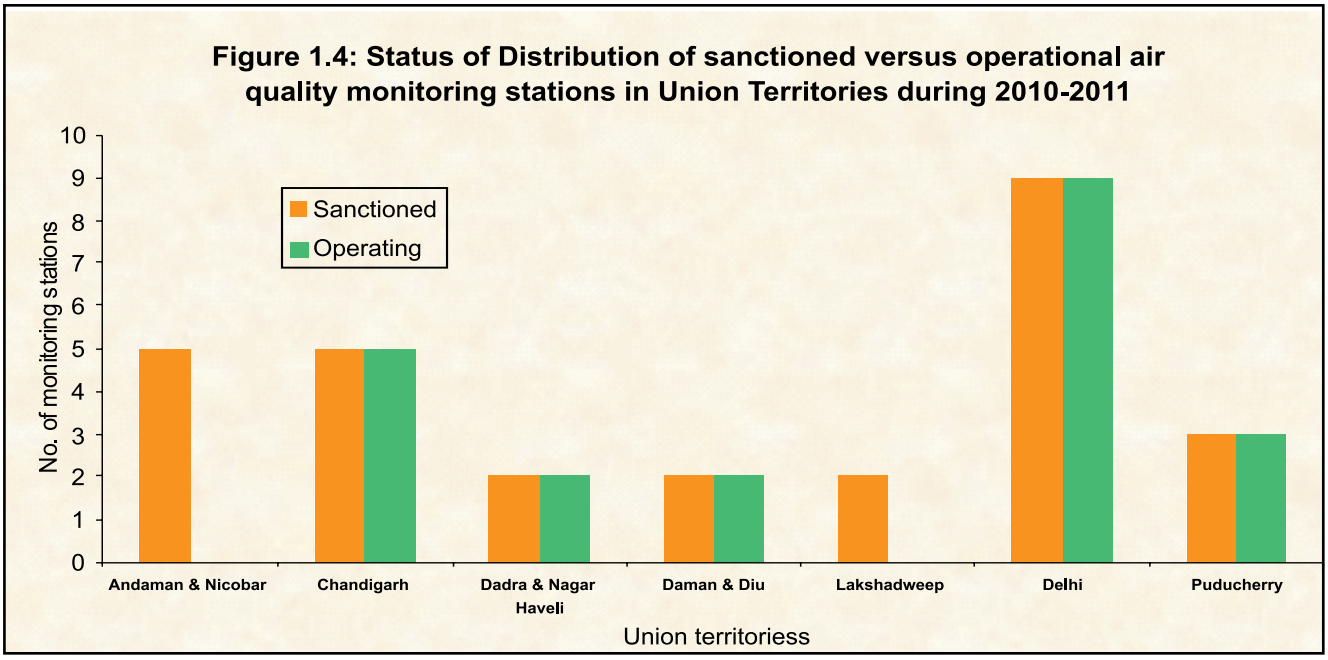
S. No.	State/Union territory	City	Number of operating stations
1	Andhra Pradesh (30)	Hyderabad	9
		Visakhapatnam	8
		Tirupati	1
		Vijayawada	2
		Kurnool	1
		Ramagundum	1
		Patencheru	1
		Nalgonda	1
		Guntur	1
		Warangal	1
		Nellore, Nellore	1
		Kakinada	1
		Khamam, Kothagudem	1
		Chitoor, Tirumala	1
2	Assam (19)	Bongaigaon	3
		Gawahati	4
		Tezpur	1
		Sibasagar	1
		Dibrugarh	1
		Golaghat	1
		Silcher	1
		Daranga	1
		Margheita	1
		North Lakhimpur	1
		Nagaon	1
		Tinsukhia	2
		Nalbari	1
3	Bihar (2)	Patna	2
4	Chandigarh (5)	Chandigarh	5
5	Chattisgarh (10)	Korba	3
		Bhilai	3
		Raipur	3
		Bilaspur	1
6	Delhi (9)	Delhi	9
7	Dadara & Nagar Haveli (2)	Silvasa	2
8	Daman Diu (2)	Daman	2
9	Goa (3)	Ponda	1
		Vasco	1
		Marmagao	1
10	Gujarat (20)	Ahmedabad	6
		Ankaleshwar	2
		Jamnagar	1
		Rajkot	2
		Surat	3
		Vadodara	4
		Vapi	2

S. No.	State/Union territory	City	Number of operating stations
11	Haryana (5)	Faridabad	2
		Hissar	2
		Yamuna Nagar	1
12	Himachal Pradesh (14)	Damtal	2
		Parwanoo	2
		Poanta Sahib	2
		Shimla	2
		Kala Amb	2
		Baddi-Barotiwala	3
		Nalagarh	1
13	Jammu& Kashmir (3)	Jammu	3
14	Jharkand (12)	Dhanbad	1
		Jharia	3
		Sindri	1
		Jamshedpur	2
		Ranchi	1
		Hazaribagh	2
		Saraikela-Kharsawan	1
		West Singhbhum	1
15	Karnataka (29)	Bangalore	9
		Dharwar, Hubli	2
		Mangalore	1
		Hassan	1
		Mysore	2
		Gulbarga	1
		Belgaum	1
		Devanagere	2
		Mandya	1
		Raichur	1
		Bijapur	1
		Chitradurga	1
		Shimaga	1
		Karwar	1
		Ranebennur	1
		Bagalkote	1
		Kolar	1
		Bidar	1
16	Kerala (24)	Kozhikode	2
		Kottayam	2
		Cochin	7
		Thiruvanantapuram	4
		Palakkad	1
		Alappuzha	2
		Near District Office, KSPCB, Makkamkunnu, Pathanamthitta	1
		Kollam	2
		Sulthan, Bathery, Wayanad	1
		Kakkanchery, Near KINFRA, Mallappuram	1
		Kerela SPCB, District Office, Poonkunnam, Thrissur	1

S. No.	State/Union territory	City	Number of operating stations
17	Madhya Pradesh (26)	Bhopal	4
		Indore	3
		Jabalpur	1
		Nagda	3
		Gwalior	2
		Sagar	2
		Satna	2
		Singrauli	3
		Ujjain	3
		Dewas	3
18	Maharashtra (65)	Aurangabad	3
		Lote	2
		Tarapur	3
		Kolhapur	3
		Mumbai	3
		Ambernath	2
		Chandrapur	6
		Nagpur	6
		Nasik	3
		Solapur	2
		Pune	3
		Thane	3
		Navi Mumbai (incl TTC Ind. Area, Taloja Ind Area)	6
		Mahad	3
		Roha	2
		Sangli	3
		Amravati	3
		Latur	3
		Ulhas Nagar	2
		Badlapur	1
		Jalgaon	3
19	Meghalaya (4)	Shillong	2
		Dwaki	1
		Ri-Bhoi, Brynihat	1
20	Mizoram (3)	Aizwal	3
21	Manipur (1)	Imphal	1
22	Nagaland (4)	Dimapur	2
		Kohima	2
23	Orissa (12)	Rayagada	2
		Rourkela	2
		Talcher	2
		Angul	2
		Bhubaneshwar	1
		Cuttack	1
		Sambalpur	1
		Berhampur	1

S. No.	State/Union territory	City	Number of operating stations
24	Punjab (24)	Gobindgarh	3
		Jalandhar	4
		Ludhiana	4
		Naya Nangal	2
		Khanna	2
		Pathankot(Dera baba)	1
		Amritsar	2
		Derra Bassi	2
		Bhatinda	1
		Batala	1
		Patiala	2
25	Pondicherry (3)	Pondicherry	3
26	Rajasthan (21)	Alwar	3
		Jaipur	6
		Jodhpur	6
		Kota	3
		Udaipur	3
27	Sikkim (2)	Gangtok	2
28	Tamilnadu (16)	Chennai	6
		Tuticorin	3
		Coimbatore	3
		Madurai	3
		Salem	1
29	Uttar Pradesh (42)	Agra	6
		Allahabad	2
		Anpara	2
		Firozabad	3
		Gajroula	2
		Ghaziabad	2
		Kanpur	6
		Lucknow	5
		Noida	2
		Varanasi	2
		Jhansi	2
		Khurja	2
		Meerut	2
		Bareily	2
		Moradabad	2
30	Uttarakhand (5)	Dehradun	3
		Haridwar	1
		Rishikesh	1
31	West Bengal (39)	Kolkata	10
		Durgapur	4
		Haldia	5
		Howrah	4
		Asansol	3
		Barrckpore	3
		Ranigunj	3
		South Suburban	3
		Sankrail	4
Total	**26 states, 5UTs**	**190 cities**	**456 stations**





1.3.2. Objectives of NAMP

The objectives of the NAMP are as follows:

- To determine status and trends of ambient air quality;
- To ascertain whether the prescribed ambient air quality standards are violated;
- To Identify Non-attainment Cities;
- To obtain the knowledge and understanding necessary for developing preventive and corrective measures;
- To understand the natural cleansing process undergoing in the environment through pollution dilution, dispersion, wind based movement, dry deposition, precipitation and chemical transformation of pollutants generated.

1.3.3. Parameters monitored under NAMP

Under NAMP three criteria pollutants viz. PM_{10} (Particulate Matter having an aerodynamic diameter less than or equal to 10 μm), Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2) were identified for regular monitoring at all locations. Additional parameters like Carbon monoxide (CO), Ammonia (NH_3), Lead (Pb) and Ozone (O_3) are being monitored at selected locations. The other parameters as notified in revised NAAQS viz. $PM_{2.5}$ (Particulate Matter having an aerodynamic diameter less than or equal to 2.5 μm), Benzo(a)pyrene {B(a)P}, Arsenic (As) and (Ni) are slowly being added in monitoring network under NAMP

The monitoring of meteorological parameters such as wind speed and direction, relative humidity and temperature were 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 under the NAMP is being carried out with the help of State Pollution Control Boards (SPCB), Pollution Control Committees (PCC) and National Environmental Engineering Research Institute (NEERI), Nagpur and Central Pollution Control Board (CPCB) head and Zonal Offices. CPCB co-ordinates with these agencies to ensure uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring station (Plate 1.1).

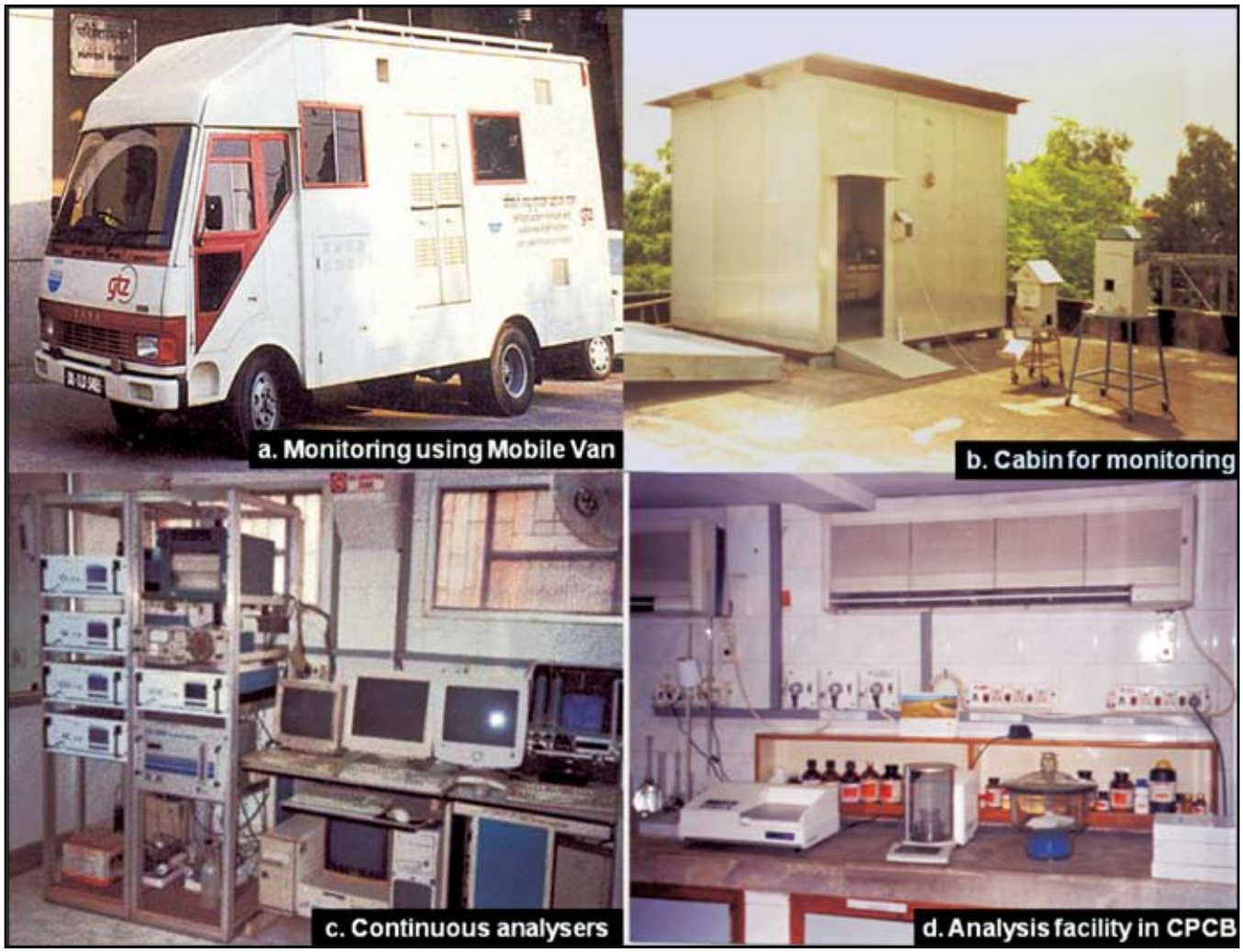


Plate 1.1. Different monitoring modes a. Mobile van monitoring, b. cabin for monitoring, c. Continuous analysers and d. analysis facility under NAMP

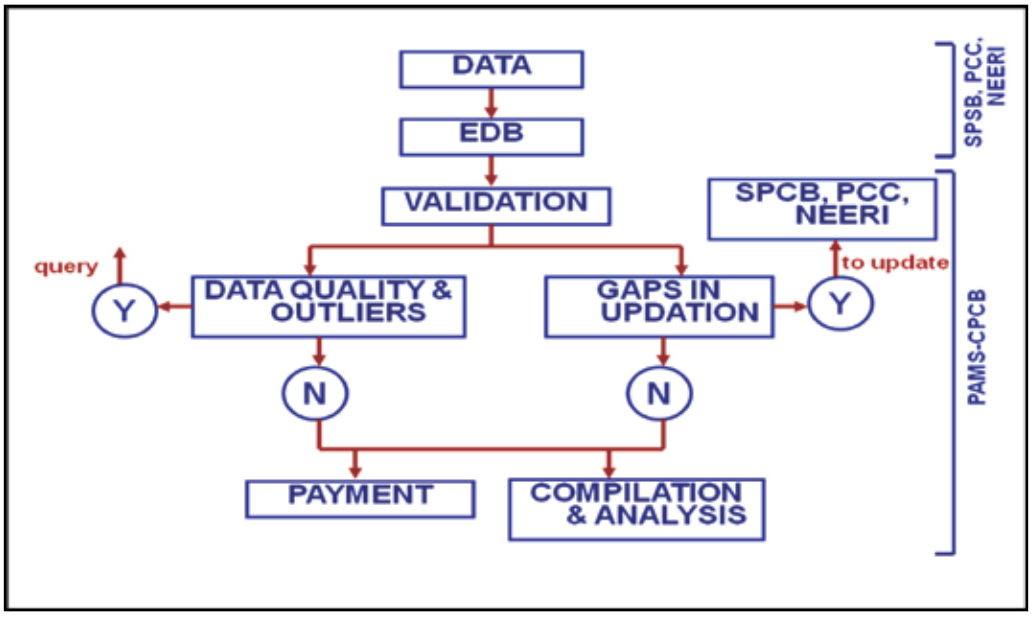
1.3.4. Data Analysis and Limitations

The air quality data generated at the monitoring stations are entered into Environmental Data Bank (EDB) by respective SPCBs and PCCs and transmitted to CPCB where the data is scrutinized for outliers and gaps in input of data. In case of any gaps the matter is discussed with the respective agencies and later the data is checked, scrutinized, compiled, processed and analyzed statistically to get the information on the annual mean, standard deviation etc. of the pollutants and payment is also made to the respective agencies. Figure 1.5 shows the data flow in NAMP. In the present report, results of PM_{10}, SO_2 and NO_2, for the year 2010 are presented.

While presenting the air quality data in this report following conventions have been followed:

i. If the 24 hours sampling in a day could not be fulfilled at all the locations due to force majeure like power failure, rainfall etc, and the values monitored for 16 hours and more are considered as the representative values for assessing the ambient air quality for that day;
ii. In case no data is available in a particular month with respect to all the three parameters, the month has been excluded;
iii. In case, no data is reported for a particular station with respect to all the three parameters, during entire year, that station has been excluded; and
iv. The frequency of monitoring twice a week, 104 days in a year could not be met in some of the locations. In such cases, 50 days of monitoring in a year is considered adequate for the purpose of data analysis.

Figure 1.5 Data flow chart under NAMP



As NAMP is being operated through various monitoring agencies, a large number of personnel and equipments are involved in the sampling, chemical analyses, data reporting etc.. This increases the probability of personal biases reflecting in the data. Hence it is pertinent to mention that this document be referred keeping in view the above facts and the data be considered more as indicative rather than absolute. The data presented in this report is average over the entire year as available.

1.3.5. Quality Assurance/Quality Control of Data and Management

Quality assurance and Quality control (QA/QC) is an essential part of any monitoring system. QA/QC is a programme of activities that ensures that measurements meet defined standards of quality, with a stated level of confidence. In order to ensure the quality of data the CPCB is carrying out various exercises as follows:

i) **Calibration, Servicing and Repair of Instruments** CPCB is carrying out a project on calibration, servicing and repair of instruments/equipments and evaluation of ambient air quality monitoring stations under NAMP. Servicing and repair of respirable dust sampler and high volume sampler is carried out and they are also calibrated using top loading calibrator (Plate 1.2). The location of monitoring stations is evaluated as per CPCB guidelines so as to ensure quality of data.

ii) **Training Program on Ambient Air Quality Monitoring** CPCB carries out training program on ambient air quality monitoring with an objective to improve quality of data generated under National Air Quality Monitoring Programme (NAMP). Training is provided to field and laboratory staff involved in NAMP. The training is provided on measurement methods of air pollutants i.e. sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of size less than 10μg (PM_{10}) and suspended particulate matter (SPM) etc.

iii) **Guidelines for Ambient Air Quality Monitoring** CPCB has developed guidelines for carrying out ambient air quality monitoring. The Guidelines for Ambient Air Quality Monitoring include site selection criteria, quality assurance and quality control in air quality monitoring, type of pollutants to be monitored in a city, frequency and duration of monitoring, data reporting and compilation procedures and measurement methods of various air pollutants etc.

iv) **Evaluation of Ambient Air Quality Monitoring Stations** Regular Inspection of Monitoring stations and monitoring laboratories are regularly inspected by CPCB officials to ensure proper and uniform methodology for sampling and analysis.

v) **Review meetings of NAMP** are regularly conducted with monitoring agencies to discuss various problems related to monitoring activities and sort out the remedial measures.

vi) **Analytical quality control exercises** using Ring Test Facility are regularly conducted to evaluate the performance of different laboratories.

NB. In this report data has been taken from 1st January 2010 to 31st December 2010. Operating stations has been listed as numbers reported till 31st March 2010 (financial year wise). However, there are cases where data has been given on October 2010 which has been included during data analysis.

Plate 1.2. Field calibration a, b.Top loading calibration of Respirable Dust Sampler at Kurnool and Goa c. Use of dry gas meter for gaseous calibration at Vizag d. Calibration of balance at Ramachandrapuram

Air Quality Assessment and major findings of the ambient air quality monitoring carried out countrywide during the year 2010 are presented in this chapter. The air quality of different cities/towns has been compared with the respective NAAQS.

2.1 Air Quality Assessment

The air quality of different cities/towns has been compared with the respective NAAQS. The air quality has been categorized into four broad categories based on an Exceedence Factor (the ratio of annual mean concentration of a pollutant with that of a respective standard). The Exceedence Factor (EF) is calculated as follows:

$$\text{Exceedence Factor} = \frac{\text{Observed annual mean concentration of criteria pollutant}}{\text{Annual standard for the respective pollutant and area class}}$$

The four air quality categories are:

- Critical pollution (C) : when EF is > 1.5;
- High pollution (H) : when the EF is between 1.0 - <1.5;
- Moderate pollution (M) : when the EF between 0.5 - <1.0; and
- Low pollution (L): when the EF is < 0.5.

It is obvious from the above categorization, that the locations in either of the first two categories are actually not meeting the standards, although, with varying magnitude. Those, falling in the third category are meeting the standards as of now but likely to exceed the standards in future if pollution continues to increase and is not controlled. However, the locations in Low pollution category have a rather clean air quality and such areas are to be maintained at low pollution level by way of adopting preventive and control measures of air pollution. The pollution control classification is given in Table 2.1.

Table 2.1: Pollution Level Classification

Pollution level	Annual Mean Concentration Range ($\mu g/m^3$)					
	Industrial, Residential,Rural & others areas			Ecologically Sensitive Area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low (L)	0-25	0-20	0-30	0-10	0-15	0-30
Moderate (M)	26-50	21-40	31-60	11-20	16-30	31-60
High (H)	51-75	41-60	61-90	21-30	31-45	61-90
Critical (C)	>75	>60	>90	>30	>45	>90

This report represent the air quality scenario with air quality data from January – December 2010 of **402 stations from residential / commercial / industrial / rural area** and **31 stations from ecologically sensitive area** {Notified by Ministry of Environment and Forests under Section 3(2)(V) of Environment (Protection) Act, 1986 and Rule 5(3)(d) of Environment (Protection) Rules, 1986} ie a **total of 433 stations**. Adequate data on annual average concentration (with 50 and more day of monitoring) was received from 360 stations for SO_2, 362 stations for NO_2 and 359 stations PM_{10} for residential / commercial / industrial / rural area. The total number of stations considered for NO_2 and PM_{10} were 402 and SO_2 was 401 as the data for Byrnihat, Meghalaya in case of SO_2 was outlier. Therefore, it was not considered. In case of Ecologically Sensitive Area adequate data was received from 25 stations for SO_2, 24 stations for NO_2 and 26 stations for PM_{10}. The total number of stations considered were 31 for each parameter. The detail of number of stations for which data was adequate or inadequate is given in Table 2.2.

Table 2.2: Details of data generated during 2010

Data type	Number of monitoring stations					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Adequate data	360	362	359	25	24	26
Inadequate data	38	37	42	4	5	5
No data	3	3	1	2	2	0
Total monitoring stations	401	402	402	31	31	31

Key: Adequate data: locations where ≥50 days of monitoring was done in a year; Indequate data: locations < 50 days of monitoring was done in a year; No data: Monitoring not done or data not received for the particular parameter

2.2 Number of locations / monitoring stations with low, moderate, high and critical pollution level of air pollution

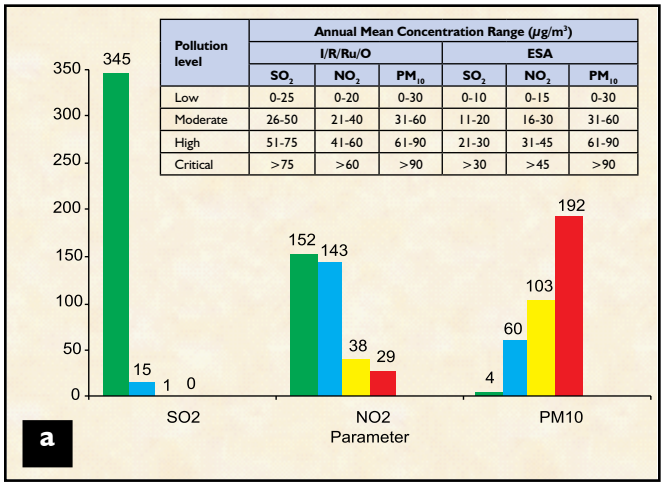
The analysis of three criteria pollutants (adequate data) with respect to National Ambient Air Quality Standards (NAAQS) during 2010 revealed that SO_2 showed low concentration in most of the locations (345 locations, 96%), moderate in 15 locations (4%) and high in 1 location. With respect to NO_2, 152 locations (42%) were in low category, 143 in moderate (40%), 38 in high (10%) and 29 (8%) in critical category. With respect to PM_{10} only 4 locations (1%) showed low PM_{10} level, 60 locations (17%) showed moderate, 103 high (29%) and 192 location (53%) were in critical category. Table 2.3, Figure 2.1a shows categorization of locations according to low, moderate, high and critical level of pollutants in residential / industrial / commercial / rural and other Figure 2.1b shows the same in ecologically sensitive areas. Locations at sensitive zones also showed more or less a similar trend. SO_2 mainly showed low concentration in most of the locations (16 locations, 64%)) and moderate in 9 locations (36%). There was no cities in high or critical range. With respect to NO_2, 12 locations (50%) were in low category, 8 in moderate (33%) and 4 in high (17%). In case of PM_{10} no location showed low PM_{10} level. 9 (35%) locations showed moderate and 1 (4%) high and 16 (62%) locations were in critical category. Table 2.3, Figure 2.2 gives a picture of percentage of locations according to low, moderate, high and critical level of pollutants in both residential / industrial / commercial / rural and other and sensitive areas.

Table 2.3: Number of locations with low, moderate, high & critical air quality (residential/industrial/commercial/rural and sensitive)

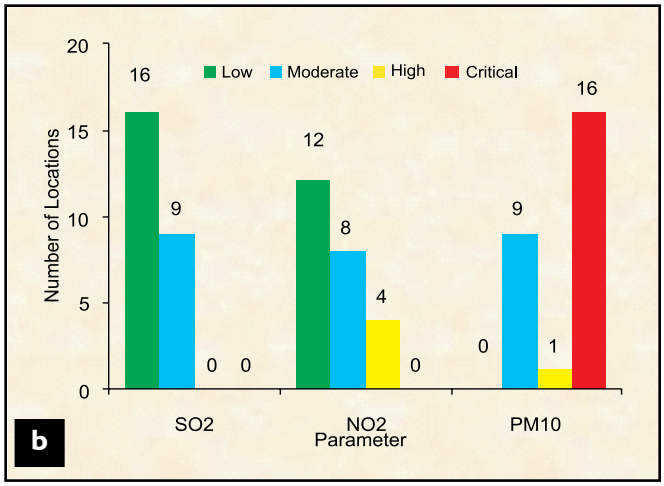
Category	Number of monitoring stations					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low (L)	345 (96)	152 (42)	4 (1)	16 (64)	12 (50)	0 (0)
Moderate (M)	15 (4)	143 (40)	60 (17)	9 (36)	8 (33)	9 (35)
High (H)	1 (0.3)	38 (10)	103 (29)	0 (0)	4 (17)	1 (4)
Critical (C)	0 (0)	29 (8)	192 (53)	0 (0)	0 (0)	16 (62)
Inadequate data (ID)	38	37	42	4	5	5
No monitoring (NM)	3	3	1	2	2	0
Total locations (LMHC)	**361**	**362**	**359**	**25**	**24**	**26**
Grand total (L/M/H/C/IA/NM)	**401**	**402**	**402**	**31**	**31**	**31**

NB. *Low, moderate, high, critical classification based on Pollution Level Classification,Chapter 2,Table 2. Figures in parenthesis represent percentage of stations in a particular category.*

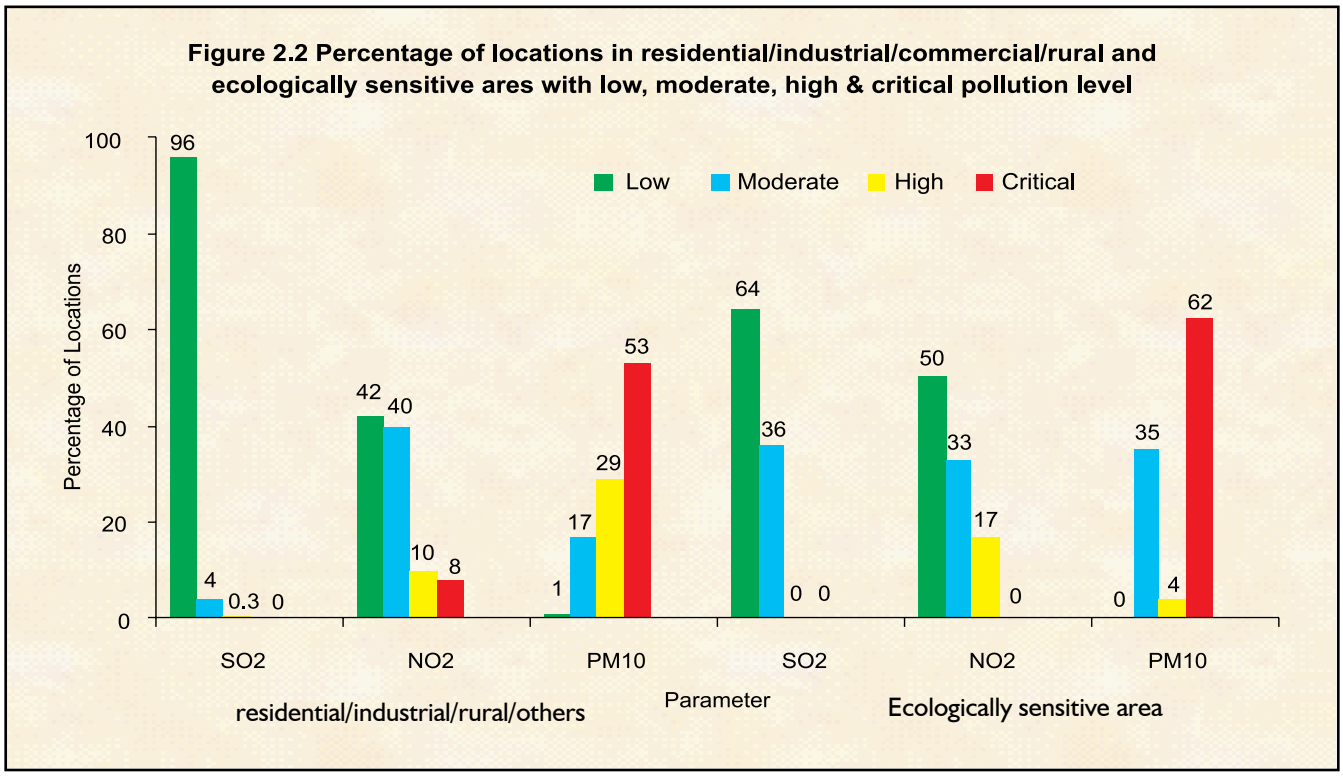
Figure 2.1 a,b: a.Number of locations with low, moderate, high & critical pollution level in a. residential/industrial/commercial/rural b. ecologically sensitive ares



Residential/Industrial/Rural/Others



Ecologically sensitive area



2.3 Number of cities with low, moderate, high and critical pollution levels in the country

The analysis of three pollutants was done in 167 (SO_2) and 168 (NO_2 and PM_{10}) cities of residential / industrial / commercial / rural and other areas. In case of ecologically sensitive area analysis of three pollutants was done in 13 cities for the three parameters. Data with number of monitoring days less than 50 has also been considered with respect to all the parameters. Data for 2010 for residential / industrial / commercial / rural and other areas revealed that 153 cities fall uner low category and 10 under moderate category 1 (Lote in Maharashtra) under high category with respect to Sulphur dioxide (SO_2). NO_2 pollution levels if considered time weighted annual average

concentrations indicated that 83 cities are under the low category, 63 under moderate, 10 under high and 9 cities in the critical category. PM_{10} in indicated that 2 cities fall under low category, 35 cities in moderate category, 47 cities in high pollution levels category and 83 cities in critical category. The number of cities with low, moderate, high and critical categories are depicted in Table 2.4, Figure 2.3. Figure 2.4 shows the percentage of cities in low, moderate, high and critical categories

Table 2.4: Number of cities with low, moderate, high & critical air quality

Category	Number of cities					
	Cities with Residential/industrial/ rural/commercial areas			Cities with sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low	153 (93)	83 (50)	2 (1)	9 (75)	6 (50)	0
Moderate	10 (6)	63 (38)	35 (21)	2 (17)	5 (42)	3 (23)
High	1 (1)	10 (6)	47 (28)	1 (8)	1 (8)	3 (23)
Critical	0	9 (5)	83 (50)	0	0	7 (54)
No monitoring	3	3	1	1	1	0
Total cities (LMHC)	164	165	167	12	12	13
Grand total (L/M/H/C/NM)	167	168	168	13	13	13

NB. *Low, moderate, high, critical classification based on Pollution Level Classification,Chapter 2,Table 2.1Figures within parenthesis represent percentage*

Figure 2.3: Number of cities with low, moderate, high & critical pollution level (residential / industrial / rural / other area)

Pollution level	Annual Mean Concentration Range (µg/m³) Industrial, Residential, Rural & other areas		
	SO_2	NO_2	PM_{10}
Low (L)	0-25	0-20	0-30
Moderate (M)	26-50	21-40	31-60
High (H)	51-75	41-60	61-90
Critical (C)	>75	>60	>90

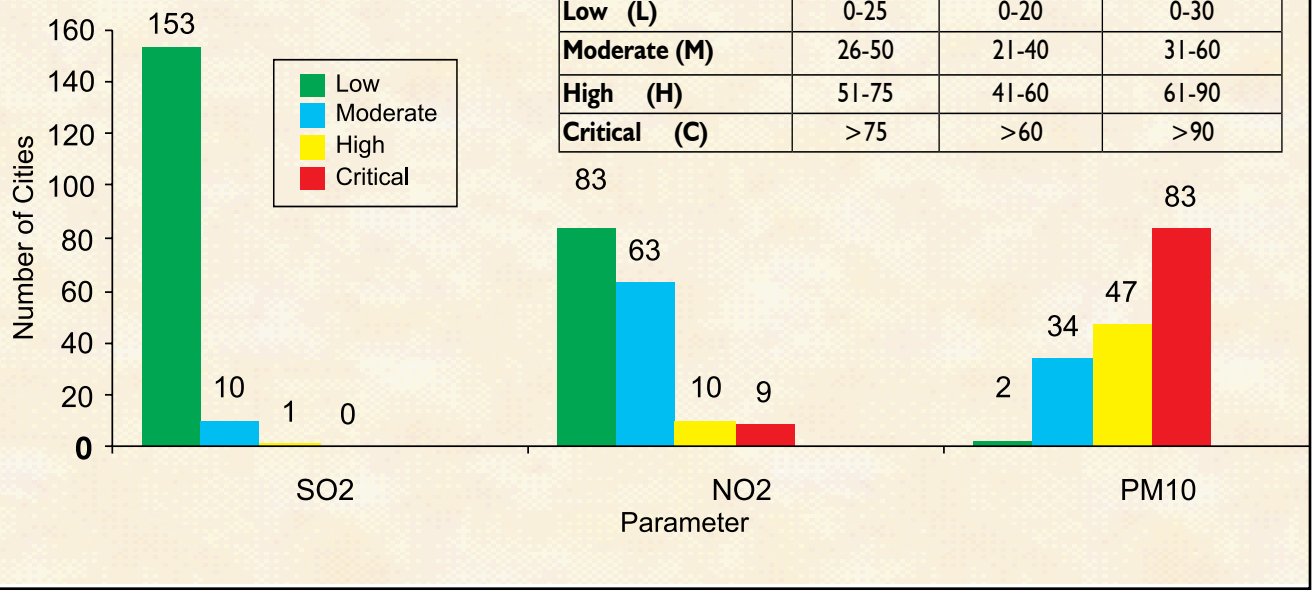


Figure 2.4: Percentage of cities showing low, moderate, high and critical level of SO_2, NO_2 and PM_{10} (residential / industrial / rural / other area)

Figure 2.4a: Percentage of cities showing low, moderate, high and critical level of SO2

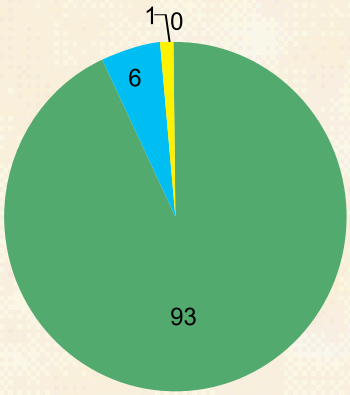


Figure 2.4b : Percentage of cities showing low, moderate, high and critical level of NO2

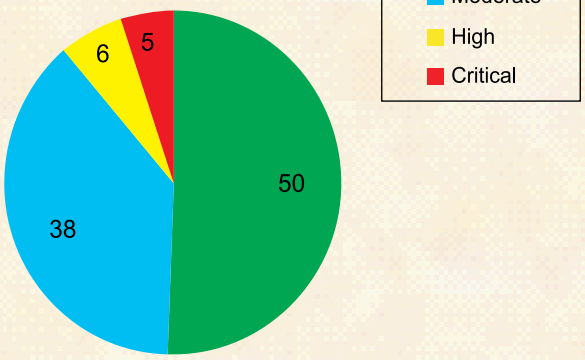
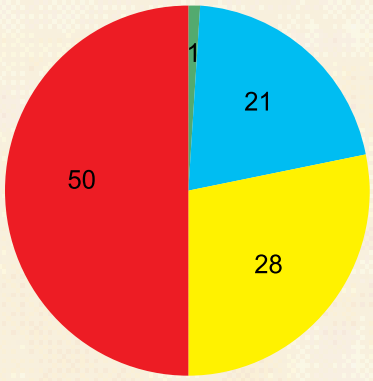


Figure 2.4c: Percentage of cities showing low, moderate, high and critical level PM10



Pollution level	Annual Mean Concentration Range ($\mu g/m^3$) Industrial, Residential, Rural & other areas		
	SO_2	NO_2	RSPM
Low (L)	0-25	0-20	0-30
Moderate (M)	26-50	21-40	31-60
High (H)	51-75	41-60	61-90
Critical (C)	>75	>60	>90

Annual average in each city and its catagorization for different pollutant is represented in Table 2.5 represent the. Close examination of Table 2.5 indicates that:

- Cities like Badlapur and Ulhasnagar (Maharashtra), Asansol, Durgapur, Barrackpur, Howrah, Kolkata Raniganj and Sankrail (West Bengal) are critical with respect to both NO_2 and PM_{10}
- State capital cities like Patna, Raipur, Delhi Ahmedabad, Ranchi, Bhopal, Mumbai, Amritsar, Jaipur, Lucknow, and Kolkata are critical with respect to PM_{10}
- Industrial cities like Bhilai, Korba, Ahmedabad, Faridabad, Jamshedpur, Jharia, Sindri, Ludhiana, Muradabad, Rourkela, Indore, Kota, Kanpur, Asansol, Durgapur, Howrah are critical with respect to PM_{10}

Table 2.5: a. Ambient Air Quality in different cities for the year 2010
(residential / industrial / rural / others & ecologically sensitive areas)

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Andhra Pradesh	Chitoor	RIRuO		4	L	9	L	39	M
	Guntur	RIRuO		2	L	11	L	81*	H
	Hydrabad	RIRuO		5	L	24	M	79*	H
	Kothagudem	RIRuO		2	L	11	L	62*	H
	Kurnool	RIRuO		4	L	9	L	85*	H
	Nalgonda	RIRuO		5	L	23	M	85*	H
	Nellore	RIRuO		2	L	12	L	65*	H
	Patencheru	RIRuO		11	L	23	M	76*	H
	Ramagundam	RIRuO		4	L	12	L	68*	H
	Tirupati	RIRuO		4	L	9	L	37	M
	Vijaywada	RIRuO		6	L	14	L	93*	C
	Warangal	RIRuO		4	L	10	L	52	M
	Vishakhapatnam	RIRuO		7	L	16	L	71*	H
Assam	Bongaigaon	RIRuO		6	L	15	L	58	M
	Daranga	RIRuO		5	L	14	L	58	M
	Dibrugarh	RIRuO		6	L	14	L	38	M
	Golaghat	ES	Numaligarh	6	L	15	L	73*	C
	Guwahati	RIRuO		7	L	15	L	94*	C
	Lakhimpur	RIRuO		6	L	15	L	76*	H
	Nagaon	RIRuO		6	L	14	L	103*	C
	Nalbari	RIRuO		7	L	16	L	68*	H
	Sibsagar	RIRuO		6	L	14	L	59	M
	Silchar	RIRuO		6	L	16	L	81*	H
	Tezpur	RIRuO		6	L	13	L	68*	H
	Tinsukia	RIRuO		7	L	16	L	58	M
Bihar	Patna	RIRuO		7	L	40	M	181*	C
Chandigarh	Chandigarh	RIRuO		2	L	16	L	92*	C
Chattisgarh	Bhillai	RIRuO		9	L	22	M	109*	C
	Bilaspur	RIRuO		8	-	19	-	-	-
	Korba	RIRuO		13	L	21	M	104*	C
	Raipur	RIRuO		15	-	43*	-	289*	C
Dadra & Nagar Haveli	Silvassa	RIRuO		7	L	18	L	39	M

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Daman & Diu	Daman	RIRuO		7	L	18	L	35	M
Delhi	Delhi	RIRuO		5	L	55*	H	261*	C
Goa	Panaji	RIRuO		4	L	17	L	85*	H
	Marmagao	RIRuO		32	M	18	L	59	M
	Vasco	RIRuO		6	L	19	L	61*	H
	Curchorem	RIRuO		32	-	17	-	38	-
	Codli	RIRuO		10	-	27	-	90*	-
	Bicholim	RIRuO		9	-	50*	-	89*	-
	Amona	RIRuO		6	-	18	-	55	-
	Assanora	RIRuO		5	-	16	-	71*	-
	Honda	ES	Sahyadri	8	L	25	M	100*	C
	Usgao	RIRuO		6	-	10	-	245*	-
Gujarat	Ahmedabad	RIRuO		15	L	21	M	95*	C
	Anklesvar	RIRuO		16	L	24	M	77*	H
	Jamnagar	RIRuO		12	L	27	M	104*	C
	Rajkot	RIRuO		13	L	17	L	96*	C
	Surat	RIRuO		16	L	24	M	76*	H
	Vadodara	RIRuO		17	L	29	M	93*	C
	Vapi	RIRuO		16	L	24	M	80*	H
Haryana	Faridabad	RIRuO		18	L	29	M	164*	C
	Hissar	RIRuO		8	-	8	-	95*	-
	Yamunanagar	RIRuO		12	L	26	M	261	C*
Himachal Pradesh	Baddi	RIRuO		3	L	16	L	105*	C
	Damtal	RIRuO		2	L	11	L	68*	H
	Kala Amb	RIRuO		3	L	18	L	79*	H
	Nalagarh	RIRuO		3	L	18	L	86*	H
	Parwanoo	RIRuO		3	L	12	L	84*	H
	Paonta Sahib	RIRuO		3	L	17	L	135*	C
	Shimla	ES	Hill station	3	L	13	L	58	M
Jammu & Kashmir	Jammu	RIRuO		7	L	15	L	115*	C

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Jharkhand	Dhanbad	RIRuO		15	L	36	M	184*	C
	Jamshedpur	RIRuO		35	M	48*	H	153*	C
	Jharia	RIRuO		17	L	38	M	237*	C
	Ranchi	RIRuO		19	L	35	M	172*	C
	Saraikela Kharsawan	RIRuO		35	M	45*	H	169*	C
	Sindri	RIRuO		16	-	37	-	174*	-
	West Singhbhum	RIRuO		21	L	32	M	302*	C
Karnataka	Bangalore	RIRuO		14	L	31	M	89*	H
	Belgaum	ES	Sahyadri	2	L	15	L	33	M
	Gulburga	RIRuO		9	L	13	L	65*	H
	Hassan	RIRuO		5	L	22	M	45	M
	Hubli-Dharwad	RIRuO		5	L	13	L	92*	C
	Mangalore	RIRuO		6	L	8	L	48	M
	Mysore	RIRuO		10	L	28	M	44	M
Kerala	Alappuzha	RIRuO		2	L	5	L	44	M
	Kochi	RIRuO		4	L	17	L	61*	H
	Kollam	RIRuO		3	L	15	L	47	M
	Kottayam	RIRuO		6	L	19	L	47	M
	Kozhikode	RIRuO		2	L	9	L	42	M
	Malapuram	RIRuO		2	L	5	L	30	L
	Palakkad	RIRuO		3	L	6	L	32	M
	Pathanamthitta	RIRuO		2	L	13	L	27	L
	Thissur	RIRuO		2	L	7	L	31	M
	Wayanad	RIRuO		2	L	12	L	46	M
	Trivandrum	RIRuO		9	L	24	M	56	M
Madhya Pradesh	Bhopal	RIRuO		9	L	18	L	133*	C
	Dewas	RIRuO		12	L	18	L	85*	H
	Gwalior	RIRuO		12	L	20	L	308*	C
	Indore	RIRuO		14	L	18	L	120*	C
	Jabalpur	RIRuO		2	-	25	-	135*	-
	Nagda	RIRuO		19	L	24	M	95*	C
	Sagar	RIRuO		4	L	17	L	66*	-
	Satna	RIRuO		3	L	6	L	194*	C
	Singrauli	RIRuO		15	-	19	-	59	-
	Ujjain	RIRuO		12	L	13	L	80*	H

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Maharashtra	Amravati	RIRuO		12	L	14	L	118*	C
	Aurangabad	RIRuO		6	L	21	M	75*	H
	Badlapur	RIRuO		32	M	73*	C	112*	C
	Chandrapur	RIRuO		26	M	26	M	152*	C
	Jalgaon	RIRuO		17	L	45*	H	122*	C
	Kolhapur	ES	Sahyadri	15	M	22	M	83*	H
	Latur	RIRuO		8	L	16	L	106*	C
	Lote	RIRuO		60*	-	30	-	119*	-
	Pune	RIRuO		29	M	39	M	82*	H
	Mahad	RIRuO		19	L	38	M	93*	C
	Mumbai	RIRuO		4	L	19	L	97*	C
	Nagpur	RIRuO		7	L	33	M	113*	C
	Nashik	RIRuO		21	L	26	M	76*	H
	Navi Mumbai	RIRuO		20	L	39	M	113*	C
	Roha	RIRuO		16	L	34	M	89*	H
	Sangli	RIRuO		14	L	27	M	62*	H
	Solapur	RIRuO		17	L	35	M	66*	H
	Thane	RIRuO		14	L	14	L	50	M
	Ulhasnagar	RIRuO		31	M	68*	C	106*	C
Meghalaya	Byrnihat	RIRuO		-	-	15	L	175*	C
	Dawki	RIRuO		2	L	6	L	71*	H
	Shillong	ES	Hill station	2	L	10	L	79*	H
	Tura	RIRuO		2	-	9	-	63*	-
Mizoram	Aizawl	Hill station		2	L	6	L	42	M
Nagaland	Dimapur	RIRuO		2	L	7	L	76*	H
Nagaland	Kohima	ES	Hill station	2	L	5	L	66*	H
Orissa	Angul	RIRuO		7	L	21	M	110*	C
	Balasore	RIRuO		2	L	12	L	73*	H
	Berhampur	RIRuO		2	L	13	L	58	M
	Bhubneshwar	RIRuO		2	L	18	L	84*	H
	Cuttack	RIRuO		2	L	21	M	74*	H
	Rayagada	RIRuO		2	L	20	L	58	M
	Rourkela	RIRuO		5	L	11	L	105*	C
	Sambalpur	RIRuO		3	L	15	L	50	M
	Talcher	RIRuO		12	L	23	M	116*	C

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Punjab	Amritsar	RIRuO		14	L	36	M	219*	C
	Bhatinda	RIRuO		9	L	21	M	216*	C
	Dera Bassi	RIRuO		10	L	23	M	162*	C
	Pathankot/Dera Baba	RIRuO		7	L	14	L	76*	H
	Gobindgarh	RIRuO		18	L	35	M	224*	C
	Jalandar	RIRuO		11	-	29	-	144*	-
	Khanna	RIRuO		9	L	31	M	231*	C
	Ludhiana	RIRuO		9	L	32	M	214*	C
	Naya Nangal	RIRuO		7	L	16	L	94*	C
	Patiala	RIRuO		7	L	20	L	143*	C
Puducherry	Puducherry	RIRuO		6	L	13	L	38	M
Rajasthan	Alwar	ES	Aravali range	8	L	24	M	225*	C
	Jaipur	RIRuO		6	L	37	M	164*	C
	Jodhpur	RIRuO		6	L	22	M	181*	C
	Kota	RIRuO		10	L	29	M	132*	C
	Udaipur	RIRuO		6	L	34	M	116*	C
Tamilnadu	Chennai	RIRuO		9	L	15	L	59	M
	Coimbatore	RIRuO		5	L	27	M	78*	H
	Madurai	RIRuO		11	L	25	M	47	M
	Salem	RIRuO		8	L	26	M	85*	H
	Tuticorin	RIRuO		12	L	12	L	119*	C
Uttar Pradesh	Agra	ES	Taj-trapezi-um	5	L	20	M	185*	C
	Allahabad	RIRuO		4	L	24	M	218*	C
	Anpara	RIRuO		17	L	28	M	128*	C
	Ferozabad	ES	Taj-trapezi-um	16	M	33	H	214*	C
	Gajraula	RIRuO		16	L	22	M	87*	H
	Ghaziabad	RIRuO		30	M	37	M	290*	C
	Jhansi	RIRuO		9	L	25	M	118*	C
	Kanpur	RIRuO		7	L	34	M	203*	C
	Khurja	RIRuO		29	M	27	M	173*	C
	Lucknow	RIRuO		8	L	34	M	204*	C
	Meerut	RIRuO		8	L	47*	H	166*	C
	Muradabad	RIRuO		11	-	21	-	195*	-
	Noida	RIRuO		11	L	46*	H	132*	C
	Varanasi	RIRuO		18	L	20	L	127*	-

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Uttarakhand	Dehradun	ES	Doon valley	28*	H	30	M	162*	C
	Haldwani	RIRuO		-	-	-	-	196*	-
	Haridwar	RIRuO		-	-	-	-	139*	-
	Kashipur	RIRuO		-	-	-	-	46	-
	Rishikesh	ES	Hill station	-	-	-	-	212*	C
West Bengal	Asansol	RIRuO		8	L	66*	C	141*	C
	Barrackpore	RIRuO		12	L	74*	C	121*	C
	Durgapur	RIRuO		8	L	66*	C	141*	C
	Haldia	RIRuO		14	L	52*	H	57	M
	Howrah	RIRuO		12	L	75*	C	118*	C
	Kolkata	RIRuO		11	L	62*	C	99*	C
	Raniganj	RIRuO		8	L	63*	C	159*	C
	Sankrail	RIRuO		10	L	65*	C	100*	C
	South Suburban	RIRuO		7	L	56*	H	82*	H

L: Low, M: Moderate, H: High, C: Critical; Low, moderate, high, critical classification based on Pollution Level Classification, Chapter 2,Table 2.1;

'-' No monitoring:Monitoring not conducted; - exceeding NAAQS; Data of monitoring stations with monitoring days less than 50 hasalso been considered For LMHC classification cities with monitoring days only ≥50 has been considered.*

Table 2.5: b. Ambient Air Quality in different cities for the year 2010

(ecologically sensitive areas)

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Assam	Golaghat	ES	Numaligarh	6	L	15	L	73*	C
Goa	Honda	ES	Sahyadri	8	L	25	M	100*	C
Himachal Pradesh	Shimla	ES	Hill station	3	L	13	L	58	M
Karnataka	Belgaum	ES	Sahyadri	2	L	15	L	33	M
Maharashtra	Kolhapur	ES	Sahyadri	15	M	22	M	83*	H
Meghalaya	Shillong	ES	Hill station	2	L	10	L	79*	H
Mizoram	Aizawl	ES	Hill station	2	L	6	L	42	M

State	City	Type of station	Category of ESA	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Nagaland	Kohima	ES	Hill station	2	L	5	L	66*	H
Rajasthan	Alwar	ES	Aravali range	8	L	24	M	225*	C
Uttar Pradesh	Agra	ES	Taj-trapezium	5	L	20	M	185*	C
	Ferozabad	ES	Taj-trapezium	16	M	33	H	214*	C
Uttarakhand	Dehradun	ES	Doon valley	28*	H	30	M	162*	C
	Rishikesh	ES	Hill station	-	-	-	-	212*	C

L: Low, M: Moderate, H: High, C: Critical; Low, moderate, high, critical classification based on Pollution Level Classification, Chapter 2,Table 2.1;'-' No monitoring:Monitoring not conducted;- exceeding NAAQS; Data of monitoring stations with monitoring days less than 50 has also been considered.*

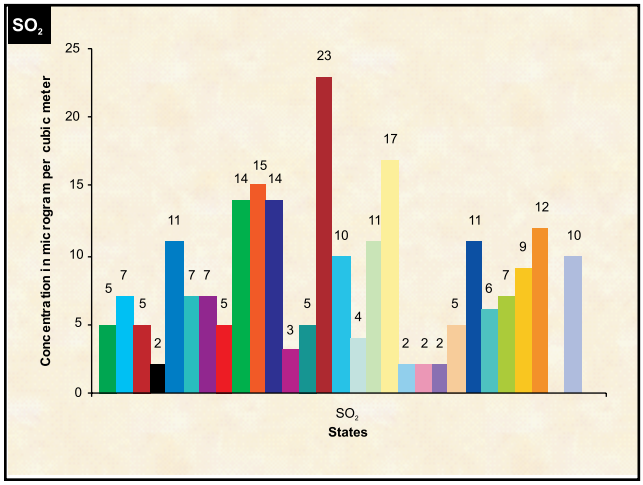
2.4 Annual average concentration of pollutants in different States and Union territories

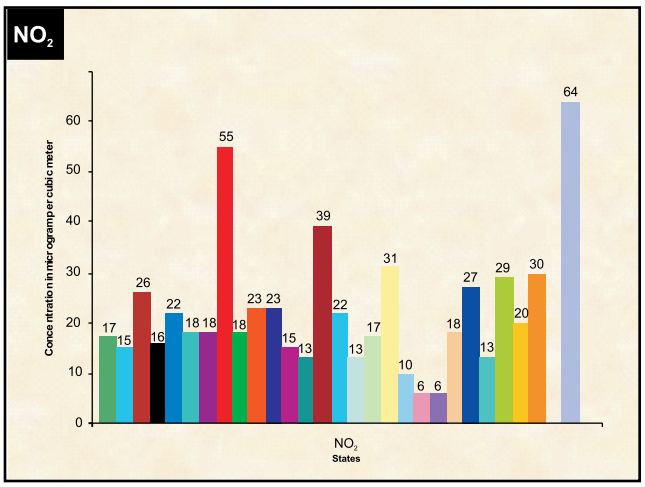
The analysis of three pollutants (combining residential/industrial/rural/other and sensitive area; only data with number of monitoring days greater than or equal to 50 days has been considered) during 2010 in each state revealed that with respect to SO_2 Jharkhand had the maximum annual average concentration (23 $\mu g/m^3$) followed by Maharashtra (17 $\mu g/m^3$). With respect to NO_2 West Bengal had the maximum annual average concentration (64 $\mu g/m^3$) followed by Delhi (55 $\mu g/m^3$). With respect to PM_{10} Delhi had the maximum annual average concentration (261 $\mu g/m^3$) followed by Jharkhand (193 $\mu g/m^3$). Table 2.6 shows the top 2 states with highest criteria pollutants and Table 2.7, Figure 2.5 shows the annual average concentration of states in India.

Table 2.6: The states having high annual averages of criteria pollutants

SO_2		NO_2		PM_{10}	
State	Conc. $\mu g/m^3$	State	Conc. $\mu g/m^3$	State	Conc. $\mu g/m^3$
Jharkhand	23	West Bengal	64	Delhi	261
Maharashtra	17	Delhi	55	Jharkhand	193

Figure 2.5: Annual average concentration in States and UTs of India





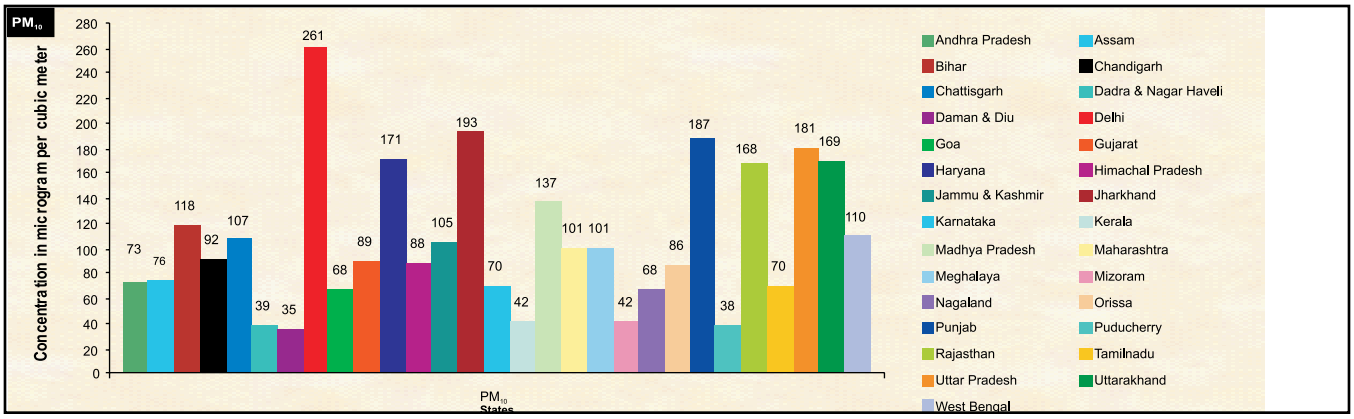


Table 2.7: Annual average concentration of criteria pollutants in states

(residential/industrial/rural/other and sensitive area)

States & Union territories	SO_2		NO_2		PM_{10}	
	Annual average ($\mu g/m^3$)	Standard deviation	Annual average ($\mu g/m^3$)	Standard deviation	Annual average ($\mu g/m^3$)	Standard deviation
Andhra Pradesh	5	2	17	4	73	24
Assam	7	1	15	2	76	51
Bihar	5	2	26	9	118	80*
Chandigarh	2	0	16	7	92	56
Chattisgarh	11	1	22	2	107	14
Dadra & Nagar Haveli	7	0	18	1	39	27
Daman & Diu	7	0	18	1	35	21
Delhi	5	2	55	13	261	130*
Goa	14	15	18	10	68	36
Gujarat	15	3	23	3	89	15
Haryana	14	4	23	6	171	73*
Himachal Pradesh	3	1	15	4	88	39
Jammu & Kashmir	5	2	13	4	105	41
Jharkhand	23	3	39	4	193	67*
Karnataka	10	6	22	5	70	35
Kerala	4	1	13	3	42	16
Madhya Pradesh	11	6	17	6	137	57
Maharashtra	17	7	31	11	101	40
Meghalaya	2	1	10	4	101	15
Mizoram	2	0	6	1	42	10
Nagaland	2	0	6	2	68	42
Orissa	5	1	18	3	86	25
Punjab	11	2	27	5	187	37
Puducherry	6	2	13	3	38	12
Rajasthan	7	2	29	6	168	99*
Tamilnadu	9	3	20	8	70	39
Uttar Pradesh	12	6	30	11	181	111*
Uttarakhand	-	-	-	-	169	36
West Bengal	10	4	64*	19	110	70*

NB. *'-' inadequate data *-exceeding NAAQS , Data of monitoring stations with monitoring days greater than or equal to 50 has been considered*

2.5 Exceedence of pollutants from National ambient Air Quality Standard

2.5.1. Locations exceeding NAAQS

Number of monitoring stations (with adequate data) exceeding NAAQS is presented in Table 2.8, Figure 2.6. For residential/industrial/rural area, taking annual average into considerration, 67 stations (for NO_2) and 295 stations (for PM_{10}) exceed NAAQS. No location exceedes NAAQS for SO_2. Considering 24-hourly average data into consideration, 11 stations (for SO_2), 57 stations (for NO_2) and 241 stations (for PM_{10}) exceed NAAQS. For sensitive area, considering annual average into consideration, 4 stations (for NO_2) and 17 stations (for PM_{10}) stations exceed NAAQS. Considering 24-hourly average data, 19 stations (for SO_2), 54 stations (for NO_2), and 316 stations (for PM_{10}) exceed NAAQS for residential/industrial/rural area.

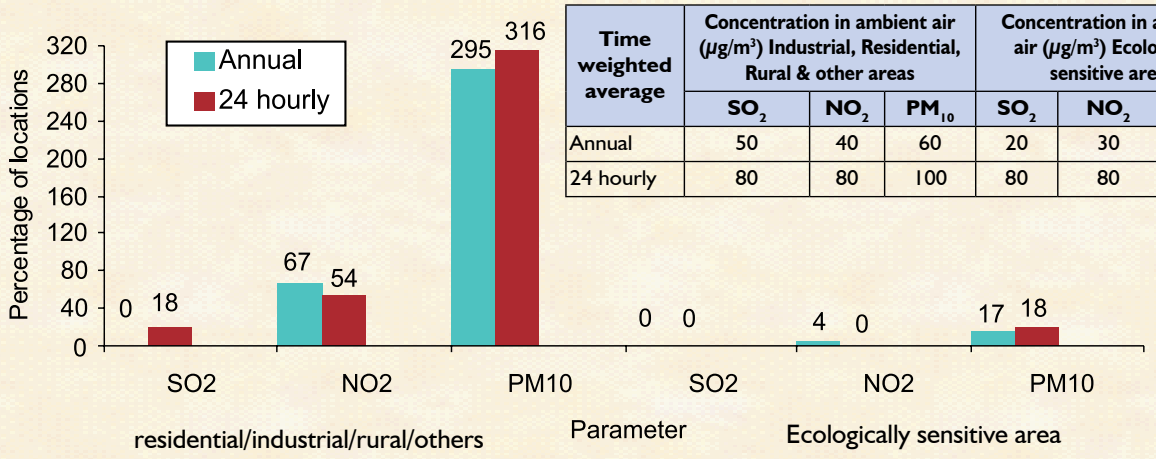
Table 2.8. Number of locations exceeding the NAAQS

(Based on annual average data and 24-hourly data in $\mu g/m^3$)

	Residential/Industrial/Rural area						Sensitive area					
	SO_2		NO_2		PM_{10}		SO_2		NO_2		PM_{10}	
	Annual >50	24 hourly >80	Annual >40	24 hourly >80	Annual >60	24 hourly >100	Annual >20	24 hourly >80	Annual >30	24 hourly >80	Annual >60	24 hourly >100
Not exceeding NAAQS	360	342	295	308	64	43	25	25	20	24	9	8
Exceeding NAAQS	0	18	67	54	295	316	0	0	4	0	17	18
Inadequate data	38	38	37	37	42	42	4	4	5	5	5	5
No monitoring	3	3	3	3	1	1	2	2	2	2	0	0
Total (NE & E)	360	360	362	362	359	359	25	25	24	24	26	26
Grand total stations	401	401	402	402	402	402	31	31	31	31	31	31

NB. *NE/E: not exceedingNAAQS / exceeding the NAAQS*

Figure 2.6: Locations exceeding NAAQS in residential/industrial/rural and sensitive areas



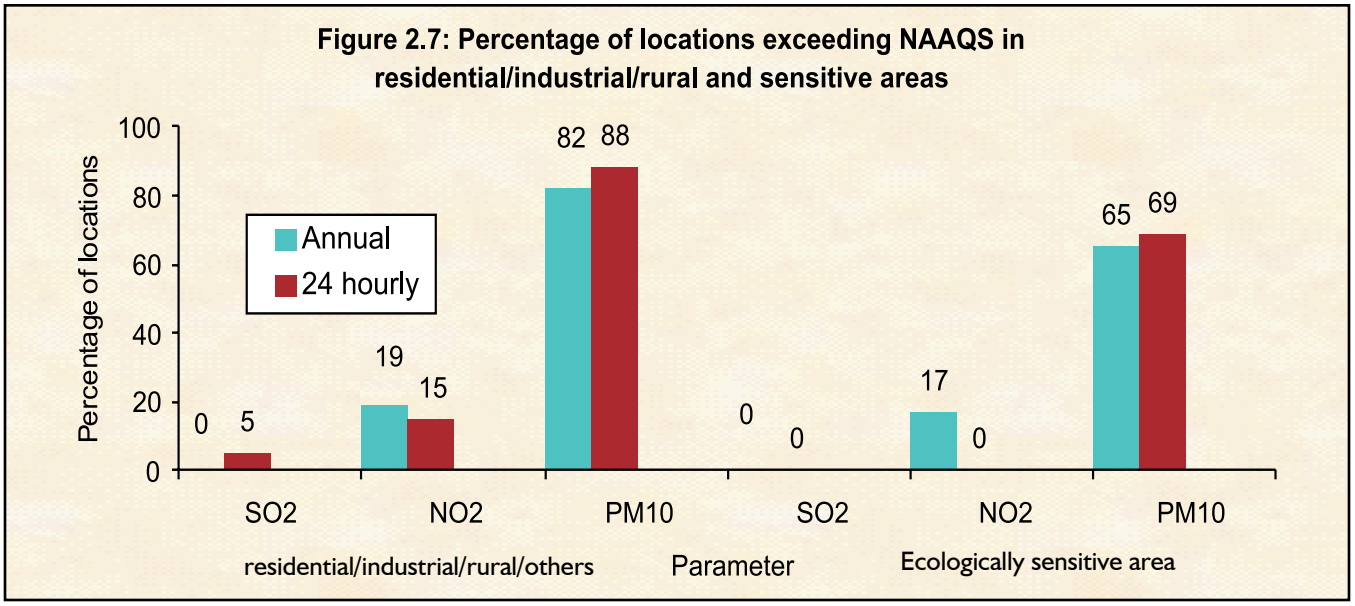
Time weighted average	Concentration in ambient air ($\mu g/m^3$) Industrial, Residential, Rural & other areas			Concentration in ambient air ($\mu g/m^3$) Ecologically sensitive areas		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Annual	50	40	60	20	30	60
24 hourly	80	80	100	80	80	100

The percentage of locations exceeding national standards with respect to NO_2, SO_2 and PM_{10} is depicted in Table 2.9, Figure 2.7. For residential/industrial/rural area, considering annual average no location for SO_2, 19% station (for NO_2) and 82% (PM_{10}) stations exceed NAAQS. Considering 24-hourly average data into consideration, 5% station (for SO_2), 15% (NO_2) stations and 88% stations (PM_{10}) exceed NAAQS. In case of sensitive area considering annual average into 17% station (for NO_2) and 65% (PM_{10}) stations exceed NAAQS. Considering 24-hourly average data into consideration, 69% station (PM_{10}) exceed NAAQS. SO_2 does not exceed the standard for both annual average and 24-hourly data and NO_2 does not exceed taking 24-hourly data into consideration.

Table 2.9: Percentage of locations exceeding the NAAQS

(Based on annual average data and 24-hourly data in $\mu g/m3$)

% of locations	Residential/Industrial/Rural area						Sensitive area					
	SO_2		NO_2		PM_{10}		SO_2		NO_2		PM_{10}	
	Annual >50	24 hourly >80	Annual >40	24 hourly >80	Annual >60	24 hourly >100	Annual >20	24 hourly >80	Annual >30	24 hourly >80	Annual >60	24 hourly >100
Not exceeding NAAQS	100	95	81	85	18	12	100	100	83	100	35	31
Exceeding NAAQS	0	5	19	15	82	88	0	0	17	0	65	69



Number and percentage of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of PM_{10} is depicted in Table 2.10. The percentage exceedence of NAAQS for residential/industrial/rural/ other area was less than 2% at 353 (88%) monitoring stations for SO_2, 313 (78%) monitoring stations for NO_2 and 50 (12%) monitoring stations for PM_{10} out of 402 stations. Therefore it can be mentioned that considering daily average values the exceedence from NAAQS for SO_2 was minimum followed by NO_2 and was maximum for PM_{10}. (Figure 2.8). As for sensitive areas was less than 2% at 25 (81%) monitoring stations for SO_2 and NO_2 and 1 (7%) monitoring stations for PM_{10} out of 14 stations (Figure 2.9).

Table 2.10: Number and percentage of locations in different ranges of percent exceedance

Ranges of percent exceedence	Residential/Industrial/rural/other area						Sensitive area					
	SO_2		NO_2		PM_{10}		SO_2		NO_2		PM_{10}	
	no.of station	% of station	no.of station	% of station	no.of station	% of station	no.of station	% of station	no.of station	% of station	no.of station	% of station
<2	352	98	313	86	50	14	25	100	24	100	8	31
2-5	4	1	14	4	19	5	0	0	0	0	0	0
6-25	3	1	20	6	64	18	0	0	0	0	3	12
26-50	1	0	15	4	83	23	0	0	0	0	2	8
51-75	0	0	0	0	56	16	0	0	0	0	5	19
>75	0	0	0	0	87	24	0	0	0	0	8	31
Total (NE/E)	360	100	362	100	359	100	25	100	24	100	26	100

NB. *NE/E: not exceeding/exceeding the NAAQS*

Figure 2.8: Number of monitoring stations in various ranges of percent exceedence for SO2, NO2 and PM10 in residential/industrial/rural/other area

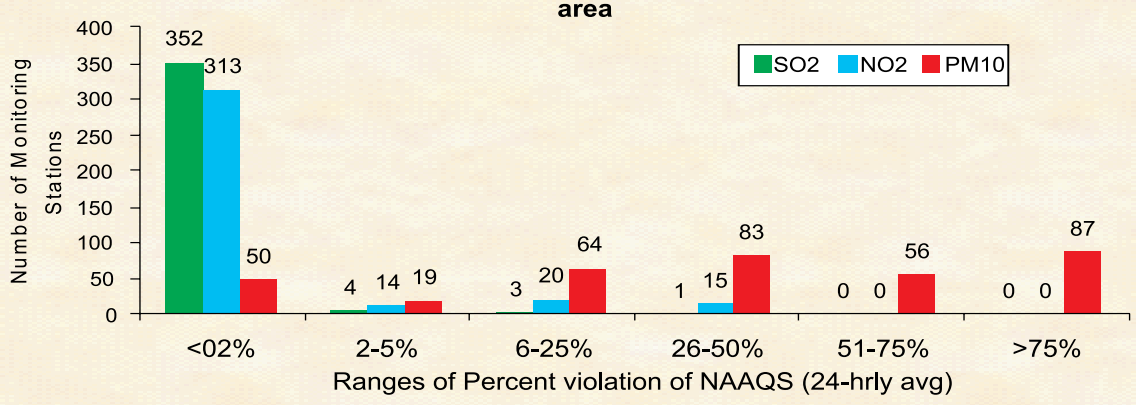
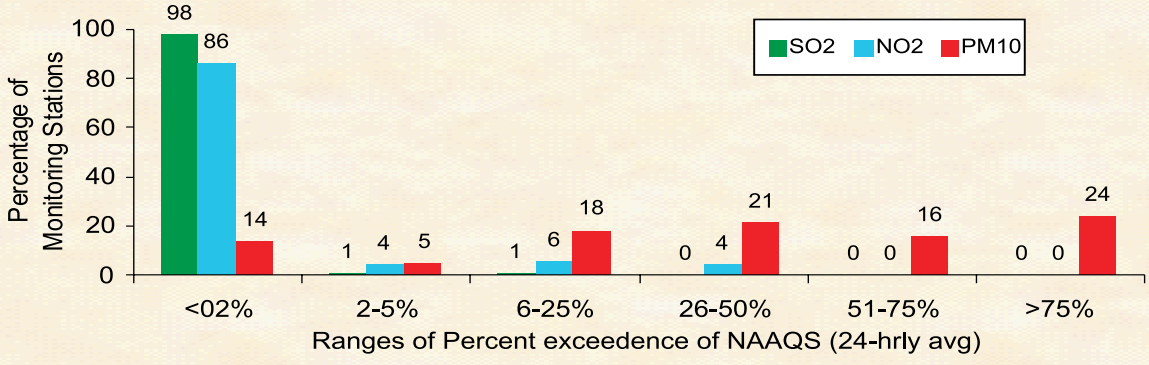


Figure 2.9: Percentage of monitoring stations in various ranges of percent exceedence for SO2, NO2 and PM10 in 10 in residential/industrial/rural/other



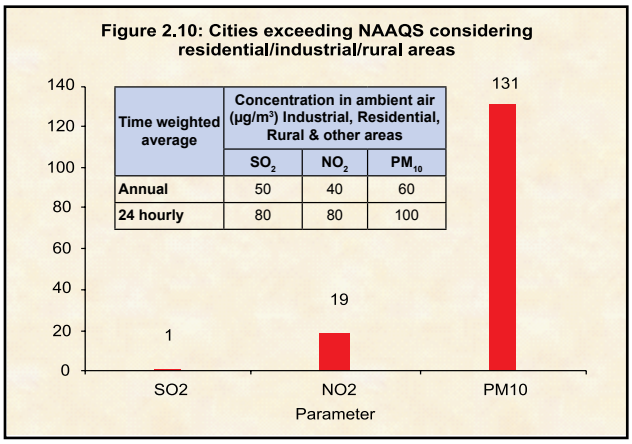
2.5.2. Cities exceeding NAAQS

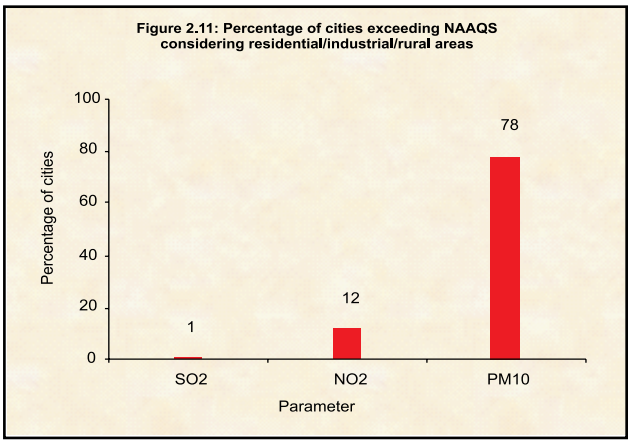
Number and percentage of cities exceeding NAAQS is presented in Table 2.11, Figure 2.10 and 2.11. Considering residential/ industrial/rural area, 2 cities (1% for SO_2), 19 cities (12% for NO_2) and 131 cities (78% for PM_{10}) exceed NAAQS. Considering sensitive area, 1 (8%) cities exceed NAAQS for SO_2 and NO_2 and 10 (77%) exceed for PM_{10} respectively.

Table 2.11. Number of cities exceeding the NAAQS
(Based on annual average data)

	Residential/Industrial/Rural area			Ecologically sensitive area		
	SO_2 >50	NO_2 >40	PM_{10} >60	SO_2 >20	NO_2 >30	PM_{10} >60
Not exceeding NAAQS	163 (99)	146 (88)	36 (22)	11 (92)	11 (92)	3 (23)
Exceeding NAAQS	1 (1)	19 (12)	131 (78)	1 (8)	1 (8)	10 (77)
Total cities	164	165	167	12	12	13

NB. Figures in parenthesis indicate percentage

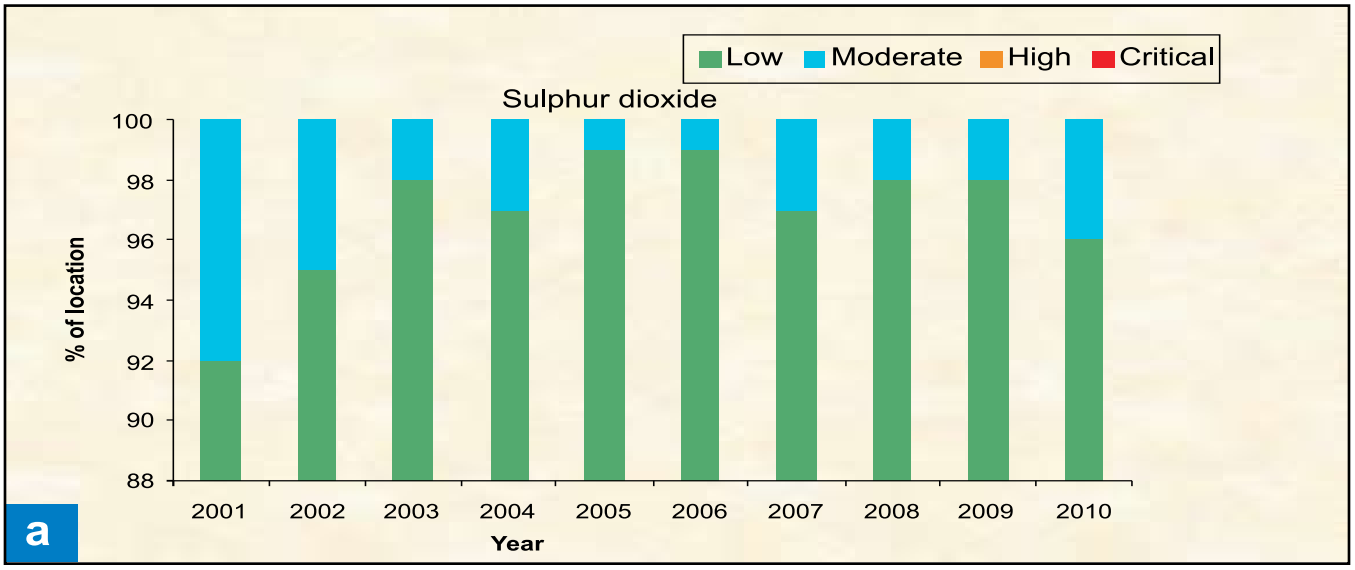


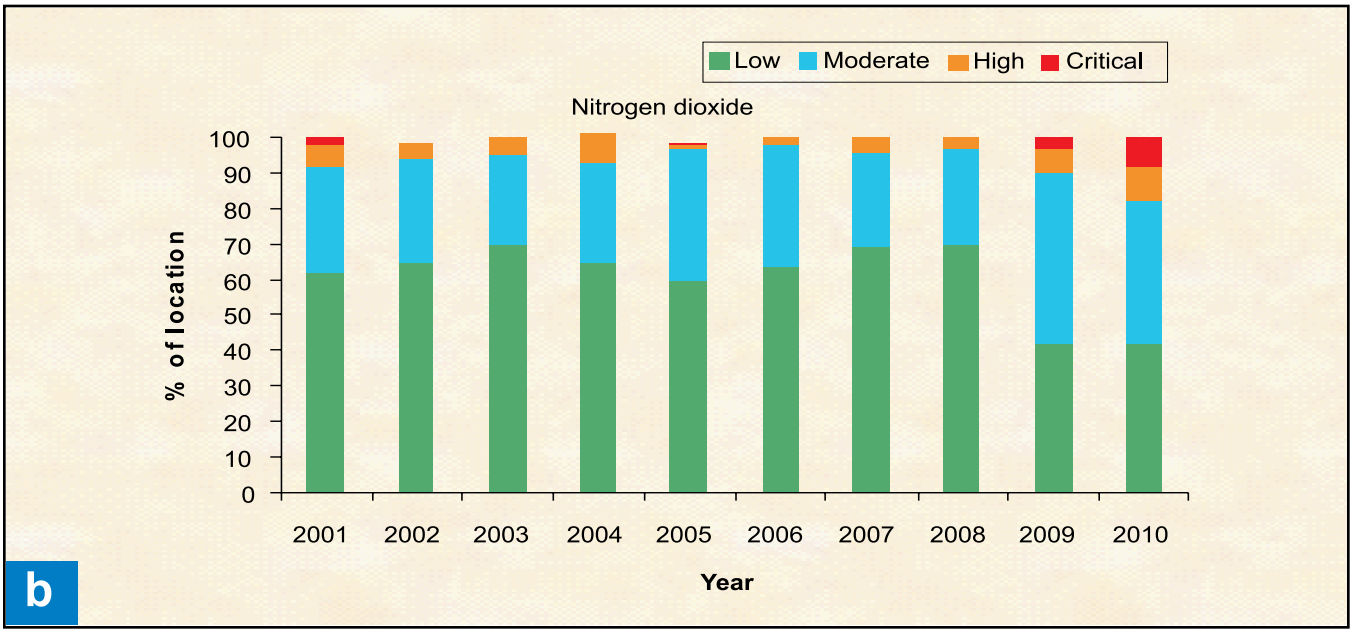


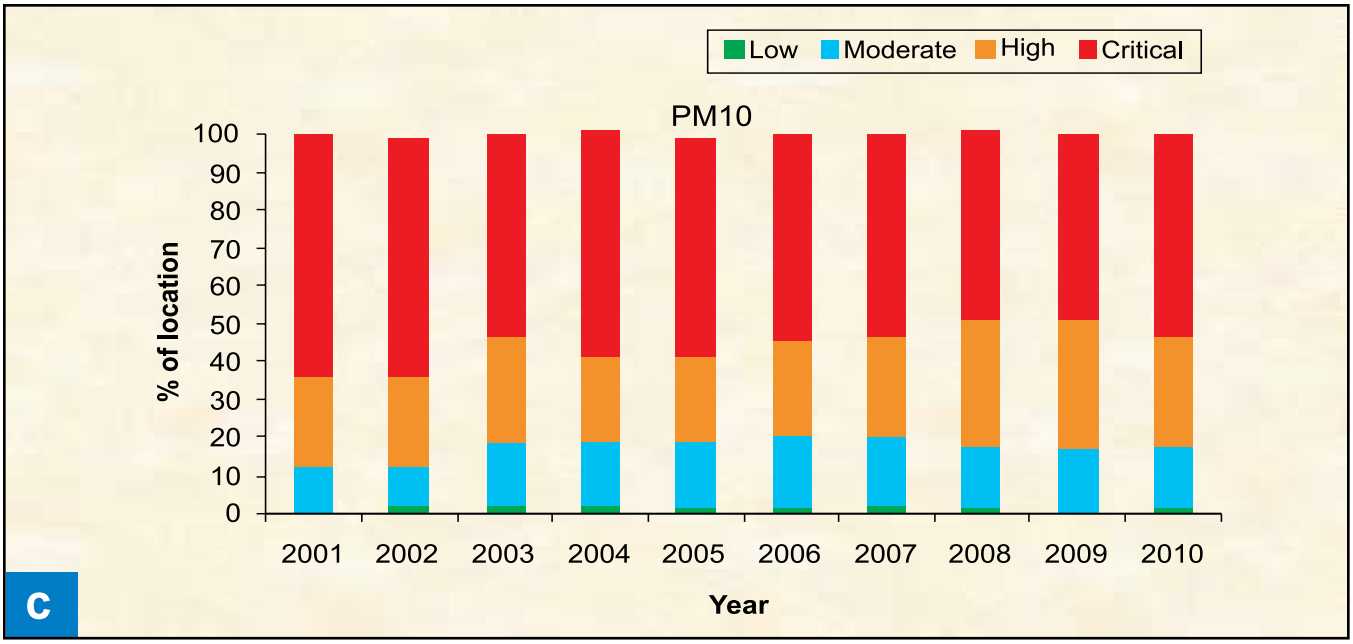
2.6 Percentage of residential/industrial/rural/other location in different pollution categories

Trend in percentage of locations (Residential areas till 2009 and residential/industrial/rural/others for 2010, adequate data) with low, moderate, high and critical levels of SO_2, NO_2, PM_{10} is depicted in Figure 2.10. With respect to SO_2, percentage of locations are limited to low and moderate category though fluctuating over the years. This indicates a low SO_2 pollution level (Figure 12.10a). NO_2 levels showed a reduction in the low category and an increase in moderate, high and critical level indicating an increase in the pollution level (Figure 12.10b). Location with respect to PM_{10} showed similar trend in 2010 with a reduction in the low category (Figure 12.10c)

Figure 2.12: Yearly Trends of Low, Moderate, High and Critical levels of a. SO_2, b. NO_2 and c. PM_{10} (Residential areas; percentage of location)



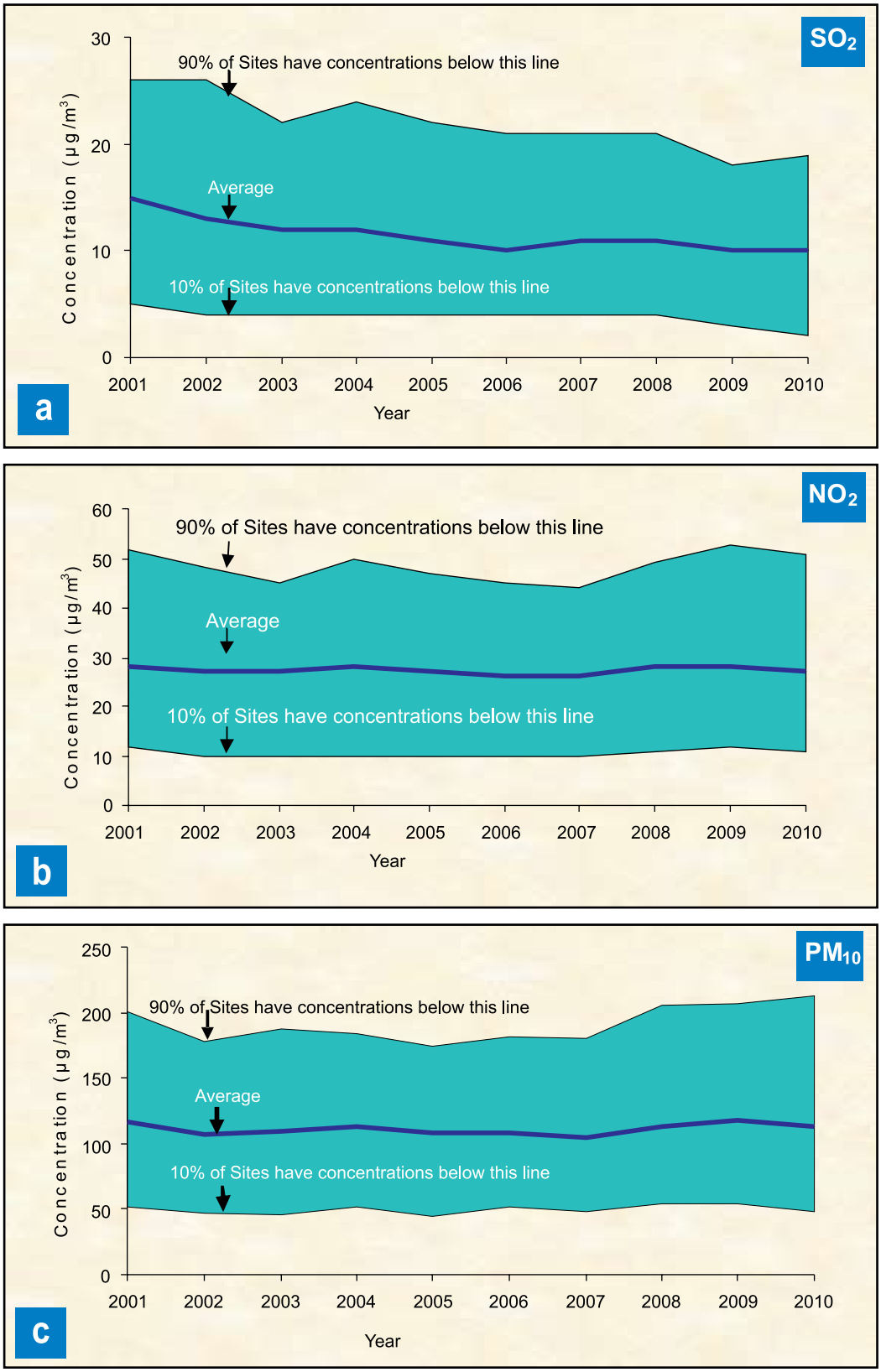




2.7 National Mean Concentration

National mean concentration with 90th percentile and 10th percentile for SO_2, NO_2 and PM_{10} is depicted in Figure 2.13. National mean of SO_2 concentration has decreased over the years indicating that there has been a decline in SO_2 levels (Figure 2.13a). Decreasing trend may be due to various intervention that have taken place in recent years such as reduction in sulphur in diesel, use of cleaner fuel such as CNG in metro cities, change in domestic fuel from coal to LPG etc. National mean of NO_2 concentration has remained stable over the years despite increase in sources like vehicles (Figure 2.13b). 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 of PM_{10} concentration shows fluctuating trend (Figure 2.13b). The reasons being emission from gensets, small scale industries, biomass incineration, suspension of traffic dust, natural dust, commercial and domestic use of fuel and vehicular emission etc.

Figure 2.13: National mean concentration of different locations that} fall under 10th and 90th percentile for SO_2, NO_2 and PM_{10}



Sulphur dioxide (SO_2) is a colourless, soluble gas with a characteristic pungent smell It is the chemical compound produced by volcanoes and in various industrial processes and are also a precursor to particulates in the atmosphere. Its natural source is volcanic eruptions (67%) and anthropogenic sources are combustion of fossil fuel (coal, heavy fuel oil in thermal power plants, office, factories), paper Industry, extravtion & distribution of fossil fuels, smelting of metals (sulfide ores to produce copper, lead and zinc), petroleum refining, combustion process in diesel, petrol, natural gas driven vehicles. SO_2 in ambient air can also affect human health, particularly in those suffering from asthma and chronic lung diseases and exacerbates respiratory symptoms and impaired breathing in sensitive individuals. It also causes visibility impairment. It is considered more harmful when particulate and other pollution concentrations are high. SO_2 also causes acid rain and aesthetic damage. A compilation of sources and effects of SO_2 are given in Annexure 1.

In this chapter a detailed summary of SO_2 levels in the country is furnished. The air quality of different cities/towns has been compared with the respective NAAQS. The air quality has been categorized into four broad categories based on an Exceedence Factor (the ratio of annual mean concentration of a pollutant with that of a respective standard. The four categories are low, moderate, high and critical levels. The top 10 location, cities and states with maximum SO_2 pollution is given.

3.1 Locations, cities and states with highest SO_2 values during 2010

Table 3.1 shows top ten locations in terms of annual average concentration of SO_2 for residential / industrial / rural / other area in which highest concentration was observed at Bhosari, Pune, Maharashtra Table 3.2 shows sensitive area in which the highest concentration was observed at Ruikar Trust, Kolhapur, Maharashtra. Among the cities Jamshedpur, Jharkhand tops the list with 35.4 $\mu g/m^3$ SO_2. (Table 3.3). Among the states Jharkhand shows highest SO_2 values 23.2 $\mu g/m^3$ (Table 3.4).

Table 3.1: Ten locations with highest SO_2 values (annual average) during 2010
(residential / industrial / rural / other area)

Sl. No.	State	City	Location	Station code	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	Maharashtra	Pune	Bhosari	312	104	11	195	39.7	28	10	M
2	Maharashtra	Chandrapur	MIDC Chandrapur	281	96	6	181	38.4	36	13	M
3	Jharkhand	Jamshedpur	Bistupur	351	89	30	41	35.6	-	0	M
4	Jharkhand	Jamshedpur	Golmuri	382	91	23	42	35.2	3	0	M
5	Jharkhand	Saraikela Kharsawan	Adityapur	614	86	28	41	35.0	3	0	M
6	Uttar Pradesh	Khurja	CGCRI	534	58	24	42	33.2	4	0	M
7	Maharashtra	Ulhasnagar	Octroi Naka	648	94	5	132	32.4	21	4	M
8	Maharashtra	Badlapur	BIWA House	649	92	5	86	32.3	15	1	M
9	Goa	Marmagao	Fire Brigade	435	118	7	253	31.8	35	6	M
10	Uttar Pradesh	Ghaziabad	Sahibabad	258	97	25	39	31.1	3	0	M

** - Locations where annual mean concentration of SO_2 exceeded the NAAQS of 50 µg/m3 for Residential/ industrial / other area. Std. dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2., Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 3.2: Ten locations with highest SO_2 values (annual average) during 2010
(Ecologically sensitive area)

Sl. No.	State	City	Location	Station code	ESA category	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	Maharashtra	Kolhapur	Ruikar Trust	509	Sahyadri	92	15	32	20.0	4	0	M
2	Uttar Pradesh	Ferozabad	CDGI	399	Taj-trapezium	104	8	32	16.9	23	0	M
3	Maharashtra	Kolhapur	Mahadwar Road	510	Sahyadri	102	10	24	16.3	3	0	M
4	Uttar Pradesh	Ferozabad	Tilak Nagar	400	Taj-trapezium	103	7	24	15.7	22	0	M
5	Uttar Pradesh	Ferozabad	Raza ka Tal	401	Taj-trapezium	101	7	25	15.3	21	0	M
6	Uttar Pradesh	Agra	Nunhai	324	Taj-trapezium	79	7	13	9.8	11	0	L
7	Uttar Pradesh	Agra	RO, Bodla	323	Taj-trapezium	80	7	12	9.3	11	0	L
8	Rajasthan	Alwar	Gaurav Solvex	373	Aravali range	75	4	24	9.0	4	0	L
9	Maharashtra	Kolhapur	Shivaji University	508	Sahyadri	100	7	11	8.7	1	0	L
10	Rajasthan	Alwar	RIICO Pump House	219	Aravali range	72	4	24	7.9	4	0	L

** - Locations where annual mean concentration of SO_2 exceeded the NAAQS of 20 µg/m3 for Residential / industrial / other area. Std. dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2.1 Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 3.3: Ten cities with highest SO_2 values (annual average) during 2010
(residential / industrial / rural / other area)

Sl. No.	State	City	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	Air Quality
1	Jharkhand	Jamshedpur	27	42	35.4	1	M
2	Jharkhand	Saraikela Kharsawan	28	41	35.0	3	M
3	Maharashtra	Badlapur	5	86	32.3	15	M
4	Goa	Marmagao	7	253	31.8	35	M
5	Maharashtra	Ulhasnagar	5	109	31.2	17	M
6	Uttar Pradesh	Ghaziabad	21	37	30.3	3	M
7	Uttar Pradesh	Khurja	21	40	29.2	4	M
8	Maharashtra	Pune	10	96	28.7	15	M
9	Maharashtra	Chandrapur	12	35	21.3	4	L
10	Jharkhand	West Singhbhum	15	36	21	3	L

** - Locations where annual mean concentration of SO2 exceeded the NAAQS of 50 µg/m3 for Residential/ industrial / other area. Std. dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2.1, Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 3.4: Ten states with highest SO_2 values (annual average) during 2010
(residential / industrial / rural / other & ecologically sensitive area)

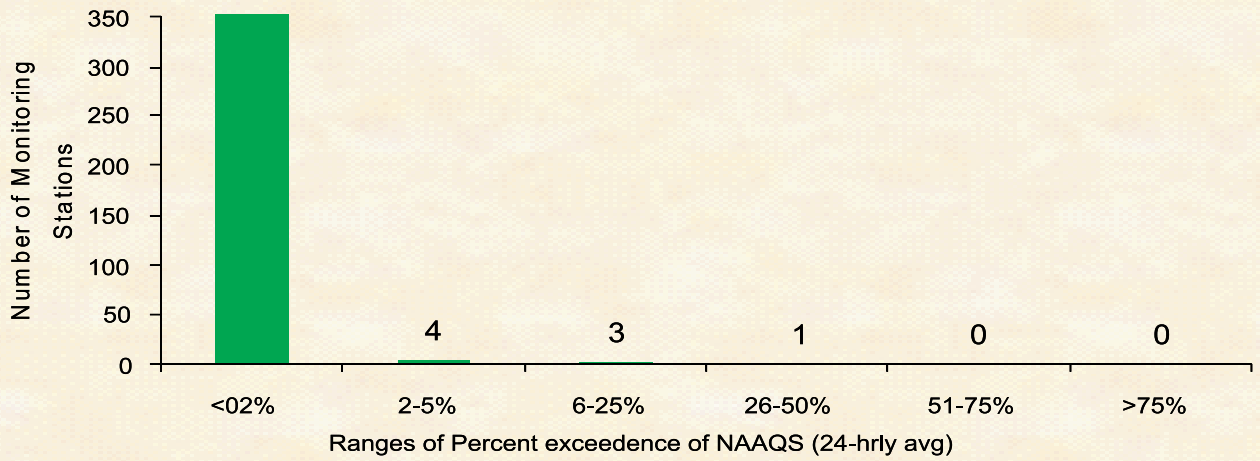
Sl. No.	State	Min	Max	Annual average ($\mu g/m^3$)
1	Jharkhand	18	37	23.2
2	Maharashtra	7	41	16.5
3	Gujarat	10	24	15.5
4	Goa	4	111	13.8
5	Haryana	7	24	13.7
6	Uttar Pradesh	8	20	12.1
7	Madhya Pradesh	14	21	11.3
8	Chattisgarh	9	13	10.9
9	Punjab	6	17	10.6
10	West Bengal	5	25	10.3

** - Locations where annual mean concentration of SO_2 exceeded the NAAQS of 50 µg/m3 for Residential/ industrial /other area., Data of monitoring stations with monitoring days ≥50 has only been considered*

3.2 Percentage exceedence of NAAQS (24 Hourly Average)

Number of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of SO_2 is depicted in Figure 3.1. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 353 monitoring stations out of 361 stations with adequate data. In the remaining stations (8 stations), the percentage exceedence of NAAQS (24 hourly avg.) was 2% or more.

Figure 3.1: Number of monitoring stations in various (residential / industrial / rural / other) ranges of percent violation of SO2 (24 hourly average)

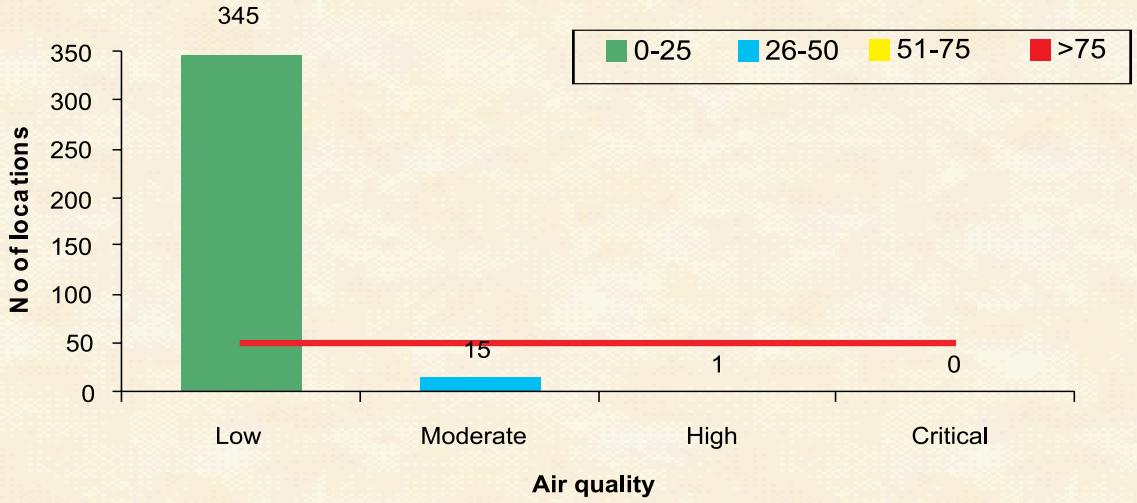


NB. Data of monitoring stations with monitoring days ≥50 has only been considered

3.3 Air Quality (Low, Moderate, High & Critical)

Number of monitoring stations with low, moderate, high and critical levels of SO_2 is depicted in Figure 3.2. 345 locations showed low SO_2 level, 15 locations showed moderate and 1 location fall under high pollutin category. None of the location were in the critical category.

Figure 3.2: Number of monitoring stations in various ranges of SO2 in residential/industrial/rural/other area (annual average)



NB. Data of monitoring stations with monitoring days ≥50 has only been considered

Table 3.5: SO_2 levels (Annual average) in Ambient Air Quality Stations under NAMP during 2010

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Andhra Pradesh	Chitoor	GNC Toll Gate Tirumala	582	RIRuO		93	A	4	4	4	4	4	4	-	0	L
	Guntur	Near Hindu College, Market Road	583	RIRuO		102	A	2	2	2	2	2	2	-	0	L
	Hydrabad	Tarnaka, NEERI Lab.	150	RIRuO		94	A	2	8	4	2	4	7	2	0	L
		Nacharam, Industrial Estate	151	RIRuO		88	A	2	7	4	2	3	6	1	0	L
		ABIDS Circle General Post Office Building	152	RIRuO		92	A	3	11	7	4	7	9	2	0	L
		Balanagar	95	RIRuO		108	A	4	6	5	5	5	5	-	0	L
		Uppal, IDA	203	RIRuO		108	A	4	6	5	5	5	5	-	0	L
		Jublee Hills	365	RIRuO		108	A	4	5	4	4	4	5	-	0	L
		Paradise	393	RIRuO		108	A	4	6	5	5	5	5	-	0	L
		Charminar	394	RIRuO		108	A	4	6	5	5	5	5	-	0	L
		Zoo Park	470	RIRuO		107	A	4	5	4	4	4	5	-	0	L
	Kothagudem	CER Club, Khamam	581	RIRuO		103	A	2	2	2	2	2	2	-	0	L
	Kurnool	Mourya Inn	466	RIRuO		118	A	4	4	4	4	4	4	-	0	L
	Nalgonda	RO, APPCB	577	RIRuO		108	A	4	5	5	4	5	5	-	0	L
	Nellore	Kamakhya Temple	580	RIRuO		94	A	2	2	2	2	2	2	-	0	L
	Patencheru	Police Station, Ramachadrapuram	468	RIRuO		98	A	7	17	11	9	11	15	2	0	L
	Ramagundam	Karimnagar Godavarikhani	465	RIRuO		98	A	2	13	4	2	3	9	3	0	L
	Tirupati	Regional Science Centre, Chittoor Bypass Road	389	RIRuO		104	A	4	4	4	4	4	4	-	0	L
	Vijaywada	Benz Circle	462	RIRuO		113	A	2	7	4	3	4	6	1	0	L
		Autonagar	469	RIRuO		113	A	3	15	7	3	6	13	4	0	L
	Warangal	KUDA Office, Hanumakonda	579	RIRuO		102	A	2	18	4	2	2	7	3	0	L
	Vishakhapatnam	Panchayat Raj office, Mindi	234	RIRuO		108	A	4	127	9	4	6	13	14	1	L
		Industrial Estate, Marripalem	233	RIRuO		108	A	4	24	5	4	4	8	3	0	L
		Police Barracks	371	RIRuO		108	A	4	17	7	4	7	10	3	0	L
		INS-Virabahu, Naval Area	387	RIRuO		108	A	4	27	6	4	5	10	3	0	L
		Seethammadhara	388	RIRuO		107	A	4	18	6	4	5	8	2	0	L
		Ganapuram Area	467	RIRuO		108	A	4	61	10	4	10	15	8	0	L
		Pedagantyada, Gajuwada	584	RIRuO		117	A	4	15	5	4	4	7	2	0	L
		CWMP, RAMKY, Parawada	585	RIRuO		108	A	4	16	4	4	4	5	1	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average ($\mu g/m3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Assam	Bongaigaon	Oil India Ltd. Chirang	542	RIRuO		104	A	3	10	6	5	6	8	1	0	L
		Barpara Office Building	520	RIRuO		104	A	3	10	7	5	7	8	1	0	L
	Daranga	BATAD, Baska	566	RIRuO		92	A	3	10	5	4	6	7	1	0	L
	Dibrugarh	Dibrugarh Office Building	538	RIRuO		103	A	4	10	6	5	6	8	1	0	L
	Golaghat	Golaghat Office Building	539	ES	Numaligarh	82	A	3	8	6	4	6	8	1	0	L
	Guwahati	Head Office, Bamunimaidam	193	RIRuO		254	A	3	11	7	5	7	9	1	0	L
		Boragaon, office premises of IASST, Kamrup	603	RIRuO		33	IA	3	11	6	5	6	7	1	0	-
		Guwahati University, Kamrup	602	RIRuO		82	A	3	8	6	5	6	7	1	0	L
		ITI Building, Gopinath Nagar	519	RIRuO		280	A	4	15	9	8	9	11	2	0	L
		Central Dairy, Khanapara, Kamrup	596	RIRuO		106	A	4	10	6	6	6	7	1	0	L
		Near Pragjyotish College, Santipur	541	RIRuO		264	A	5	13	7	5	7	9	1	0	L
	Lakhimpur	Bazar Patti, North Lakhimpur	587	RIRuO		102	A	4	10	6	5	6	8	1	0	L
	Nagaon	Water Resources Div., Christian Patty	595	RIRuO		103	A	3	9	6	4	6	8	1	0	L
	Nalbari	PWD Rural Div Office Complex,	597	RIRuO		82	A	2	19	7	5	7	9	2	0	L
	Sibsagar	Sibasagar Office Building	537	RIRuO		108	A	3	8	6	4	6	8	1	0	L
		Usha Lodge, near ONGCL Colony	604	RIRuO		24	IA	4	8	6	5	6	8	1	0	-
	Silchar	Janiganj Govt. Boys HS School	607	RIRuO		11	IA	5	7	6	5	6	7	1	0	-
		Office Building of RLO, Ithkola Market	567	RIRuO		92	A	2	11	7	5	7	9	1	0	L
	Tezpur	Tezpur Office Building	536	RIRuO		104	A	4	8	6	5	6	7	1	0	L
	Tinsukia	Digboi Carbon factory Campus, Borguri	594	RIRuO		99	A	4	15	5	5	6	8	2	0	L
		Coal India Office Complex, Margherita	586	RIRuO		97	A	7	29	10	8	10	12	3	0	L
		Shreepuria, Borguri	605	RIRuO		43	IA	5	9	6	5	6	7	1	0	-
Bihar	Patna	Beltron Bhawan, Shastri Nagar	210	RIRuO		80	A	2	10	5	3	5	7	2	0	L
		Gandhi Maidan Test Centre	284	RIRuO		46	IA	4	28	9	4	7	18	6	0	-
Chandigarh	Chandigarh	Modern Foods, Industrial Area	106	RIRuO		149	A	2	2	2	2	2	2	-	0	L
		Sector-17 C	263	RIRuO		150	A	2	2	2	2	2	2	-	0	L
		Punjab Engineering College, Sector 12	264	RIRuO		153	A	2	2	2	2	2	2	-	0	L
		Sector-39, IMTECH	463	RIRuO		150	A	2	2	2	2	2	2	-	0	L
		Kaimbwala Village	464	RIRuO		145	A	2	6	2	2	2	2	-	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Chattisgarh	Bhillai	Visak Hostel, Sector-4	65	RIRuO		91	A	8	12	10	9	10	12	1	0	L
		R.O., 5/32 Banglow Office Building	67	RIRuO		89	A	3	7	5	4	5	6	1	0	L
		M.P. Laghu Udyog Nigam	245	RIRuO		87	A	9	14	12	10	12	14	1	0	L
	Bilaspur	RO, CECB Vyapar Vihar		RIRuO		35	IA	4	14	8	5	8	10	2	0	-
	Korba	HIG 21,22.Near Ghantaghar,	364	RIRuO		94	A	12	14	13	12	13	14	1	0	L
		Pragati Nagar NTPC Colony	249	RIRuO		97	A	10	13	13	12	13	13	-	0	L
		I.T.I., Rampur	407	RIRuO		95	A	11	15	13	12	13	14	1	0	L
	Raipur	New HIG-9, Hirapur	368	RIRuO		41	IA	11	17	14	11	14	15	2	0	-
		M/S Wool Worth India, Sarora Raipur	223	RIRuO		46	IA	13	21	16	14	16	19	2	0	-
		Yatayat Thana, Jai Stambh Chowk	447	RIRuO		44	IA	8	17	14	12	14	16	2	0	-
Dadra & Nagar Haveli	Silvassa	Khadoli Industrial Area, Village- Khadoli	558	RIRuO		94	A	7	8	7	7	7	8	-	0	L
Daman & Diu	Daman	Kadaiya Industrial Area, Village- Kadaiya	560	RIRuO		96	A	7	8	7	7	7	8	-	0	L
Delhi	Delhi	N.Y. School, Sarojini Nagar	144	RIRuO		96	A	2	18	4	2	3	9	3	0	L
		Town Hall, Chandni Chowk	146	RIRuO		96	A	2	23	7	2	5	14	5	0	L
		Mayapuri Industrial Area	345	RIRuO		96	A	2	28	10	3	9	19	7	0	L
		Pritampura	531	RIRuO		81	A	4	6	4	4	4	5	-	0	L
		Shahadra	58	RIRuO		80	A	4	9	5	4	4	5	1	0	L
		Shahzada Bagh	57	RIRuO		79	A	4	10	5	4	5	6	1	0	L
		Nizamuddin	55	RIRuO		80	A	4	5	4	4	4	5	-	0	L
		Janakpuri	59	RIRuO		76	A	4	9	5	4	5	5	1	0	L
		Siri Fort	60	RIRuO		80	A	4	6	4	4	4	5	-	0	L
Goa	Panaji	Old GSPCB premises, Patto	327	RIRuO		105	A	2	35	4	2	2	10	5	0	L
	Marmagao	Fire Brigade Station, Port Trust	435	RIRuO		118	A	7	253	32	12	15	67	35	6	M
	Vasco	Fuse Call Office of Elec. Dept., Mormugao	37	RIRuO		103	A	2	45	6	2	2	12	7	0	L
	Curchorem	Curchorem, Sanvordem, Quepem	628	RIRuO		19	IA	5	76	32	6	19	66	25	0	-
	Codli	Codli Tisk, Ponda	630	RIRuO		6	IA	8	12	10	8	10	11	2	0	-
	Honda	Honda Junction, Sattari	631	ES	Sahyadri	8	IA	6	11	8	7	8	10	2	0	-
	Bicholim	Bicholim	632	RIRuO		11	IA	7	10	9	7	9	10	1	0	-
	Amona	Amona, Bicholim	633	RIRuO		16	IA	4	9	6	5	6	9	2	0	-
	Assanora	Assanora Junction, Bardez	634	RIRuO		8	IA	4	7	5	4	5	7	1	0	-
	Usgao	Usgao Plae, Junction, Ponda	629	RIRuO		10	IA	2	10	6	3	5	9	3	0	-

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average ($\mu g/m3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Gujarat	Ahmedabad	Naroda, G.I.D.C., Ahmadabad	101	RIRuO		104	A	12	23	20	18	20	22	2	0	L
		Cadilla Bridge Narol	102	RIRuO		103	A	11	21	16	12	16	20	3	0	L
		L.D. Engg. College	103	RIRuO		104	A	8	17	12	10	12	14	2	0	L
		Shardaben Hospital, Saraspur	154	RIRuO		103	A	10	18	14	11	14	17	2	0	L
		R.C. High School, Mirzapur	155	RIRuO		104	A	10	21	15	13	15	18	2	0	L
		Naroda, G.I.D.C.,	347	RIRuO		104	A	9	19	15	13	15	18	2	0	L
	Anklesvar	Rallis India Ltd.	252	RIRuO		104	A	12	24	18	14	18	23	4	0	L
		Durga Traders, Bhavanafarm Society	253	RIRuO		104	A	10	19	15	12	14	18	3	0	L
	Jamnagar	Fisheries Office	319	RIRuO		104	A	9	26	12	10	12	15	2	0	L
	Rajkot	Sardhara Industrial Corporation	257	RIRuO		104	A	8	19	13	12	13	15	2	0	L
		Regional Offce	374	RIRuO		104	A	9	23	12	10	12	13	2	0	L
	Surat	S.V.R. Engg. College	21	RIRuO		104	A	9	17	13	11	13	16	2	0	L
		B.R.C. High School, Udhna	22	RIRuO		114	A	13	27	20	15	20	24	3	0	L
		Air India Office	23	RIRuO		104	A	12	40	16	13	16	18	3	0	L
	Vadodara	GPCB Office, Geri Vasahat	50	RIRuO		96	A	8	17	11	8	10	13	2	0	L
		Dandia Bazaar	333	RIRuO		96	A	12	26	16	13	15	21	3	0	L
		CETP Nandesari	334	RIRuO		96	A	17	31	23	20	23	26	3	0	L
	Vapi	GEB, IIIrd Phase, GIDC, Vapi	367	RIRuO		104	A	11	49	17	13	17	19	6	0	L
		Vapi Nagar Palika, Vapi	221	RIRuO		104	A	10	17	14	12	14	17	2	0	L
Haryana	Faridabad	Escorts Research Centre Mathura Road	331	RIRuO		145	A	7	32	17	12	16	23	4	0	L
		RO Haryana SPCB	330	RIRuO		96	A	10	29	18	14	17	26	5	0	L
	Hissar	Urban Estate - II	390	RIRuO		27	IA	5	11	8	7	8	9	1	0	-
		Guru Jambehswar University	414	RIRuO		52	A	2	18	7	2	6	16	4	0	L
	Yamunanagar	Ballarpur Industries	196	RIRuO		52	A	7	19	12	9	12	16	3	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Himachal Pradesh	Baddi	Industry Department Office Building	449	RIRuO		93	A	0	7	3	2	3	5	1	0	L
		AHC barotiwala	564	RIRuO		77	A	1	9	3	2	3	5	1	0	L
		Housing Board	563	RIRuO		10	IA	2	2	2	2	2	2	-	0	-
	Damtal	Regional Office	268	RIRuO		147	A	2	2	2	2	2	2	-	0	L
		Old Road	271	RIRuO		113	A	2	2	2	2	2	2	-	0	L
	Kala Amb	Kala Amb Industrial Area	461	RIRuO		156	A	2	10	4	2	4	6	2	0	L
		Trilokpur	530	RIRuO		155	A	2	5	2	2	2	3	-	0	L
	Nalagarh	Municipal Council	565	RIRuO		66	A	1	8	3	2	3	4	1	0	L
	Parwanoo	Regional Office, Sector- 4	132	RIRuO		147	A	2	5	3	2	2	3	1	0	L
		Asst. Commissioner Building, Sector I	339	RIRuO		134	A	2	6	3	2	3	4	1	0	L
	Paonta Sahib	Paonta Sahib	117	RIRuO		136	A	2	4	2	2	2	3	-	0	L
		Gondhpur Industrial Area	118	RIRuO		107	A	2	5	3	2	3	4	1	0	L
	Shimla	Tekka Bench Ridge	34	ES	Hill station	140	A	2	6	3	2	2	4	1	0	L
		Bus Stand, Winterfield	35	ES	Hill station	114	A	2	8	4	2	3	6	1	0	L
Jammu & Kashmir	Jammu	Regional Office, Jammu	184	RIRuO		88	A	2	9	5	3	4	7	2	0	L
		M.A. Stadium, Jewel Chowk, Jammu	482	RIRuO		89	A	2	15	6	4	6	9	2	0	L
		Bari Brahamana Industrial Area, Jammu	507	RIRuO		49	IA	3	19	10	6	9	16	4	0	-
Jharkhand	Dhanbad	EMTI, Bastacola	612	RIRuO		67	A	12	36	16	13	15	18	3	0	L
		CGM Office, Kusunda	611	RIRuO		77	A	12	36	16	13	14	20	4	0	L
		R.O. Dhanbad	44	RIRuO		75	A	10	31	14	11	13	18	4	0	L
	Jamshedpur	Bistupur Vehical Testing Centre	351	RIRuO		89	A	30	41	36	33	36	38	-	0	M
		Golmuri Vehicle Testing Centre	382	RIRuO		91	A	23	42	35	33	35	38	3	0	M
	Jharia	M.A.D.A.	332	RIRuO		68	A	13	36	17	14	17	20	3	0	L
	Ranchi	Albert Ekka Chowk, Main Road	402	RIRuO		111	A	16	31	19	17	19	23	3	0	L
	Saraikela Kharsawan	RO Building, Adityapur	614	RIRuO		86	A	28	41	35	31	35	39	3	0	M
	Sindri	BIT / PDIL	46	RIRuO		33	IA	11	24	16	12	15	21	3	0	-
	West Singhbhum	Barajamda U.M. Office	615	RIRuO		84	A	15	36	21	18	20	24	3	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average ($\mu g/m3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Karnataka	Bangalore	Graphite India	77	RIRuO		59	A	10	20	15	12	16	18	2	0	L
		Yeshwanthpura police station	457	RIRuO		100	A	9	20	16	13	17	19	2	0	L
		Peenya Industrial Area	405	RIRuO		99	A	6	40	16	13	15	17	4	0	L
		KHB Industrial Area, Yelahanka	404	RIRuO		107	A	9	18	14	12	15	16	2	0	L
		AMCO Batteries, Mysore Road	78	RIRuO		100	A	7	19	14	12	14	15	2	0	L
		Jnanabharathi , Bangalore University	598	RIRuO		104	A	2	24	6	2	5	7	5	0	L
		R V College of Engineering	589	RIRuO		22	IA	2	14	7	4	6	10	2	0	-
		TERI office, Vital Medi healthcare Pvt.Ltd		RIRuO		15	IA	26	32	28	26	28	31	2	0	-
		Victoria hospital	406	RIRuO		29	IA	6	14	11	7	12	13	2	0	-
	Belgaum	Karnataka SPCB Office Building	460	ES	Sahyadri	83	A	2	2	2	2	2	2	-	0	L
	Gulburga	Government Hospital	459	RIRuO		77	A	2	523	9	2	2	3	59	1	L
	Hassan	KSRTC bus stand building	458	RIRuO		84	A	4	6	5	4	5	6	1	0	L
	Hubli-Dharwad	Lakamanahali Industrial Area, Dharwad	432	RIRuO		69	A	2	13	4	2	2	9	3	0	L
		Rani Chennamma Circle, Hubli	431	RIRuO		95	A	2	13	5	2	5	9	3	0	L
	Mangalore	Stides Premises, Baikampady Industrial Area	488	RIRuO		105	A	2	17	6	3	5	9	3	0	L
	Mysore	K.R.Circle	40	RIRuO		94	A	7	15	11	8	11	14	2	0	L
		KSPCB Bldg. Hebbal Ind. Area	328	RIRuO		117	A	6	14	10	7	10	12	2	0	L
Kerala	Alappuzha	District Office, Alissery Road	618	RIRuO		120	A	2	2	2	2	2	2	-	0	L
		DC Mills, Pathirappally	617	RIRuO		120	A	2	2	2	2	2	2	-	0	L
	Kochi	Eloor I	149	RIRuO		90	A	2	3	2	2	2	2	-	0	L
		Eloor II	29	RIRuO		91	A	2	3	2	2	2	2	-	0	L
		Irumpanam	30	RIRuO		109	A	2	11	4	2	4	7	2	0	L
		Ernakulum South	338	RIRuO		109	A	2	36	4	2	3	5	4	0	L
		VYTTILA	562	RIRuO		108	A	2	16	4	2	4	8	3	0	L
		MG Road Bank Ernakulum	147	RIRuO		109	A	2	15	4	2	3	7	2	0	L
		Kalamassery	346	RIRuO		108	A	2	23	6	2	4	9	4	0	L
	Kollam	KSPCB, District Office, Kadappakada	621	RIRuO		117	A	2	3	2	2	2	2	-	0	L
		KMML Chavara	620	RIRuO		56	A	2	12	3	2	2	6	2	0	L
	Kottayam	Kottayam	187	RIRuO		96	A	6	6	6	6	6	6	-	0	L
		Vadavathoor	361	RIRuO		96	A	4	5	5	5	5	5	-	0	L
	Kozhikode	Kozhikode City	360	RIRuO		108	A	2	2	2	2	2	2	-	0	L
		Nallalam	359	RIRuO		108	A	2	2	2	2	2	2	-	0	L
	Malapuram	Kakkanchery Sijmak oils	623	RIRuO		108	A	2	2	2	2	2	2	-	0	L
	Palakkad	SEPR Refractories India Ltd.	311	RIRuO		121	A	2	11	3	2	2	5	2	0	L
	Pathanamthitta	Near District Office KSPCB, Makkam-kunnu	619	RIRuO		120	A	2	2	2	2	2	2	-	0	L
	Thissur	KSPCB, District Office, Poonkunnam	624	RIRuO		93	A	2	2	2	2	2	2	-	0	L
	Wayanad	Sulthan Bathery	622	RIRuO		119	A	2	3	2	2	2	2	-	0	L
	Trivandrum	PRS Hospital/COSMO	419	RIRuO		108	A	5	8	6	6	6	7	1	0	L
		SMV School	181	RIRuO		109	A	5	25	7	6	7	7	2	0	L
		VELI	357	RIRuO		106	A	6	23	16	11	16	20	3	0	L
		PETTAH	358	RIRuO		107	A	5	11	6	6	6	7	1	0	L

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Madhya Pradesh	Bhopal	Hamidia Road, M.P. Hastshilp Vikas Nigam	122	RIRuO		72	A	2	93	10	3	8	13	12	1	L
		C E T P Govindpura	123	RIRuO		73	A	0	61	7	3	5	13	8	0	L
	Dewas	EID Perry (I) Limited	525	RIRuO		86	A	29	8	14	0	11	13	19	4	L
		Dewas Metal Section	524	RIRuO		52	A	15	6	10	7	10	13	2	0	L
		Vikas Nagar	523	RIRuO		79	A	24	7	11	8	11	15	3	0	L
	Gwalior	Dindayal Nagar	479	RIRuO		71	A	17	7	12	9	12	14	2	0	L
		Maharaj Bada	478	RIRuO		60	A	19	8	13	10	13	15	2	0	L
	Indore	Polo Ground	127	RIRuO		89	A	7	70	22	12	17	43	13	0	L
		Kothari Market, M.G. Road	128	RIRuO		93	A	2	22	11	5	12	16	4	0	L
		Telephone Nagar, Kanadia Road	131	RIRuO		91	A	0	22	8	5	8	12	3	0	L
	Jabalpur	Vijay Nagar	248	RIRuO		21	IA	2	2	2	2	2	2	-	0	-
	Nagda	B C I Labour Club	84	RIRuO		91	A	34	11	16	13	16	20	4	0	L
		Grasim Kalyan Kendra	246	RIRuO		98	A	39	12	21	14	21	26	5	0	L
	Sagar	Pt.Deendayal Nagar, Housing Board Colony	532	RIRuO		72	A	5	3	4	3	4	4	-	0	L
	Satna	Sub-divisional Office E/M LightMachniery	343	RIRuO		80	A	5	2	3	2	3	4	1	0	L
		Regional Office MPPCB	342	RIRuO		96	A	4	2	3	2	2	3	1	0	L
	Singrauli	Jayant Township	515	RIRuO		13	IA	21	18	19	18	19	21	1	0	-
		N.T.P.C., Vidyanagar	514	RIRuO		19	IA	17	14	16	14	16	17	1	0	-
		Waidhan	516	RIRuO		13	IA	12	9	10	9	10	11	1	0	-
	Ujjain	District Office	527	RIRuO		71	A	23	12	15	13	14	15	19	3	L
		Regional Office	526	RIRuO		42	IA	9	6	8	6	8	9	1	0	-
		Mahakal Temple	528	RIRuO		51	A	15	10	12	11	13	14	1	0	L

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Maharashtra	Amravati	M/s Apurva Oil and Industries Pvt. Ltd	549	RIRuO		88	A	9	15	12	10	12	14	2	0	L
		Govt College of Engineering	548	RIRuO		97	A	6	14	11	8	11	13	2	0	L
		Rajkamal Square	547	RIRuO		96	A	6	18	13	11	14	16	2	0	L
	Aurangabad	S.B.E.S. College	511	RIRuO		110	A	4	13	7	5	7	9	2	0	L
		Collector Oifice	512	RIRuO		108	A	3	10	6	4	6	8	1	0	L
		C.A.D.A. Office, Garkheda	513	RIRuO		97	A	3	19	6	5	6	8	2	0	L
	Badlapur	BIWA Office	649	RIRuO		92	A	5	86	32	13	31	53	15	1	M
	Chandrapur	Grampanchat Ghughus	267	RIRuO		93	A	5	86	30	9	23	62	20	1	M
		MIDC Chandrapur	281	RIRuO		96	A	6	181	38	8	24	92	36	13	M
		Nagar Parishad	396	RIRuO		97	A	5	95	27	6	24	53	20	2	M
		Gadchandur Gram Panchayat, Rajura	640	RIRuO		74	A	4	79	20	7	15	36	14	0	L
		MIDC, Tadali	638	RIRuO		62	A	5	48	20	7	16	38	12	0	L
		Muncipal Council, Ballarshah	639	RIRuO		94	A	4	85	20	6	15	35	14	1	L
	Jalgaon	B. J. Market	644	RIRuO		69	A	9	24	16	12	16	22	4	0	L
		Girna water tank	645	RIRuO		68	A	9	19	15	13	15	17	2	0	L
		MIDC Jalgaon	646	RIRuO		70	A	15	28	21	16	20	25	3	0	L
	Kolhapur	University Campus, Shivaji University,	508	ES	Sahyadri	100	A	7	11	9	8	9	10	1	0	L
		Ruikar Trust, Dabholkar Corner, ST Stand	509	ES	Sahyadri	92	A	15	32	20	16	19	28	4	0	M
		Mahadwar Road, Near Mahalaxmi Temple	510	ES	Sahyadri	102	A	10	24	16	13	16	20	3	0	M
	Latur	MIDC Water Works	641	RIRuO		96	A	4	22	8	4	7	15	4	0	L
		Terrace of Kshewraj Vidyalaya Shyamnagar	642	RIRuO		104	A	4	22	8	4	6	12	4	0	L
		Terrace of Sidhheshwar Sahakari Bank Ganjgolai	643	RIRuO		61	A	4	21	7	4	7	12	3	0	L
	Lote	MIDC Chalkewadi	489	RIRuO		12	IA	24	180	74	28	60	132	46	33	-
		Pump House, CETP	490	RIRuO		18	IA	13	136	46	21	46	65	28	6	-
	Mahad	Water treatment plant, Bhirwadi	569	RIRuO		66	A	9	36	19	12	18	26	6	0	L
		EHS, M/s Privi organics Ltd	570	RIRuO		56	A	11	36	21	12	21	27	6	0	L
		Mahatma Phule Hall, MNP	571	RIRuO		50	A	10	26	16	12	16	22	4	0	L
	Mumbai	Kalbadevi	169	RIRuO		84	A	2	24	4	2	3	7	4	0	L
		Parel, Ambedkar Road	170	RIRuO		98	A	2	35	4	2	3	6	4	0	L
		Worli	349	RIRuO		103	A	2	16	4	2	3	8	3	0	L
	Nagpur	Institution of Engineers	287	RIRuO		86	A	8	17	11	9	9	13	2	0	L
		Govt. Polytechnic College, Sadar	314	RIRuO		87	A	7	19	11	9	11	13	2	0	L
		MIDC Office Hingana Road	288	RIRuO		83	A	7	15	11	9	11	14	2	0	L
		MIDC Industrial Area, MIDC Office, Hingna	165	RIRuO		81	A	2	48	6	2	3	15	8	0	L
		Maskasath, Itwari	166	RIRuO		98	A	2	17	3	2	2	5	2	0	L
		NEERI Lab, Nehru Marg	167	RIRuO		96	A	2	22	3	2	2	4	3	0	L
	Nashik	R.T.O. Colony Tank	259	RIRuO		112	A	11	35	20	16	20	27	4	0	L
		VIP Industrial Area, MIDC Satpura	269	RIRuO		113	A	13	38	23	19	23	28	4	0	L
		Nashik Municipal Council Building	280	RIRuO		111	A	11	33	21	16	20	26	4	0	L
	Navi Mumbai	T.B.I.A. Rabale , Airoli, TTC	491	RIRuO		102	A	8	63	23	11	23	33	9	0	L
		Dr. D.Y. Patil College, Nerul, TTC	492	RIRuO		104	A	7	22	14	8	13	19	4	0	L
		MPCB Central Lab, Mhape	493	RIRuO		96	A	8	49	22	10	22	33	9	0	L
		CIDCO Nodal Office Kharghar	494	RIRuO		105	A	6	43	15	9	13	21	6	0	L
		Panvel Residential Area, Taloja	495	RIRuO		96	A	5	30	15	9	15	22	5	0	L
		MIDC Collom Faciolity Building	496	RIRuO		99	A	8	74	30	16	29	44	11	0	M
	Pune	Maratha Chamber of commerce, Bhosari	312	RIRuO		104	A	11	195	40	15	31	74	28	10	M
		State Electricity Board BLDG Nalstop	379	RIRuO		104	A	10	45	23	13	21	38	9	0	L
		Swargate Police Chawki	381	RIRuO		104	A	10	49	23	13	21	37	9	0	L

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	Roha	Roha Industrial Association office	572	RIRuO		64	A	9	29	16	12	15	23	4	0	L
		Filter House of MIDC Water works	573	RIRuO		61	A	9	27	17	11	17	23	4	0	L
	Sangli	Udyog bhavan / SRO, MPCB Sangli	574	RIRuO		105	A	8	20	13	9	13	16	3	0	L
		Sangli- Miraj Primary school Building	575	RIRuO		104	A	7	24	14	9	15	18	4	0	L
		Krishna Valley School	576	RIRuO		104	A	8	24	14	10	14	20	4	0	L
	Solapur	WIT Campus	299	RIRuO		106	A	13	19	17	15	16	18	1	0	L
		Voronoko School / Chitale Clinic	300	RIRuO		107	A	13	20	17	15	17	19	1	0	L
	Thane	Maternity Hospital,Dhobighat,Kopri	303	RIRuO		122	A	7	16	12	10	13	15	2	0	L
	Thane	Terrace of Shahu Market,Naupada	304	RIRuO		108	A	10	20	16	14	16	19	2	0	L
		Kolshet and Balkum, Thane West	305	RIRuO		36	IA	10	16	13	11	13	15	2	0	-
	Ulhasnagar	Smt. C. H. M. College Campus	647	RIRuO		99	A	4	85	30	15	26	47	13	1	M
		Octroi Naka	648	RIRuO		94	A	5	132	32	14	27	47	21	4	M
Meghalaya	Byrnihat	EPIP, Ri-Bhoi district	568	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Dawki	Terrace building, Jaintia Hills District	588	RIRuO		68	A	2	8	2	2	2	2	1	0	L
	Tura	Office building of Add Chief Engineer, Garo Hills District	608	RIRuO		34	IA	2	2	2	2	2	2	-	0	-
	Shillong	State Tuberculosis Hospital	340	ES	Hill station	79	A	2	18	3	2	2	2	3	0	L
		Boards Office Permises, Lumpyngngad	120	ES	Hill station	54	A	2	2	2	2	2	2	-	0	L
Mizoram	Aizawl	Khatla, M.G-Road, Mizoram SPCB	450	ES	Hill station	104	A	2	2	2	2	2	2	-	0	L
	Aizawl	Laipuitlang, Residence of Chairman, MPCB	451	ES	Hill station	104	A	2	2	2	2	2	2	-	0	L
	Aizawl	Bawngkawn , Roof Top of Mr.K.L. Berema's residence	452	ES	Hill station	104	A	2	2	2	2	2	2	-	0	L
Nagaland	Dimapur	Bank Colony	317	RIRuO		93	A	2	2	2	2	2	2	-	0	L
		Dhobinala	448	RIRuO		93	A	2	2	2	2	2	2	-	0	L
	Kohima	Opposite NST Office	609	ES	Hill station	51	A	2	2	2	2	2	2	-	0	L
		Opposite War Cemetery	610	ES	Hill station	42	IA	2	2	2	2	2	2	-	0	-

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Orissa	Angul	Industrial Estate	70	RIRuO		103	A	4	8	6	5	6	7	1	0	L
		NALCO Township	231	RIRuO		100	A	6	21	8	6	7	9	2	0	L
	Balasore	Sahadevkhunta	428	RIRuO		100	A	2	2	2	2	2	2	-	0	L
	Berhampur	Regional Office Orissa SPCB	429	RIRuO		95	A	2	2	2	2	2	2	-	0	L
	Bhubneshwar	Capital Police Station	424	RIRuO		105	A	2	2	2	2	2	2	-	0	L
		IRC Village	423	RIRuO		98	A	2	2	2	2	2	2	-	0	L
		SPCB Building	322	RIRuO		113	A	2	2	2	2	2	2	-	0	L
	Cuttack	Roof of Traffic Tower, Badambadi	426	RIRuO		105	A	2	6	2	2	2	3	1	0	L
		R.O. Cuttack Office, Surya Vihar	425	RIRuO		45	IA	2	4	2	2	2	2	-	0	-
	Rayagada	Regional Office Orissa SPCB	428	RIRuO		103	A	2	3	2	2	2	2	-	0	L
		LPS High School, Jaykaypur	229	RIRuO		103	A	2	4	2	2	2	3	-	0	L
	Rourkela	Regional Office, ORPB	370	RIRuO		94	A	4	6	5	5	5	6	-	0	L
		IDL Police Out-post, Sonaparbat	227	RIRuO		104	A	4	7	5	4	5	6	1	0	L
	Sambalpur	Filter Plant, PHD Office, Modipara	427	RIRuO		84	A	2	5	3	2	4	4	1	0	L
	Talcher	Coal Field Area / MCL AREA	471	RIRuO		66	A	8	44	14	12	14	15	4	0	L
		T.T.P.S.Colony	68	RIRuO		103	A	4	18	10	8	10	12	2	0	L
Punjab	Amritsar	R.O. Focal Point, Amritsar	487	RIRuO		53	A	12	18	14	13	14	16	1	0	L
		A-1,Platers, Amritsar / VMC	486	RIRuO		57	A	11	16	14	12	14	15	1	0	L
	Bhatinda	Ms Milk Plant, Ropar	506	RIRuO		96	A	5	18	9	7	9	12	2	0	L
	Dera Bassi	M/s Punjab Chemicals & Crop Protection Ltd	504	RIRuO		128	A	6	18	10	8	10	14	3	0	L
		M/s Winsome Yarns Ltd., Barwala Road, Dera-bassi	505	RIRuO		138	A	5	15	10	7	10	13	2	0	L
	Pathankot/	C-PYTE Building at Dera Baba Nanak	590	RIRuO		56	A	4	11	7	5	7	8	1	0	L
	Gobindgarh	M/s Modi Oil and General Mills	302	RIRuO		107	A	10	28	17	12	17	21	3	0	L
		M/s Raj Steel Rolling Mills	301	RIRuO		121	A	11	31	18	14	17	25	4	0	L
		United Rolling Mills, Mandi Gobindgarh	483	RIRuO		96	A	10	32	18	14	17	23	4	0	L
	Jalandar	Municipal Council Tubewell	353	RIRuO		25	IA	10	12	11	10	11	12	1	0	-
	Khanna	Markfed Vanaspati, Khanna	485	RIRuO		123	A	5	17	9	7	9	12	2	0	L
		AS School, Khanna	484	RIRuO		134	A	5	13	9	6	9	11	2	0	L

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	Ludhiana	Bharat Nagar Chowk	422	RIRuO		24	IA	7	10	9	7	9	9	1	0	-
		Nahar Spining Mlls, Dholewal Chawk	76	RIRuO		115	A	5	19	10	6	10	14	3	0	L
		Milk plant, Ferozpur Road	61	RIRuO		131	A	5	14	9	6	9	11	2	0	L
		Vishavkarma Chowk	335	RIRuO		126	A	5	17	9	6	10	13	2	0	L
	Naya Nangal	M/s Punjab Alkalis & Chemicals Ltd.	420	RIRuO		111	A	5	13	7	6	7	8	1	0	L
		M/s NFL Guest House	421	RIRuO		104	A	5	9	7	6	6	8	1	0	L
	Patiala	Ceylon Industries	600	RIRuO		126	A	3	14	7	4	7	10	2	0	L
		Fire Brigade Station, Bahera Road,	599	RIRuO		119	A	4	12	6	5	6	8	1	0	L
Puducherry	Puducherry	DSTC Office Upstairs, AnnaNagar	64	RIRuO		90	A	3	9	6	4	6	8	1	0	L
		PIPDIC Ind. Estate Mettupalayam	93	RIRuO		82	A	4	10	6	4	7	8	2	0	L
		Chamber Of Commerce	337	RIRuO		83	A	2	9	5	3	5	8	2	0	L
Rajasthan	Alwar	Regional Office, Rajasthan SPCB	372	ES	Aravali range	79	A	4	14	7	4	7	9	2	0	L
		Gaurav Solvex Ltd. MIA	373	ES	Aravali range	75	A	4	24	9	4	8	14	4	0	L
		RIICO Pump House, MIA	219	ES	Aravali range	72	A	4	24	8	4	7	13	4	0	L
	Jaipur	Ajmeri Gate	296	RIRuO		1	IA	5	37	6	5	6	6	3	0	-
		RJPB Office,Jhalana Doongari	298	RIRuO		110	A	2	6	5	5	5	6	1	0	L
		Office of District Education Officer, Chandpole	408	RIRuO		94	A	4	10	6	5	6	7	1	0	L
		RIICO Office, M.I.A.	410	RIRuO		102	A	4	7	6	5	5	6	-	0	L
		Regional Office (North), RSPCB, Vidyadhar Nagar	409	RIRuO		109	A	5	11	6	5	6	7	1	0	L
		VKIA	297	RIRuO		114	A	5	11	6	5	6	7	1	0	L
	Jodhpur	DIC Office, Industrial Estate	413	RIRuO		96	A	4	12	6	5	6	7	1	0	L
		Sojati Gate	273	RIRuO		103	A	4	15	6	5	6	7	1	0	L
		Basni Industrial Area, RIICO Office	274	RIRuO		97	A	3	25	7	5	6	8	3	0	L
		Maha Mandir Police Thane	376	RIRuO		99	A	4	11	5	5	5	5	1	0	L
		Office of Housing Board, Chopasani Road	411	RIRuO		98	A	4	15	5	5	5	5	1	0	L
		Shastri Nagar Police Thana	412	RIRuO		102	A	4	12	6	5	6	6	1	0	L
	Kota	Regional Office, RJPB, Anantpura	17	RIRuO		102	A	9	20	13	10	13	15	2	0	L
		Municipal Corporation Building	326	RIRuO		101	A	7	16	12	9	12	14	2	0	L
		Samcore Glass Ltd.	325	RIRuO		103	A	5	20	6	5	6	8	2	0	L
	Udaipur	Ambamata	320	RIRuO		92	A	4	7	5	5	5	6	1	0	L
		Town Hall	294	RIRuO		96	A	4	7	6	5	6	7	1	0	L
		Regional Office,MIA	321	RIRuO		86	A	5	128	7	5	6	7	13	1	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average ($\mu g/m3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Tamilnadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam	38	RIRuO		100	A	9	17	11	9	11	14	2	0	L
		Govt. High School, Manali	71	RIRuO		102	A	9	16	11	9	11	14	2	0	L
		Thiruvottiyur	72	RIRuO		93	A	9	26	13	10	12	15	2	0	L
		Madras Medical College	159	RIRuO		93	A	2	25	6	2	6	11	4	0	L
		NEERI, CSIR Campus	160	RIRuO		95	A	2	20	5	2	4	8	3	0	L
		Thiruvottiyur Municipal Office	161	RIRuO		94	A	2	22	6	3	5	11	4	0	L
	Coimbatore	Poniarajapuram, On the top of DEL	371	RIRuO		50	A	4	8	5	4	4	6	1	0	L
		G.D.Matric Hr.Sec.School	238	RIRuO		93	A	4	49	5	4	4	7	5	0	L
		SIDCO Office Kurichi	237	RIRuO		85	A	4	43	6	4	4	6	7	0	L
	Madurai	Highway (Project -I) Building	306	RIRuO		102	A	6	16	10	8	10	13	2	0	L
		Fenner (I) Ltd. Susee Cars & Trucks	307	RIRuO		92	A	7	19	11	8	11	14	2	0	L
		Kunnathur Chatram Girls HS School	308	RIRuO		94	A	7	15	11	8	11	13	2	0	L
	Salem	Sowdeswari College Building	309	RIRuO		96	A	6	12	8	7	8	10	1	0	L
	Tuticorin	Fisheries College	239	RIRuO		98	A	4	36	13	6	11	19	6	0	L
		Raja Agencies	240	RIRuO		86	A	4	56	11	5	10	17	7	0	L
Uttar Pradesh	Agra	Regional Office, Bodla	323	ES	Taj-trapezium	80	A	7	12	9	1	8	9	11	0	L
		Nunhai	324	ES	Taj-trapezium	79	A	7	13	10	1	8	10	11	0	L
		Taj Mahal	1	ES	Taj-trapezium	286	A	2	18	3	2	2	7	3	0	M
		DIC Nunhai	415	ES	Taj-trapezium	131	A	2	18	4	2	2	7	3	0	M
		Etmad-uddaulah	416	ES	Taj-trapezium	123	A	2	11	3	2	2	6	2	0	M
		Rambagh	417	ES	Taj-trapezium	116	A	2	20	3	2	2	5	2	0	M
	Allahabad	Square crossing circle of Laxmi Talkies	554	RIRuO		105	A	2	29	5	3	2	3	8	0	L
		Bharat Yantra Nigam Ltd	555	RIRuO		105	A	1	40	4	4	2	3	7	0	L
	Anpara	Anpara Colony, Sonabhadra	6	RIRuO		104	A	13	20	17	1	16	17	18	0	L
		Renusagar Colony, Sonabhadra	7	RIRuO		87	A	11	19	17	1	16	17	18	0	L
	Ferozabad	Center for Development of Glass Industry (CDGI)	399	ES	Taj-trapezium	104	A	8	32	17	5	10	18	23	0	M
		Tilak Nagar	400	ES	Taj-trapezium	103	A	7	24	16	5	9	16	22	0	M
		Raza ka Tal	401	ES	Taj-trapezium	101	A	7	25	15	6	8	16	21	0	M

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Uttar Pradesh	Gajraula	Raunaq Auto Ltd, J.P. Nagar	140	RIRuO		88	A	11	27	18	13	17	23	4	0	L
		Indira Chowk, J.P. Nagar	139	RIRuO		71	A	9	22	15	11	14	18	3	0	L
	Ghaziabad	M/s Atlas Cycles Industries Ltd, Sahibabad Industrial Area	258	RIRuO		97	A	25	39	31	27	31	35	3	0	M
	Ghaziabad	Bulandshaar Road Industrial Area	369	RIRuO		88	A	17	35	30	24	31	34	4	0	M
	Jhansi	Jail Chauraha	517	RIRuO		120	A	6	16	9	7	9	11	10	0	L
		Veeranga Nagar	518	RIRuO		120	A	5	13	8	7	8	9	1	0	L
	Kanpur	Forest & Training Centre, Kidwai Nagar	212	RIRuO		98	A	4	12	7	6	7	9	1	0	L
		Chamber Of Commerce, Darshanpurwa	98	RIRuO		81	A	5	12	7	6	7	9	1	0	L
		Fazalganj	86	RIRuO		80	A	6	10	8	7	8	10	1	0	L
		Dabauli	391	RIRuO		71	A	6	10	8	6	8	9	1	0	L
		Awas Vikas, Jajmau	395	RIRuO		89	A	5	9	7	6	7	8	1	0	L
	Khurja	Central Glass & Ceramic Research Institute	534	RIRuO		58	A	24	42	33	28	33	38	4	0	M
		Ahirpara	535	RIRuO		58	A	19	38	25	21	24	33	5	0	L
	Lucknow	Mahanagar	377	RIRuO		75	A	6	9	8	7	8	9	1	0	L
		Chandganj Garden, Aliganj	398	RIRuO		109	A	5	10	8	7	8	9	1	0	L
		Kapoor Hotel, Hazratganj	109	RIRuO		82	A	7	13	8	7	8	9	1	0	L
		Talkatora	113	RIRuO		81	A	7	10	9	8	9	10	1	0	L
		S.M.K Chowk, Aminabad	397	RIRuO		103	A	6	28	8	7	8	9	2	0	L
	Meerut	Begum Bridge	550	RIRuO		67	A	5	15	9	5	9	12	3	0	L
		Thana Railway Road, Kesarganj	551	RIRuO		40	IA	3	12	6	4	5	10	3	0	-
	Muradabad	Budh Bazar		RIRuO		28	IA	3	58	13	4	9	23	12	0	-
		PTC		RIRuO		30	IA	2	46	10	4	8	18	9	0	-
	Noida	Regional Office, UP PCB	403	RIRuO		95	A	4	30	11	7	12	14	3	0	L
		Gee-Pee Electroplating and Engineering Work	378	RIRuO		96	A	4	21	11	7	12	14	3	0	L
	Varanasi	Regional Office, Jawahar Nagar	362	RIRuO		82	A	16	18	17	17	17	18	-	0	L
		Sigra	553	RIRuO		79	A	17	20	18	17	18	18	-	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Uttarakhand	Dehradun	Raipur Road, Near parag Diary	90	ES	Doon valley	18	IA	22	31	27	22	27	29	3	0	-
		Clock Tower, PWD Guest House	89	ES	Doon valley	32	IA	25	33	29	27	30	32	2	0	-
		Himalaya Drug Co. Near ISBT	637	ES	Doon valley	-	-	-	-	-	-	-	-	-	-	-
	Haldwani	Govt. Women Hospital	625	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Haridwar	SIDCUL, Haridwar	635	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Kashipur	BSNL Office, Kashipur	627	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Rishikesh	Nagar Palika Parishad	636	ES	Hill station	-	-	-	-	-	-	-	-	-	-	-
West Bengal	Asansol	Asansol Municipal Corporation	386	RIRuO		105	A	5	13	8	7	8	10	1	0	L
		Kangsabati Spinning Mill, Barjora	593	RIRuO		105	A	5	12	8	7	12	10	1	0	L
		Burnpur Town Department, Burnpur	592	RIRuO		105	A	4	12	8	6	8	9	1	0	L
	Barrackpore	Barrackpore Municiaplity	655	RIRuO		102	A	5	20	9	6	9	13	3	0	L
		Dum Dum Telephone Exchange	653	RIRuO		101	A	6	25	11	7	11	16	4	0	L
		Khardah Municipality	654	RIRuO		102	A	7	29	14	8	13	22	5	0	L
	Durgapur	DMC Water Works, Angadpur	591	RIRuO		105	A	5	11	8	6	8	9	1	0	L
		Kwality Hotel, Bhiringi More, Benachiti	384	RIRuO		105	A	6	11	8	7	8	10	1	0	L
		Bidhannagar, PCBL Club, Muchipara	385	RIRuO		105	A	5	13	7	6	7	8	9	0	L
		Dew India Limited, PCBL More, Durgapur	383	RIRuO		105	A	6	13	9	8	9	11	1	0	L
	Haldia	Bhabanipur, Debhog Milan Viyapith	663	RIRuO		108	A	10	23	15	12	14	18	3	0	L
		Driver's Hut of M/s. MCC PTA, Bhunia Raichak	664	RIRuO		108	A	9	20	13	11	13	16	2	0	L
		Supermarket Building, Durgachak	15	RIRuO		108	A	8	20	13	10	13	15	2	0	L
		WBIIDC Durgachak	14	RIRuO		108	A	10	21	15	11	15	19	3	0	L
	Howrah	Howrah Municipal Corporation Building	8	RIRuO		103	A	6	26	12	8	12	18	4	0	L
		Naskarpara Pump House, Ghuseri	10	RIRuO		103	A	6	24	12	7	11	18	5	0	L
		CDS & Health Centre, Bator	11	RIRuO		103	A	5	20	9	6	8	12	3	0	L
		Howrah Municipality School, Bandhaghat	9	RIRuO		103	A	7	27	15	9	13	22	5	0	L

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
West Bengal	Kolkata	Salt Lake, Rooftop of CK Market	474	RIRuO		103	A	4	17	8	5	7	11	3	0	L
		Moulali, Rooftop of KMC office Building	473	RIRuO		104	A	5	19	9	6	9	14	3	0	L
		Minto Park, Inside Park AJC Bose Road	475	RIRuO		102	A	4	14	8	5	7	11	2	0	L
		Dunlop Bridge, National Sample Survey Building	472	RIRuO		102	A	4	15	8	6	8	12	3	0	L
		Behala Chowrasta, Traffic Guard Building	476	RIRuO		103	A	4	20	9	5	8	13	3	0	L
		Baishnabghata, Upanagari Sporting Club	477	RIRuO		101	A	4	11	6	4	6	9	2	0	L
		Cossipore Police Station, B.T. Road	162	RIRuO		96	A	2	132	22	2	18	43	21	1	L
		Lal-Bazar, Dalhousie Square	163	RIRuO		96	A	2	107	16	2	13	29	15	1	L
		Kasba	348	RIRuO		96	A	2	106	14	2	12	26	14	1	L
	Raniganj	Raniganj Municipality	662	RIRuO		105	A	6	13	9	7	9	11	1	0	L
		Mangalpur, SKS School Mangalpur	660	RIRuO		105	A	5	10	8	7	8	9	1	0	L
		Jamuria Municipality	661	RIRuO		105	A	6	11	8	7	8	10	1	0	L
	Sankrail	Bharat Co-operative Housing Society	657	RIRuO		104	A	5	19	9	6	9	13	3	0	L
		Bagan Police Station, Bagan	659	RIRuO		104	A	5	27	12	7	11	20	5	0	L
		Dhulagar Gram Pachayat	656	RIRuO		104	A	5	22	11	7	11	18	4	0	L
		P Mukherjee's House, Near SBI Amta	658	RIRuO		104	A	4	14	7	5	6	8	2	0	L
	South Suburban	Chanditala Water Supply Pump House, Tollygunge	652	RIRuO		102	A	4	13	7	5	7	11	3	0	L
		Bauipur Police Station, Baruipur	650	RIRuO		105	A	4	11	6	4	6	9	2	0	L
		P Roy Industrial Training Institute, Amtala	651	RIRuO		103	A	4	13	7	4	7	10	2	0	L

*Note: * - Locations where annual mean concentration of SO_2 exceeded the NAAQS of 50 µg/m³ for Residential/ industrial / other area and 20 µg/m³ for sensitive area. '-' Data not available/outlier/ not classified as monitoring days <50days, RIRuO – Residential/industrial/rural/other area, ES – Ecologically sensitive area, Std dev. – Standard deviation, Mon - monitoring, n – number of days monitored for 16 and more hours a day L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedence factor (calculated for n ≥ 50 days) classification based on Pollution Level Classification,Chapter 2,Table 2.1, % violation – percentage violation of NAAQS (24 hourly average) BDL = Below Detection Limit (Concentration less than 4 µg/m³ for SO_2).*

Oxides of nitrogen are a generic term for a group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Oxides of nitrogen are formed during combustion processes at high temperatures from the oxidation of nitrogen in air. NOx are emitted as nitrogen oxide (NO) which is rapidly oxidized to nitrogen dioxide (NO2) Nitrogen dioxide (NO2) is a reddish-brown toxic gas with a characteristic sharp, biting odor and is a prominent air pollutant. Sources of nitrogen oxides includes lightning, forest fires, bacterial activity of soil as natural source and vehicles, industrial processes that burn, high temperature combustion (internal combustion engines, fossil fuel-fired power stations, industrial, burning of bio-mass and fossil fuels are anthropogenic sources. NO2 irritates the nose and throat increase susceptibility to respiratory infections. In addition, NOx is a potent and selective vasodilator in pulmonary arterial hypertension. Oxides of nitrogen react with Volatile Organic Compounds (VOCs) to form ground level ozone. They also react to form nitrates, acid aerosols. Almost all NOx is emitted as NO, which is rapidly oxidized to non toxic NO2.

In this chapter the a detailed summary of NO_2 levels in the country is furnished. The air quality of different cities/ towns has been compared with the respective NAAQS. The air quality has been categorized into four broad categories based on an Exceedence Factor (the ratio of annual mean concentration of a pollutant with that of a respective standard. The four categories are low, moderate, high and critical levels. The top 10 location, cities and states with maximum NO_2 pollution is given.

4.1 Locations, cities and states with highest NO_2 values during 2010

Table 4.1 shows top ten locations in terms of annual average concentration of NO_2 for residential / industrial / rural / other area in which highest concentration was observed at monitoring station located at Bandhabghat, Howrah, West Bengal. In sensitive area highest concentration was observed at CDGI, Ferozabad, Uttar Pradesh (Table 4.2). Among the cities Howrah, West Bengal tops the list with 75 $\mu g/m^3$ NO_2 (Table 4.3). Among the states West Bengal shows highest NO_2 values 64 $\mu g/m^3$ (Table 4.4)

Table 4.1: Ten locations with higher NO_2 values (annual average) during 2010 (residential / industrial / rural / other area)

Sl. No.	State	City	Location	Station code	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	West Bengal	Howrah	Howrah Municipality School, Bandhaghat	9	103	40	169	84.74*	30	50	C
2	West Bengal	Barrackpore	Khardah Municipality	654	102	42	156	80.47*	28	39	C
3	West Bengal	Howrah	Howrah MC Building	8	103	43	161	79.63*	27	38	C
4	Delhi	Delhi	Town Hall, Chandni Chowk	146	96	38	125	75.79*	19	40	C
5	West Bengal	Barrackpore	DumDum Telephone Exchange	653	101	40	146	75.72*	26	32	C
6	West Bengal	Sankrail	Bagan Police Station, Bagan	659	104	30	154	75.52*	30	30	C
7	West Bengal	Kolkata	Moulali, KMC office	473	104	38	160	74.82*	28	37	C
8	West Bengal	Sankrail	Dhulagar Gram Pachayat	656	104	30	137	74.07*	26	27	C
9	West Bengal	Howrah	Naskarpara Pump House, Ghuseri	10	103	37	141	73.50*	25	33	C
10	Maharashtra	Ulhasnagar	Octroi Naka	648	94	8	197	73.46*	37	38	C

** - Locations where annual mean concentration of NO_2 exceeded the NAAQS of 40 $\mu g/m^3$ for Residential/ industrial / other area. Std. dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2, Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 4.2: Ten locations with highest NO_2 values (annual average) during 2010 (Ecologically sensitive area)

Sl. No.	State	City	Location	Station code	ESA category	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	Uttar Pradesh	Ferozabad	CDGI	399	Taj-trapezium	104	23	42	35*	40	0	H
2	Uttar Pradesh	Agra	DIC Nunhai	415	Taj-trapezium	131	5	67	33*	13	0	H
3	Uttar Pradesh	Ferozabad	Tilak Nagar	400	Taj-trapezium	103	23	43	33*	38	0	H
4	Uttar Pradesh	Ferozabad	Raza ka Tal	401	Taj-trapezium	101	21	59	32*	36	0	H
5	Maharashtra	Kolhapur	Ruikar Trust, Dabholkar Corner	509	Sahyadri	92	16	37	26	5	0	M
6	Rajasthan	Alwar	Gaurav Solvex Ltd. MIA	373	Aravali range	75	8	58	26	11	0	M
7	Rajasthan	Alwar	RO, Rajasthan SPCB	372	Aravali range	79	12	51	26	9	0	M
8	Uttar Pradesh	Agra	Rambagh	417	Taj-trapezium	117	5	55	24	11	0	M
9	Uttar Pradesh	Agra	Etmad-uddaulah	416	Taj-trapezium	123	5	53	22	11	0	M
10	Rajasthan	Alwar	RIICO Pump House, MIA	219	Aravali range	72	6	53	21	8	0	M

** - Locations where annual mean concentration of NO_2 exceeded the NAAQS of 30 $\mu g/m^3$ for sensitive areas. Std.dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2.1, Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 4.3: Ten cities with highest NO_2 values (annual average) during 2010 (residential / industrial / rural / other area)

Sl. No.	State	City	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	Air Quality
1	West Bengal	Howrah	37	147	75*	25	C
2	West Bengal	Barrackpore	39	140	74*	24	C
3	Maharashtra	Badlapur	9	175	73*	37	C
4	Maharashtra	Ulhasnagar	8	162	68*	33	C
5	West Bengal	Durgapur	42	91	66*	11	C
6	West Bengal	Asansol	46	88	66*	10	C
7	West Bengal	Sankrail	28	120	65*	22	C
8	West Bengal	Raniganj	45	85	63*	10	C
9	West Bengal	Kolkata	23	142	62*	27	C
10	West Bengal	South Suburban	25	113	56*	23	C

** - Cities where annual mean concentration of NO_2 exceeded the NAAQS of 40 $\mu g/m^3$ for Residentail/industrial / other area. L: Low, M:moderate, H:high, classification based on Pollution Level Classification, Chapter 2, Table 2.1 Data of Monitoring Stations with Monitoring days≥50 has only been condisered.*

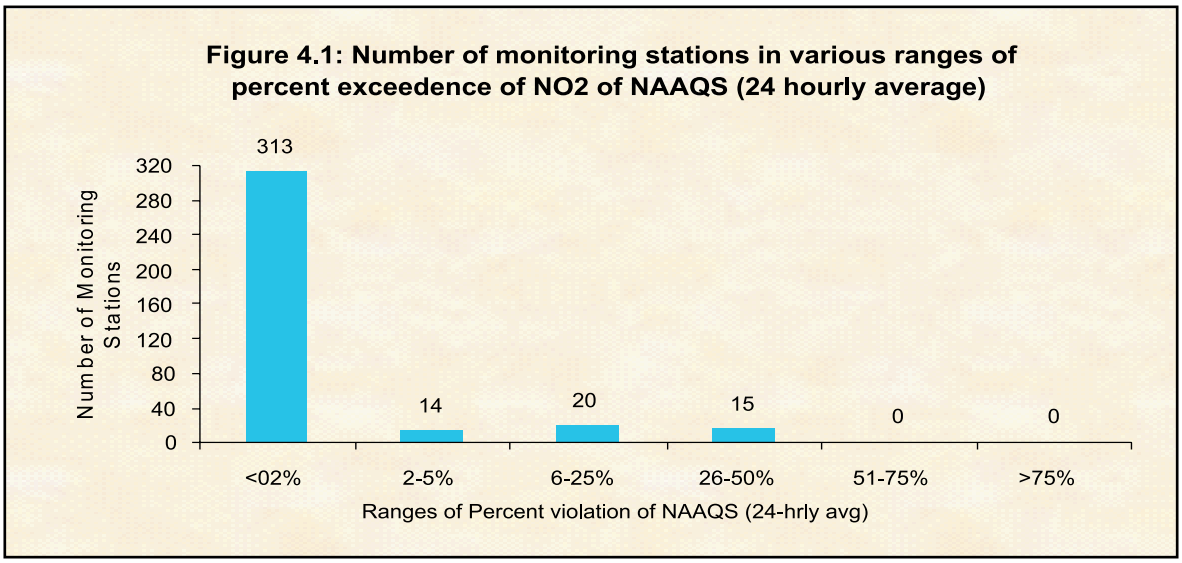
Table 4.4: Ten state with highest NO_2 values (annual average) during 2010 (residential / industrial / rural / other & ecologically senstie area)

Sl. No.	State	Min	Max	Annual average ($\mu g/m^3$)
1	West Bengal	34	115	64*
2	Delhi	26	83	55*
3	Jharkhand	28	52	39
4	Maharashtra	15	70	31
5	Uttar Pradesh	20	42	30
6	Rajasthan	18	49	29
7	Punjab	18	42	27
8	Bihar	11	57	26
9	Gujarat	16	37	23.1
10	Haryana	16	41	22.9

** - Locations where annual mean concentration of NO_2 exceeded the NAAQS of 40 $\mu g/m^3$ for Residential/ industrial / other area. , Data of monitoring stations with monitoring days ≥50 has only been considered*

4.2 Percentage exceedence of NAAQS (24 Hourly Average)

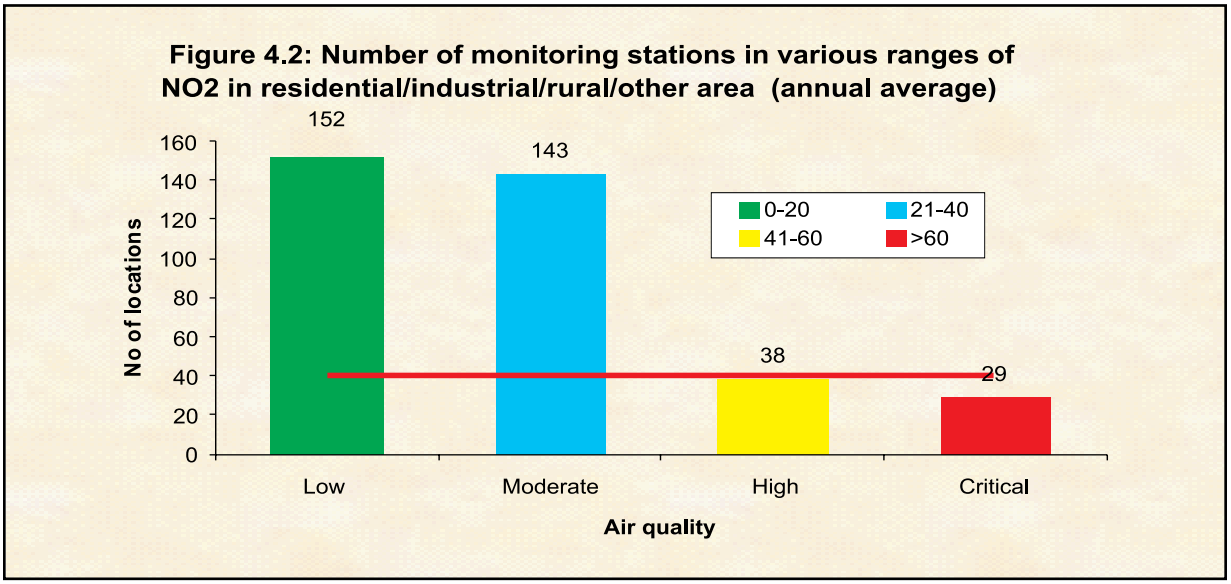
Number of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of NO_2 is depicted in Figure 4.1. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 313 monitoring stations out of 362 stations. In the remaining 49 stations, the percentage exceedence of NAAQS (24 hourly avg.) was 2% or more.



NB. Data of monitoring stations with monitoring days ≥50 has only been considered

4.3 Air Quality (Low, Moderate, High & Critical)

Number of monitoring stations with low, moderate, high and critical levels of NO_2 is depicted in Figure 4.2. 152 locations showed low NO_2 level, 143 locations showed moderate, 38 high and 29 location were in critical category. Therefore, 67 (19%) locations out of 362 exceeded the NAAQS.



NB. Data of monitoring stations with monitoring days ≥50 has only been considered

The annual average concentration of NO_2 at various monitoring stations is given in Table 4.5. The data given is annual average concentration and number of observations with 16 and more hours of monitoring a day. Also, described in the table is air quality in terms of low, moderate, high and critical. NO_2 levels at many monitoring stations (with high and critical air quality) exceeded the prescribed limit.

Table 4.5: NO_2 levels (Annual average) in Ambient Air Quality Stations under NAMP during 2010

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	NO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Andhra Pradesh	Chitoor	GNC Toll Gate Tirumala	582	RIRuO		93	A	9	9	9	9	9	9	-	0	L
	Guntur	Near Hindu College, Market Road	583	RIRuO		102	A	9	15	11	11	11	12	1	0	L
	Hydrabad	Tarnaka, NEERI Lab.	150	RIRuO		94	A	6	45	20	15	20	25	5	0	L
		Nacharam, Industrial Estate	151	RIRuO		89	A	5	43	18	13	17	23	6	0	L
		ABIDS Circle General Post Office Building	152	RIRuO		92	A	12	47	26	18	26	35	7	0	M
		Balanagar	95	RIRuO		108	A	22	71	29	25	29	35	5	0	M
		Uppal, IDA	203	RIRuO		108	A	15	52	29	25	28	34	5	0	M
		Jublee Hills	365	RIRuO		108	A	14	29	17	15	16	18	3	0	L
		Paradise	393	RIRuO		108	A	24	59	30	25	29	35	5	0	M
		Charminar	394	RIRuO		108	A	22	55	29	25	29	34	4	0	M
		Zoo Park	470	RIRuO		107	A	14	46	17	15	16	17	4	0	L
	Kothagudem	CER Club, Khamam	581	RIRuO		103	A	10	13	11	10	11	12	1	0	L
	Kurnool	Mourya Inn	466	RIRuO		118	A	9	9	9	9	9	9	-	0	L
	Nalgonda	RO, APPCB	577	RIRuO		108	A	19	29	23	20	24	27	3	0	M
	Nellore	Kamakhya Temple	580	RIRuO		94	A	10	13	12	11	12	12	1	0	L
	Patencheru	Police Station, Ramachadrapuram	468	RIRuO		98	A	18	33	23	20	23	26	3	0	M
	Ramagundam	Karimnagar Godavarikhani	465	RIRuO		98	A	5	50	12	5	9	24	10	0	L
	Tirupati	Regional Science Centre, Chittoor Bypass Road	389	RIRuO		104	A	9	9	9	9	9	9	-	0	L
	Vijaywada	Benz Circle	462	RIRuO		113	A	8	15	12	10	13	14	2	0	L
		Autonagar	469	RIRuO		113	A	10	20	15	12	15	19	3	0	L
	Warangal	KUDA Office, Hanumakonda	579	RIRuO		102	A	5	32	10	5	8	16	6	0	L
	Vishakhapatnam	Panchayat Raj office, Mindi	234	RIRuO		108	A	9	155	18	10	17	26	14	1	L
		Industrial Estate, Marripalem	233	RIRuO		108	A	9	29	15	9	13	21	5	0	L
		Police Barracks	371	RIRuO		108	A	9	48	21	12	21	28	6	0	M
		INS-Virabahu, Naval Area	387	RIRuO		108	A	9	46	16	10	15	23	6	0	L
		Seethammadhara	388	RIRuO		107	A	9	55	16	10	15	23	7	0	L
		Ganapuram Area	467	RIRuO		108	A	9	63	23	13	22	29	8	0	M
		Pedagantyada, Gajuwada	584	RIRuO		117	A	9	39	12	9	11	19	5	0	L
		CWMP, RAMKY, Parawada	585	RIRuO		108	A	9	28	10	9	9	12	2	0	L

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Assam	Bongaigaon	Oil India Ltd. Chirang	542	RIRuO		104	A	10	22	15	12	15	18	3	0	L
		Barpara Office Building	520	RIRuO		104	A	5	28	15	13	15	18	3	0	L
	Daranga	BATAD, Baska	566	RIRuO		92	A	8	21	14	11	14	17	2	0	L
	Dibrugarh	Dibrugarh Office Building	538	RIRuO		103	A	7	18	14	12	14	16	2	0	L
	Golaghat	Golaghat Office Building	539	ES	Numaligarh	82	A	9	22	15	11	15	19	3	0	L
	Guwahati	Head Office, Bamunimaidam	193	RIRuO		254	A	9	22	15	11	15	19	3	0	L
		Boragaon, office premises of IASST, Kamrup	603	RIRuO		33	IA	7	22	15	11	16	19	3	0	-
		Guwahati University, Kamrup	602	RIRuO		82	A	8	17	13	11	13	16	2	0	L
		ITI Building, Gopinath Nagar	519	RIRuO		280	A	9	45	16	13	16	19	3	0	L
		Central Dairy, Khanapara, Kamrup	596	RIRuO		106	A	10	17	13	12	13	15	1	0	L
		Near Pragjyotish College, Santipur	541	RIRuO		264	A	11	23	15	12	15	19	2	0	L
	Lakhimpur	Bazar Patti, North Lakhimpur	587	RIRuO		102	A	10	23	15	12	14	18	2	0	L
	Nagaon	Water Resources Div., Christian Patty	595	RIRuO		103	A	7	27	14	10	14	19	3	0	L
	Nalbari	PWD Rural Div Office Complex,	597	RIRuO		82	A	9	26	16	13	16	19	3	0	L
	Sibsagar	Sibasagar Office Building	537	RIRuO		108	A	7	19	14	11	14	16	2	0	L
		Usha Lodge, near ONGCL Colony	604	RIRuO		24	IA	11	18	13	11	13	16	2	0	-
	Silchar	Janiganj Govt. Boys HS School	607	RIRuO		11	IA	13	17	15	13	15	17	1	0	-
		Office Building of RLO, Ithkola Market	567	RIRuO		92	A	11	22	17	15	17	20	2	0	L
	Tezpur	Tezpur Office Building	536	RIRuO		104	A	8	18	13	11	13	15	2	0	L
	Tinsukia	Digboi Carbon factory Campus, Borguri	594	RIRuO		99	A	9	20	13	12	13	16	2	0	L
		Coal India Office Complex, Margherita	586	RIRuO		97	A	15	44	23	18	22	26	4	0	M
		Shreepuria, Borguri	605	RIRuO		43	IA	7	19	13	12	13	15	2	0	-
Bihar	Patna	Beltron Bhawan, Shastri Nagar	210	RIRuO		87	A	11	57	26	15	24	38	9	0	M
		Gandhi Maidan Test Centre	284	RIRuO		51	A	25	82	55*	36	57	71	14	4	H

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Chandigarh	Chandigarh	Modern Foods, Industrial Area	106	RIRuO		149	A	5	45	19	10	17	31	9	0	L
		Sector-17 C	263	RIRuO		150	A	5	40	19	10	17	31	8	0	L
		Punjab Engineering College, Sector 12	264	RIRuO		153	A	5	43	14	5	13	23	7	0	L
		Sector-39, IMTECH	463	RIRuO		150	A	5	38	15	5	14	25	7	0	L
		Kaimbwala Village	464	RIRuO		146	A	5	39	12	5	11	18	6	0	L
Chattisgarh	Bhillai	Visak Hostel, Sector-4	65	RIRuO		91	A	16	26	22	19	22	25	2	0	M
		R.O., 5/32 Banglow Office Building	67	RIRuO		90	A	11	18	15	13	15	17	2	0	L
		M.P. Laghu Udyog Nigam	245	RIRuO		87	A	19	33	30	29	31	32	3	0	M
	Bilaspur	RO, CECB Vyapar Vihar		RIRuO		35	IA	12	35	19	13	20	24	5	0	-
	Korba	HIG 21,22.Near Ghantaghar,	364	RIRuO		92	A	19	22	21	20	21	22	1	0	M
		Pragati Nagar NTPC Colony	249	RIRuO		97	A	16	21	20	19	20	21	1	0	L
		I.T.I., Rampur	407	RIRuO		95	A	20	23	21	20	21	22	1	0	M
	Raipur	New HIG-9, Hirapur	368	RIRuO		42	IA	31	47	42	39	43	45	3	0	-
		M/S Wool Worth India, Sarora Raipur	223	RIRuO		45	IA	40	52	46	42	46	49	3	0	-
		Yatayat Thana, Jai Stambh Chowk	447	RIRuO		44	IA	17	47	41	39	41	44	4	0	-
Dadra & Nagar Haveli	Silvassa	Khadoli Industrial Area, Village- Khadoli	558	RIRuO		94	A	17	20	18	17	17	19	1	0	L
Daman & Diu	Daman	Kadaiya Industrial Area, Village- Kadaiya	560	RIRuO		96	A	16	20	18	17	17	19	1	0	L
Delhi	Delhi	N.Y. School, Sarojini Nagar	144	RIRuO		96	A	24	124	68*	41	65	106	23	26	C
		Town Hall, Chandni Chowk	146	RIRuO		96	A	38	125	76*	53	76	102	19	40	C
		Mayapuri Industrial Area	345	RIRuO		96	A	21	129	72*	42	70	108	25	31	C
		Pritampura	531	RIRuO		81	A	23	65	38	30	37	49	8	0	M
		Shahadra	58	RIRuO		80	A	29	58	45*	33	46	55	8	0	H
		Shahzada Bagh	57	RIRuO		79	A	20	71	48*	33	47	64	12	0	H
		Nizamuddin	55	RIRuO		80	A	27	60	48*	41	49	53	6	0	H
		Janakpuri	59	RIRuO		76	A	24	59	51*	44	53	57	6	0	H
		Siri Fort	60	RIRuO		80	A	26	59	46*	34	49	54	8	0	H

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Goa	Panaji	Old GSPCB premises, Patto	327	RIRuO		105	A	5	42	17	5	16	30	8	0	L
	Marmagao	Fire Brigade Station, Port Trust	435	RIRuO		118	A	5	55	18	7	17	31	10	0	L
	Vasco	Fuse Call Office of Elec. Dept., Mormugao taluka	37	RIRuO		103	A	5	55	19	6	18	31	10	0	L
	Curchorem	Curchorem, Sanvordem, Quepem	628	RIRuO		19	IA	8	32	17	9	16	25	6	0	-
	Codli	Codli Tisk, Ponda	630	RIRuO		6	IA	23	32	27	24	26	31	3	0	-
	Honda	Honda Junction, Sattari	631	ES	Sahyadri	8	IA	16	33	25	19	25	31	6	0	-
	Bicholim	Bicholim	632	RIRuO		11	IA	15	293	50	16	29	31	81	9	-
	Amona	Amona, Bicholim	633	RIRuO		16	IA	12	28	18	13	16	28	6	0	-
	Assanora	Assanora Junction, Bardez	634	RIRuO		8	IA	13	21	16	13	14	20	3	0	-
	Usgao	Usgao Plae, Junction, Ponda	629	RIRuO		10	IA	5	26	10	6	9	13	6	0	-
Gujarat	Ahmedabad	Naroda, G.I.D.C., Ahmadabad	101	RIRuO		104	A	17	35	27	24	26	29	3	0	M
		Cadilla Bridge Narol	102	RIRuO		103	A	17	26	21	18	22	24	2	0	M
		L.D. Engg. College	103	RIRuO		104	A	13	22	17	15	17	19	2	0	L
		Shardaben Hospital, Saraspur	154	RIRuO		103	A	15	22	19	17	19	21	2	0	L
		R.C. High School, Mirzapur	155	RIRuO		104	A	16	25	20	17	20	23	2	0	L
		Naroda, G.I.D.C.,	347	RIRuO		104	A	16	24	20	18	20	22	2	0	L
	Anklesvar	Rallis India Ltd.	252	RIRuO		104	A	17	37	25	20	25	30	4	0	M
		Durga Traders, Bhavanafarm Society	253	RIRuO		104	A	16	29	22	19	22	27	3	0	M
	Jamnagar	Fisheries Office	319	RIRuO		104	A	15	37	27	22	27	32	4	0	M
	Rajkot	Sardhara Industrial Corporation	257	RIRuO		104	A	10	22	18	16	19	20	2	0	L
		Regional Offce	374	RIRuO		104	A	12	20	16	14	16	18	1	0	L
	Surat	S.V.R. Engg. College	21	RIRuO		104	A	13	27	22	18	22	25	3	0	M
		B.R.C. High School, Udhna	22	RIRuO		114	A	19	34	26	22	26	30	3	0	M
		Air India Office	23	RIRuO		104	A	16	29	24	21	25	28	3	0	M
	Vadodara	GPCB Office, Geri Vasahat	50	RIRuO		96	A	10	31	15	11	14	18	3	0	L
		Dandia Bazaar	333	RIRuO		96	A	17	54	29	23	26	37	6	0	M
		CETP Nandesari	334	RIRuO		96	A	36	101	43*	40	42	49	7	0	H
	Vapi	GEB, IIIrd Phase, GIDC, Vapi	367	RIRuO		104	A	17	68	24	19	24	27	6	0	M
		Vapi Nagar Palika, Vapi	221	RIRuO		104	A	15	65	23	19	23	26	6	0	M

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Haryana	Faridabad	Escorts Research Centre Mathura Road	331	RIRuO		145	A	18	51	26	20	23	37	8	0	M
		RO Haryana SPCB	330	RIRuO		96	A	20	71	31	22	24	50	14	0	M
	Hissar	Urban Estate - II	390	RIRuO		27	IA	5	10	8	5	8	10	2	0	-
		Guru Jambehswar University	414	RIRuO		52	A	5	10	8	5	8	10	2	0	L
	Yamunanagar	Ballarpur Industries	196	RIRuO		52	A	21	31	26	22	27	29	2	0	M
Himachal Pradesh	Baddi	Industry Department Office Building	449	RIRuO		93	A	7	56	18	11	16	26	8	0	L
		AHC barotiwala	564	RIRuO		83	A	9	48	19	11	16	32	9	0	L
		Housing Board	563	RIRuO		11	IA	5	19	12	7	12	18	4	0	-
	Damtal	Regional Office	268	RIRuO		148	A	5	40	10	6	9	13	4	0	L
		Old Road	271	RIRuO		112	A	5	18	11	8	12	15	3	0	L
	Kala Amb	Kala Amb Industrial Area	461	RIRuO		156	A	14	65	22	16	19	23	10	0	M
		Trilokpur	530	RIRuO		155	A	11	19	15	13	15	17	1	0	L
	Nalagarh	Municipal Council	565	RIRuO		66	A	7	53	18	10	16	28	-	0	L
	Parwanoo	Regional Office, Sector- 4	132	RIRuO		149	A	4	20	11	6	11	15	3	0	L
		Asst. Commissioner Building, Sector I	339	RIRuO		134	A	5	21	13	8	13	17	4	0	L
	Paonta Sahib	Paonta Sahib	117	RIRuO		136	A	12	21	16	13	16	19	2	0	L
		Gondhpur Industrial Area	118	RIRuO		107	A	13	23	17	14	17	21	2	0	L
	Shimla	Tekka Bench Ridge	34	ES	Hill station	140	A	4	17	9	4	9	13	3	0	L
		Bus Stand, Winterfield	35	ES	Hill station	114	A	6	30	17	12	17	21	4	0	M
Jammu & Kashmir	Jammu	Regional Office, Jammu	184	RIRuO		88	A	6	21	12	8	12	16	3	0	L
		M.A. Stadium, Jewel Chowk, Jammu	482	RIRuO		89	A	5	27	15	10	14	21	4	0	L
		Bari Brahamana Industrial Area, Jammu	507	RIRuO		49	IA	9	30	18	14	18	23	4	0	-
Jharkhand	Dhanbad	EMTI, Bastacola	612	RIRuO		67	A	26	47	36	31	36	40	4	0	M
		CGM Office, Kusunda	611	RIRuO		77	A	16	45	35	31	35	43	5	0	M
		R.O. Dhanbad	44	RIRuO		75	A	28	61	38	32	37	44	6	0	M
	Jamshedpur	Bistupur Vehical Testing Centre	351	RIRuO		89	A	38	55	48*	44	48	51	3	0	H
		Golmuri Vehicle Testing Centre	382	RIRuO		91	A	30	55	47*	44	48	51	3	0	H
	Jharia	M.A.D.A.	332	RIRuO		68	A	30	53	38	34	38	43	4	0	M
	Ranchi	Albert Ekka Chowk, Main Road	402	RIRuO		111	A	30	45	35	32	34	38	2	0	M
	Saraikela Kharsawan	RO Building, Adityapur	614	RIRuO		86	A	33	53	45*	41	46	51	4	0	H
	Sindri	BIT / PDIL	46	RIRuO		33	IA	27	56	37	31	36	44	6	0	-
	West Singhbhum	Barajamda U.M. Office	615	RIRuO		84	A	24	51	32	27	31	36	5	0	M
Karnataka	Bangalore	Graphite India	77	RIRuO		59	A	19	42	31	25	31	41	5	0	M
		Yeshwanthpura police station	457	RIRuO		100	A	18	41	31	26	31	34	4	0	M
		Peenya Industrial Area	405	RIRuO		99	A	20	77	32	25	31	38	8	0	M

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Karnataka	Bangalore	KHB Industrial Area, Yelahanka	404	RIRuO		107	A	18	75	30	24	30	33	6	0	M
		AMCO Batteries, Mysore Road	78	RIRuO		100	A	16	41	29	25	30	32	4	0	M
		Jnanabharathi , Bangalore University	598	RIRuO		104	A	1	29	14	8	17	18	5	0	L
		R V College of Engineering	589	RIRuO		22	IA	11	25	19	13	18	23	4	0	-
		TERI office, Vital Medi healthcare Pvt.Ltd		RIRuO		15	IA	23	244	63	30	48	98	59	13	-
		Victoria hospital	406	RIRuO		29	IA	19	38	27	20	28	36	6	0	-
	Belgaum	Karnataka SPCB Office Building	460	ES	Sahyadri	83	A	5	38	15	9	13	26	7	0	L
	Gulburga	Government Hospital	459	RIRuO		77	A	6	25	13	10	13	16	3	0	L
	Hassan	KSRTC bus stand building	458	RIRuO		84	A	14	31	22	18	22	28	4	0	M
	Hubli-Dharwad	Lakamanahali Industrial Area, Dharwad	432	RIRuO		69	A	10	27	13	10	12	15	3	0	L
		Rani Chennamma Circle, Hubli	431	RIRuO		95	A	10	28	13	10	13	15	3	0	L
	Mangalore	Stides Premises, Baikampady Industrial Area	488	RIRuO		105	A	5	18	8	5	6	13	4	0	L
	Mysore	K.R.Circle	40	RIRuO		94	A	17	40	28	21	27	37	6	0	M
		KSPCB Bldg. Hebbal Ind. Area	328	RIRuO		117	A	16	68	28	19	27	36	8	0	M
Kerala	Alappuzha	District Office, Alissery Road	618	RIRuO		120	A	5	6	5	5	5	5	-	0	L
		DC Mills, Pathirappally	617	RIRuO		120	A	5	8	5	5	5	5	-	0	L
	Kochi	Eloor I	149	RIRuO		90	A	5	11	5	5	5	6	1	0	L
		Eloor II	29	RIRuO		91	A	5	12	6	5	6	7	2	0	L
		Irumpanam	30	RIRuO		109	A	5	22	11	8	10	15	3	0	L
		Ernakulum South	338	RIRuO		109	A	6	30	16	10	15	23	5	0	L
		VYTTILA	562	RIRuO		108	A	6	27	14	9	13	19	4	0	L
		MG Road Bank Ernakulum	147	RIRuO		109	A	6	30	13	8	12	20	5	0	L
		Kalamassery	346	RIRuO		108	A	5	35	15	10	14	22	5	0	L
	Kollam	KSPCB, District Office, Kadappakada	621	RIRuO		117	A	6	44	19	9	18	30	8	0	L
		KMML Chavara	620	RIRuO		56	A	5	26	11	5	11	17	5	0	L
	Kottayam	Kottayam	187	RIRuO		96	A	22	26	24	23	24	25	1	0	M
		Vadavathoor	361	RIRuO		96	A	13	16	14	14	14	15	1	0	L
	Kozhikode	Kozhikode City	360	RIRuO		108	A	5	20	10	6	10	14	3	0	L
		Nallalam	359	RIRuO		108	A	5	18	8	5	7	13	3	0	L
	Malapuram	Kakkanchery Sijmak oils	623	RIRuO		108	A	5	6	5	5	5	5	-	0	L
	Palakkad	SEPR Refractories India Ltd.	311	RIRuO		121	A	5	12	6	5	5	9	2	0	L
	Pathanamthitta	Near District Office KSPCB, Makkam-kunnu	619	RIRuO		120	A	5	37	13	8	13	18	5	0	L
	Thissur	KSPCB, District Office, Poonkunnam	624	RIRuO		93	A	5	15	7	5	6	12	3	0	L
	Wayanad	Sulthan Bathery	622	RIRuO		119	A	5	51	12	5	10	21	8	0	L
	Trivandrum	PRS Hospital/COSMO	419	RIRuO		108	A	15	49	26	21	26	29	4	0	M
		SMV School	181	RIRuO		109	A	16	50	27	23	27	32	4	0	M
		VELI	357	RIRuO		106	A	13	24	18	16	18	21	2	0	L
		PETTAH	358	RIRuO		107	A	19	32	25	22	25	28	3	0	M

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Madhya Pradesh	Bhopal	Hamidia Road, M.P. Hastshilp Vikas Nigam	122	RIRuO		73	A	11	67	21	12	19	28	9	0	M
		C E T P Govindpura	123	RIRuO		74	A	1	111	15	7	12	22	13	1	L
	Dewas	EID Perry (I) Limited	525	RIRuO		86	A	38	14	22	0	17	21	27	5	M
		Dewas Metal Section	524	RIRuO		52	A	25	10	16	14	15	19	3	0	L
		Vikas Nagar	523	RIRuO		79	A	30	11	18	14	17	21	3	0	L
	Gwalior	Dindayal Nagar	479	RIRuO		71	A	28	12	20	17	20	25	4	0	L
		Maharaj Bada	478	RIRuO		58	A	31	12	20	16	20	24	4	0	L
	Indore	Polo Ground	127	RIRuO		89	A	8	51	21	11	21	31	8	0	M
		Kothari Market, M.G. Road	128	RIRuO		94	A	5	48	19	10	20	26	7	0	L
		Telephone Nagar, Kanadia Road	131	RIRuO		91	A	4	29	13	8	13	17	4	0	L
	Jabalpur	Vijay Nagar	248	RIRuO		21	IA	28	22	25	22	24	27	2	0	-
	Nagda	B C I Labour Club	84	RIRuO		91	A	37	15	22	18	21	26	4	0	M
		Grasim Kalyan Kendra	246	RIRuO		98	A	54	18	26	20	26	30	5	0	M
	Sagar	Pt.Deendayal Nagar, Housing Board Colony	532	RIRuO		72	A	21	8	17	15	18	20	2	0	L
	Satna	Sub-divisional Office E/M LightMachniery	343	RIRuO		80	A	9	5	6	5	7	8	1	0	L
		Regional Office MPPCB	342	RIRuO		96	A	8	5	6	5	6	7	1	0	L
	Singrauli	Jayant Township	515	RIRuO		13	IA	29	22	26	23	25	28	2	0	-
		N.T.P.C., Vidyanagar	514	RIRuO		19	IA	21	17	19	17	19	20	1	0	-
		Waidhan	516	RIRuO		13	IA	15	10	13	11	13	14	1	0	-
	Ujjain	District Office	527	RIRuO		71	A	30	13	17	14	16	21	3	0	L
		Regional Office	526	RIRuO		42	IA	11	8	9	8	9	10	1	0	-
		Mahakal Temple	528	RIRuO		51	A	42	11	14	11	13	15	5	0	L
Maharashtra	Amravati	M/s Apurva Oil and Industries Pvt. Ltd	549	RIRuO		88	A	10	18	14	12	14	16	2	0	L
		Govt College of Engineering	548	RIRuO		97	A	9	16	13	11	13	15	2	0	L
		Rajkamal Square	547	RIRuO		96	A	10	20	16	13	16	18	2	0	L
	Aurangabad	S.B.E.S. College	511	RIRuO		109	A	12	34	22	15	22	27	5	0	M
		Collector Ofiice	512	RIRuO		108	A	11	34	19	14	19	24	4	0	L
		C.A.D.A. Ofiice, Garkheda	513	RIRuO		97	A	11	46	20	14	20	26	6	0	L
	Badlapur	BIWA Office	649	RIRuO		92	A	9	175	73*	27	68	115	37	29	C

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Maharasthtra	Chandrapur	Grampanchat Ghughus	267	RIRuO		93	A	9	64	27	14	24	43	12	0	M
		MIDC Chandrapur	281	RIRuO		96	A	9	64	26	14	27	41	11	0	M
		Nagar Parishad	396	RIRuO		97	A	9	75	30	15	28	51	15	0	M
		Gadchandur Gram Panchayat, Rajura	640	RIRuO		74	A	8	65	23	9	19	39	13	0	M
		MIDC, Tadali	638	RIRuO		62	A	7	40	18	9	18	29	7	0	L
		Muncipal Council, Ballarshah	639	RIRuO		94	A	11	101	34	14	32	55	18	2	M
	Jalgaon	B. J. Market	644	RIRuO		69	A	29	54	43*	36	44	49	5	0	H
		Girna water tank	645	RIRuO		68	A	31	53	41*	36	41	47	4	0	H
		MIDC Jalgaon	646	RIRuO		70	A	41	135	51*	44	50	55	11	1	H
	Kolhapur	University Campus, Shivaji University,	508	ES	Sahyadri	100	A	7	12	10	8	10	12	1	0	L
		Ruikar Trust, Dabholkar Corner, ST Stand	509	ES	Sahyadri	92	A	16	37	26	20	25	33	5	0	M
		Mahadwar Road, Near Mahalaxmi Temple	510	ES	Sahyadri	20	IA	102	12	29	15	20	25	4	0	-
	Latur	MIDC Water Works	641	RIRuO		96	A	9	43	17	10	16	25	6	0	L
		Terrace of Kshewraj Vidyalaya Shyamnagar	642	RIRuO		104	A	9	33	16	9	15	23	5	0	L
		Terrace of Sidhheshwar Sahakari Bank Ganjgolai	643	RIRuO		61	A	9	35	16	10	15	22	5	0	L
	Lote	MIDC Chalkewadi	489	RIRuO		12	IA	20	53	33	29	32	38	8	0	-
		Pump House, CETP	490	RIRuO		18	IA	9	61	27	13	27	41	14	0	-
	Mahad	Water treatment plant, Bhirwadi	569	RIRuO		66	A	9	75	37	16	34	60	16	0	M
		EHS, M/s Privi organics Ltd	570	RIRuO		56	A	21	68	42*	26	41	54	11	0	H
		Mahatma Phule Hall, MNP	571	RIRuO		50	A	21	57	37	25	37	48	9	0	M
	Mumbai	Kalbadevi	169	RIRuO		84	A	5	74	17	5	10	34	15	0	L
		Parel , Ambedkar Road	170	RIRuO		98	A	5	59	16	5	12	37	13	0	L
		Worli	349	RIRuO		103	A	5	268	23	5	14	40	31	3	M
	Nagpur	Institution of Engineers	287	RIRuO		86	A	25	85	38	27	35	55	12	2	M
		Govt. Polytechnic College, Sadar	314	RIRuO		87	A	20	94	38	27	36	50	12	1	M
		MIDC Office Hingana Road	288	RIRuO		83	A	22	78	41*	29	39	56	12	0	H
		MIDC Industrial Area, MIDC Office, Hingna	165	RIRuO		81	A	5	98	28	10	22	57	19	1	M
		Maskasath, Itwari	166	RIRuO		98	A	5	125	32	13	27	61	20	3	M
		NEERI Lab, Nehru Marg	167	RIRuO		96	A	6	75	23	9	21	40	14	0	M

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Maharasthtra	Nashik	R.T.O. Colony Tank	259	RIRuO		112	A	16	39	25	19	23	32	5	0	M
		VIP Industrial Area, MIDC Satpura	269	RIRuO		113	A	18	70	27	21	26	33	6	0	M
		Nashik Municipal Council Building	280	RIRuO		111	A	16	41	25	20	24	34	5	0	M
	Navi Mumbai	T.B.I.A, Rabale , Airoli, TTC	491	RIRuO		102	A	16	73	41*	23	41	56	13	0	H
		Dr. D.Y. Patil College, Nerul, TTC	492	RIRuO		104	A	10	58	33	18	35	45	10	0	M
		MPCB Central Lab, Mhape	493	RIRuO		96	A	17	79	42*	22	42	60	14	0	H
		CIDCO Nodal Office Kharghar	494	RIRuO		105	A	13	77	35	19	34	50	13	0	M
		Panvel Residential Area, Taloja	495	RIRuO		96	A	13	72	34	18	33	49	13	0	M
		MIDC Collom Faciolity Building	496	RIRuO		99	A	19	93	49*	30	48	68	15	4	H
	Pune	Maratha Chamber of commerce, Bhosari	312	RIRuO		104	A	12	93	37	19	34	56	16	2	M
		State Electricity Board BLDG Nalstop	379	RIRuO		105	A	12	114	39	20	36	59	17	2	M
		Swargate Police Chawki	381	RIRuO		104	A	10	116	42*	19	40	72	21	8	H
	Roha	Roha Industrial Association office	572	RIRuO		64	A	20	88	33	23	29	46	12	2	M
		Filter House of MIDC Water works	573	RIRuO		61	A	21	70	35	23	34	49	12	0	M
	Sangli	Udyog bhavan / SRO, MPCB Sangli	574	RIRuO		105	A	16	43	25	19	24	30	5	0	M
		Sangli- Miraj Primary school Building	575	RIRuO		104	A	14	49	28	20	27	37	7	0	M
		Krishna Valley School	576	RIRuO		104	A	17	55	29	21	28	37	7	0	M
	Solapur	WIT Campus	299	RIRuO		106	A	30	49	35	33	35	38	3	0	M
		Voronoko School / Chitale Clinic	300	RIRuO		107	A	30	42	35	32	35	38	2	0	M
	Thane	Maternity Hospital,Dhobighat,Kopri	303	RIRuO		112	A	9	18	13	10	13	16	2	0	L
	Thane	Terrace of Shahu Market,Naupada	304	RIRuO		108	A	11	22	16	13	16	21	3	0	L
		Kolshet and Balkum, Thane West	305	RIRuO		36	IA	11	18	14	12	14	17	2	0	-
	Ulhasnagar	Smt. C. H. M. College Campus	647	RIRuO		99	A	8	128	62*	24	62	94	29	24	C
		Octroi Naka	648	RIRuO		94	A	8	197	73*	26	68	116	37	38	C
Meghalaya	Byrnihat	EPIP, Ri-Bhoi district	568	RIRuO		87	A	5	34	15	7	15	22	6	0	L
	Dawki	Terrace building, Jaintia Hills District	588	RIRuO		68	A	5	16	6	5	5	11	3	0	L
	Tura	Office building of Add Chief Engineer, Garo Hills District	608	RIRuO		34	IA	5	14	9	6	9	11	2	0	-
	Shillong	State Tuberculosis Hospital	340	ES	Hill station	79	A	5	29	15	8	14	23	6	0	L
		Boards Office Permises, Lumpyngngad	120	ES	Hill station	54	A	5	6	5	5	5	5	-	0	L
Mizoram	Aizawl	Khatla, M.G-Road, Roof Top of Mizoram SPCB	450	ES	Hill station	104	A	5	10	6	5	5	7	1	0	L
	Aizawl	Laipuitlang, Residence of Chairman, MPCB	451	ES	Hill station	104	A	5	8	5	5	5	5	1	0	L
	Aizawl	Bawngkawn , Roof Top of Mr.K.L. Berema's residence	452	ES	Hill station	104	A	5	11	6	5	6	8	1	0	L

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Nagaland	Dimapur	Bank Colony	317	RIRuO		93	A	5	16	7	5	7	11	3	0	L
		Dhobinala	448	RIRuO		93	A	5	14	7	5	7	11	3	0	L
	Kohima	Opposite NST Office	609	ES	Hill station	51	A	5	7	5	5	5	6	1	0	L
		Opposite War Cemetery	610	ES	Hill station	42	IA	5	7	5	5	5	6	1	0	-
Orissa	Angul	Industrial Estate	70	RIRuO		110	A	16	25	22	21	23	24	2	0	M
		NALCO Township	231	RIRuO		100	A	16	26	19	17	19	23	2	0	L
	Balasore	Sahadevkhunta	428	RIRuO		100	A	10	15	12	10	12	13	1	0	L
	Berhampur	Regional Office Orissa SPCB	429	RIRuO		95	A	7	18	13	10	13	16	2	0	L
	Bhubneshwar	Capital Police Station	424	RIRuO		105	A	13	59	19	14	20	22	5	0	L
		IRC Village	423	RIRuO		98	A	10	23	17	14	18	20	3	0	L
		SPCB Building	322	RIRuO		113	A	10	23	18	13	19	22	3	0	L
	Cuttack	Roof of Traffic Tower, Badambadi	426	RIRuO		105	A	13	38	22	17	21	29	5	0	M
		R.O. Cuttack Office, Surya Vihar	425	RIRuO		45	IA	14	38	19	15	16	32	7	0	-
	Rayagada	Regional Office Orissa SPCB	428	RIRuO		103	A	11	25	20	14	21	23	3	0	L
		LPS High School, Jaykaypur	229	RIRuO		103	A	11	25	21	15	21	24	3	0	M
	Rourkela	Regional Office, ORPB	370	RIRuO		94	A	9	11	10	10	10	11	-	0	L
		IDL Police Out-post, Sonaparbat	227	RIRuO		104	A	9	26	11	10	11	11	2	0	L
	Sambalpur	Filter Plant, PHD Office, Modipara	427	RIRuO		84	A	10	21	15	11	15	19	3	0	L
	Talcher	Coal Field Area / MCL AREA	471	RIRuO		66	A	16	31	26	22	27	28	3	0	M
		T.T.P.S.Colony	68	RIRuO		103	A	12	28	20	18	20	22	3	0	L
Punjab	Amritsar	R.O. Focal Point, Amritsar	487	RIRuO		53	A	31	39	35	32	36	38	2	0	M
		A-1,Platers, Amritsar / VMC	486	RIRuO		57	A	32	40	36	33	36	38	2	0	M
	Bhatinda	Ms Milk Plant, Ropar	506	RIRuO		96	A	10	38	21	15	20	29	6	0	M
	Dera Bassi	M/s Punjab Chemicals and Crop Protection Ltd.	504	RIRuO		128	A	12	38	23	15	24	31	6	0	M
		M/s Winsome Yarns Ltd., Barwala Road, Derabassi	505	RIRuO		138	A	12	42	24	15	24	30	6	0	M
	Pathankot/	C-PYTE Building at Dera Baba Nanak	590	RIRuO		56	A	12	16	14	13	14	15	1	0	L
	Gobindgarh	M/s Modi Oil and General Mills	302	RIRuO		107	A	19	53	34	26	34	40	6	0	M
		M/s Raj Steel Rolling Mills	301	RIRuO		121	A	21	49	35	28	35	41	6	0	M
		United Rolling Mills, Mandi Gobindgarh	483	RIRuO		96	A	25	50	35	30	34	40	4	0	M
	Jalandar	Municipal Council Tubewell	353	RIRuO		25	IA	22	33	29	24	30	33	3	0	-

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	Khanna	Markfed Vanaspati, Khanna	485	RIRuO		123	A	20	47	31	27	30	39	5	0	M
		AS School, Khanna	484	RIRuO		134	A	22	48	31	27	30	39	5	0	M
	Ludhiana	Bharat Nagar Chowk	422	RIRuO		24	IA	27	31	29	27	30	31	1	0	-
		Nahar Spining Mlls, Dholewal Chawk	76	RIRuO		115	A	22	63	35	26	33	45	9	0	M
		Milk plant, Ferozpur Road	61	RIRuO		131	A	22	49	30	24	28	39	6	0	M
		Vishavkarma Chowk	335	RIRuO		126	A	22	61	33	24	30	45	9	0	M
	Naya Nangal	M/s Punjab Alkalis & Chemicals Ltd.	420	RIRuO		111	A	10	26	16	11	16	21	3	0	L
		M/s NFL Guest House	421	RIRuO		104	A	10	32	17	11	16	23	5	0	L
	Patiala	Ceylon Industries	600	RIRuO		125	A	13	31	20	15	17	24	4	0	L
		Fire Brigade Station, Bahera Road,	599	RIRuO		120	A	11	32	20	14	20	26	5	0	L
Puducherry	Puducherry	DSTC Office Upstairs, AnnaNagar	64	RIRuO		90	A	7	20	14	11	14	18	3	0	L
		PIPDIC Ind. Estate Mettupalayam	93	RIRuO		82	A	7	20	15	11	16	18	3	0	L
		Chamber Of Commerce	337	RIRuO		83	A	5	18	10	6	10	14	4	0	L
Rajasthan	Alwar	Regional Office, Rajasthan SPCB	372	ES	Aravali range	79	A	12	51	26	17	24	38	9	0	M
		Gaurav Solvex Ltd. MIA	373	ES	Aravali range	75	A	8	58	26	16	22	40	11	0	M
		RIICO Pump House, MIA	219	ES	Aravali range	72	A	6	53	21	12	19	30	8	0	M
	Jaipur	Ajmeri Gate	296	RIRuO		1	IA	6	55	38	33	37	42	5	0	-
		RJPB Office,Jhalana Doongari	298	RIRuO		110	A	12	40	31	27	32	35	4	0	M
		Office of District Education Officer, Chandpole	408	RIRuO		93	A	26	64	42	34	41	48	6	0	H
		RIICO Office, M.I.A.	410	RIRuO		102	A	25	44	34	28	34	40	5	0	M
		Regional Office (North), RSPCB, Vidyad-har Nagar	409	RIRuO		109	A	32	50	40	33	40	47	5	0	M
		VKIA	297	RIRuO		114	A	28	54	41*	32	41	49	6	0	H
	Jodhpur	DIC Office, Industrial Estate	413	RIRuO		96	A	13	37	23	20	22	25	3	0	M
		Sojati Gate	273	RIRuO		103	A	17	45	24	21	24	26	3	0	M
		Basni Industrial Area, RIICO Office	274	RIRuO		97	A	15	40	22	19	22	25	4	0	M
		Maha Mandir Police Thane	376	RIRuO		99	A	16	50	20	18	20	21	4	0	L
		Office of Housing Board, Chopasani Road	411	RIRuO		98	A	15	52	21	18	20	23	4	0	M
		Shastri Nagar Police Thana	412	RIRuO		102	A	16	44	24	20	23	27	4	0	M
	Kota	Regional Office, RJPB, Anantpura	17	RIRuO		102	A	16	58	32	19	25	52	14	0	M
		Municipal Corporation Building	326	RIRuO		101	A	15	57	28	18	25	44	11	0	M
		Samcore Glass Ltd.	325	RIRuO		103	A	14	59	28	16	23	44	12	0	M
	Udaipur	Ambamata	320	RIRuO		92	A	21	43	33	27	32	40	5	0	M
		Town Hall	294	RIRuO		96	A	25	42	35	30	35	40	4	0	M
		Regional Office,MIA	321	RIRuO		86	A	28	42	35	30	35	40	4	0	M

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Tamilnadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam	38	RIRuO		100	A	13	25	18	15	18	22	2	0	L
		Govt. High School, Manali	71	RIRuO		102	A	12	27	19	17	19	23	3	0	L
		Thiruvottiyur	72	RIRuO		93	A	13	31	20	14	20	25	4	0	L
		Madras Medical College	159	RIRuO		93	A	5	43	12	5	10	24	8	0	L
		NEERI, CSIR Campus	160	RIRuO		95	A	5	48	10	5	8	16	7	0	L
		Thiruvottiyur Municipal Office	161	RIRuO		94	A	5	40	10	5	8	18	6	0	L
	Coimbatore	Poniarajapuram, On the top of DEL	371	RIRuO		50	A	14	50	21	14	20	28	7	0	M
		G.D.Matric Hr.Sec.School	238	RIRuO		93	A	11	51	23	15	23	27	7	0	M
		SIDCO Office Kurichi	237	RIRuO		85	A	12	264	37	17	29	50	40	0	M
	Madurai	Highway (Project -I) Building	306	RIRuO		102	A	13	34	24	20	24	29	4	0	M
		Fenner (I) Ltd. Susee Cars & Trucks	307	RIRuO		92	A	16	38	25	20	25	30	4	0	M
		Kunnathur Chatram Girls HS School	308	RIRuO		94	A	15	73	25	20	25	29	6	0	M
	Salem	Sowdeswari College Building	309	RIRuO		96	A	13	45	26	20	25	32	6	0	M
	Tuticorin	Fisheries College	239	RIRuO		98	A	4	31	11	6	10	18	5	0	L
		Raja Agencies	240	RIRuO		86	A	2	36	13	7	11	21	7	0	L
Uttar Pradesh	Agra	Regional Office, Bodla	323	ES	Taj-trapezium	80	A	9	14	11	1	10	11	12	0	L
		Nunhai	324	ES	Taj-trapezium	79	A	8	15	12	1	10	12	14	0	L
		Taj Mahal	1	ES	Taj-trapezium	287	A	5	61	19	5	17	35	12	0	M
		DIC Nunhai	415	ES	Taj-trapezium	131	A	5	67	33	16	32	50	13	0	H
		Etmad-uddaulah	416	ES	Taj-trapezium	123	A	5	53	22	9	21	38	11	0	M
		Rambagh	417	ES	Taj-trapezium	117	A	5	55	24	11	23	39	11	0	M
	Allahabad	Square crossing circle of Laxmi Talkies	554	RIRuO		105	A	14	57	27	9	18	26	39	0	M
		Bharat Yantra Nigam Ltd	555	RIRuO		105	A	11	46	21	7	14	20	28	0	M
	Anpara	Anpara Colony, Sonabhadra	6	RIRuO		104	A	19	53	28	3	25	28	31	0	M
		Renusagar Colony, Sonabhadra	7	RIRuO		87	A	21	31	27	2	25	28	29	0	M
	Ferozabad	Center for Development of Glass Industry (CDGI)	399	ES	Taj-trapezium	104	A	23	42	35*	4	28	35	40	0	H
		Tilak Nagar	400	ES	Taj-trapezium	103	A	23	43	33*	4	25	34	38	0	H
		Raza ka Tal	401	ES	Taj-trapezium	101	A	21	59	32*	5	25	33	36	0	H
	Gajraula	Raunaq Auto Ltd, J.P. Nagar	140	RIRuO		85	A	17	29	23	19	23	27	3	0	M
		Indira Chowk, J.P. Nagar	139	RIRuO		65	A	9	28	21	16	21	26	4	0	M

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	NO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
	Ghaziabad	M/s Atlas Cycles Industries Ltd, Sahibabad Industrial Area	258	RIRuO		97	A	34	41	38	35	37	40	2	0	M
	Ghaziabad	Bulandshaar Road Industrial Area	369	RIRuO		88	A	29	40	36	32	37	39	3	0	M
	Jhansi	Jail Chauraha	517	RIRuO		120	A	18	34	27	21	28	30	9	0	M
		Veeranga Nagar	518	RIRuO		120	A	15	30	24	18	25	28	4	0	M
	Kanpur	Forest & Training Centre, Kidwai Nagar	212	RIRuO		98	A	22	44	34	27	34	41	5	0	M
		Chamber Of Commerce, Darshanpurwa	98	RIRuO		81	A	18	43	33	26	34	41	6	0	M
		Fazalganj	86	RIRuO		80	A	30	50	38	33	38	41	3	0	M
		Dabauli	391	RIRuO		71	A	23	41	33	28	34	39	4	0	M
		Awas Vikas, Jajmau	395	RIRuO		89	A	23	45	32	27	31	38	5	0	M
	Khurja	Central Glass & Ceramic Research Institute	534	RIRuO		58	A	23	38	30	26	31	34	3	0	M
		Ahirpara	535	RIRuO		58	A	20	28	23	21	24	26	2	0	M
	Lucknow	Mahanagar	377	RIRuO		74	A	28	39	34	30	34	37	2	0	M
		Chandganj Garden, Aliganj	398	RIRuO		109	A	29	40	34	31	34	37	2	0	M
		Kapoor Hotel, Hazratganj	109	RIRuO		82	A	28	38	33	30	34	36	2	0	M
		Talkatora	113	RIRuO		81	A	30	49	36	32	36	39	3	0	M
		S.M.K Chowk, Aminabad	397	RIRuO		103	A	29	41	34	31	34	37	3	0	M
	Meerut	Begum Bridge	550	RIRuO		68	A	35	65	52*	42	53	59	7	0	H
		Thana Railway Road, Kesarganj	551	RIRuO		40	IA	21	61	43	35	41	51	8	0	-
	Muradabad	Budh Bazar		RIRuO		28	IA	14	44	25	17	24	38	8	0	-
		PTC		RIRuO		30	IA	3	31	16	9	15	22	6	0	-
	Noida	Regional Office, UP PCB	403	RIRuO		95	A	26	62	46*	35	47	57	8	0	H
		Gee-Pee Electroplating and Engineering Work	378	RIRuO		96	A	28	60	46*	33	48	55	8	0	H
	Varanasi	Regional Office, Jawahar Nagar	362	RIRuO		82	A	18	21	20	19	19	20	-	0	L
		Sigra	553	RIRuO		79	A	19	23	20	19	20	20	1	0	L
Uttarakhand	Dehradun	Raipur Road, Near parag Diary	90	ES	Doon valley	18	IA	24	32	28	25	28	31	2	0	-
		Clock Tower, PWD Guest House	89	ES	Doon valley	32	IA	27	35	31	29	31	34	2	0	-
		Himalaya Drug Co. Near ISBT	637	ES	Doon valley	-	-	-	-	-	-	-	-	-	-	-
	Haldwani	Govt. Women Hospital	625	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Haridwar	SIDCUL, Haridwar	635	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Kashipur	BSNL Office, Kashipur	627	RIRuO		-	-	-	-	-	-	-	-	-	-	-
	Rishikesh	Nagar Palika Parishad	636	ES	Hill station	-	-	-	-	-	-	-	-	-	-	-
West Bengal	Asansol	Asansol Municipal Corporation	386	RIRuO		105	A	49	87	68*	62	67	80	9	12	C
		Kangsabati Spinning Mill, Barjora	593	RIRuO		105	A	47	94	68*	61	68	86	11	12	C
		Burnpur Town Department, Burnpur	592	RIRuO		105	A	43	83	63*	54	62	76	10	5	C
	Barrackpore	Barrackpore Municiaplity	655	RIRuO		102	A	33	118	65*	43	64	92	19	22	C
		Dum Dum Telephone Exchange	653	RIRuO		101	A	40	146	76*	49	70	116	26	32	C
		Khardah Municipality	654	RIRuO		102	A	42	156	80*	52	72	126	28	39	C
	Durgapur	DMC Water Works, Angadpur	591	RIRuO		105	A	39	86	63*	50	61	79	11	10	C
		Kwality Hotel, Bhiringi More, Benachiti	384	RIRuO		105	A	44	94	69*	55	67	84	11	14	C

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	NO_2 Annual average (µg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
	Durgapur	Bidhannagar, PCBL Club, Muchipara	385	RIRuO		105	A	36	84	60*	47	58	75	12	3	H
		Dew India Limited, PCBL More, Durgapur	383	RIRuO		105	A	48	100	73*	59	72	89	11	21	C
	Haldia	Bhabanipur, Debhog Milan Viyapith	663	RIRuO		108	A	41	68	53*	46	54	59	5	0	H
		Driver's Hut of M/s. MCC PTA, Bhunia Raichak	664	RIRuO		108	A	35	64	51*	44	52	57	5	0	H
		Supermarket Building, Durgachak	15	RIRuO		108	A	37	61	50*	43	50	56	5	0	H
		WBIIDC Durgachak	14	RIRuO		108	A	43	64	53*	46	53	59	5	0	H
	Howrah	Howrah Municipal Corporation Building	8	RIRuO		103	A	43	161	80*	50	72	119	27	38	C
		Naskarpara Pump House, Ghuseri	10	RIRuO		103	A	37	141	73*	46	68	111	25	33	C
		CDS & Health Centre, Bator	11	RIRuO		103	A	29	115	63*	42	61	89	19	19	C
		Howrah Municipality School, Bandhaghat	9	RIRuO		103	A	40	169	85*	51	81	127	30	50	C
	Kolkata	Salt Lake, Rooftop of CK Market	474	RIRuO		103	A	27	135	61*	38	53	92	25	20	C
		Moulali, Rooftop of KMC office Building	473	RIRuO		104	A	38	160	75*	48	63	113	28	37	C
		Minto Park, Inside Park AJC Bose Road	475	RIRuO		102	A	26	109	60*	35	52	92	22	24	H
		Dunlop Bridge, National Sample Survey Building	472	RIRuO		102	A	32	131	67*	41	58	103	25	28	C
		Behala Chowrasta, Traffic Guard Building	476	RIRuO		103	A	30	147	72*	47	63	112	27	28	C
		Baishnabghata, Upanagari Sporting Club	477	RIRuO		101	A	24	117	52*	30	44	84	22	15	H
		Cossipore Police Station, B.T. Road	162	RIRuO		96	A	10	221	65*	26	56	122	37	25	C
		Lal-Bazar, Dalhousie Square	163	RIRuO		96	A	12	126	58*	27	52	98	28	25	H
		Kasba	348	RIRuO		96	A	5	137	48*	13	39	94	32	16	H
	Raniganj	Raniganj Municipality	662	RIRuO		105	A	53	93	70*	59	70	82	9	13	C
		Mangalpur, SKS School Mangalpur	660	RIRuO		105	A	42	82	61*	48	59	73	10	2	C
		Jamuria Municipality	661	RIRuO		105	A	40	81	59*	45	56	74	11	2	H
	Sankrail	Bharat Co-operative Housing Society	657	RIRuO		104	A	28	116	65*	42	62	95	20	22	C
		Bagan Police Station, Bagan	659	RIRuO		104	A	30	154	76*	44	67	122	30	30	C
		Dhulagar Gram Pachayat	656	RIRuO		104	A	30	137	74*	44	70	118	26	27	C
		P Mukherjee's House, Near SBI Amta	658	RIRuO		104	A	22	74	46*	30	47	62	12	0	H
	South Suburban	Chanditala Water Supply Pump House, Tollygunge	652	RIRuO		102	A	22	119	59*	34	51	90	24	22	H
		Bauipur Police Station, Baruipur	650	RIRuO		105	A	26	109	52*	29	43	84	22	13	H
		P Roy Industrial Training Institute, Amtala	651	RIRuO		103	A	27	110	57*	33	47	89	23	20	H

*Note: * - Locations where annual mean concentration of NO_2 exceeded the NAAQS of 40 µg/m³ for Residential/ industrial / other area and 30 µg/m³ for sensitive area. '-' Data not available/outlier/ not classified as monitoring days <50days, RIRuO – Residential/industrial/rural/other area, ES – Ecologically sensitive area, mon- monitoring Std dev. – Standard deviation, n – number of days monitored for 16 and more hours a day L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedence factor (calculated for n ≥ 50 days) classification based on Pollution Level Classification, Chapter 2,Table 2.1; % violation – percentage violation of NAAQS (24 hourly average) BDL = Below Detection Limit (Concentration less than 9 µg/m³ for NO_2).*

Particulate matter (PM) is a complex mixture of suspended solid and liquid particle in semi equilibrium with surrounding gases. It is classified in different ways:

a. Classification on emission:

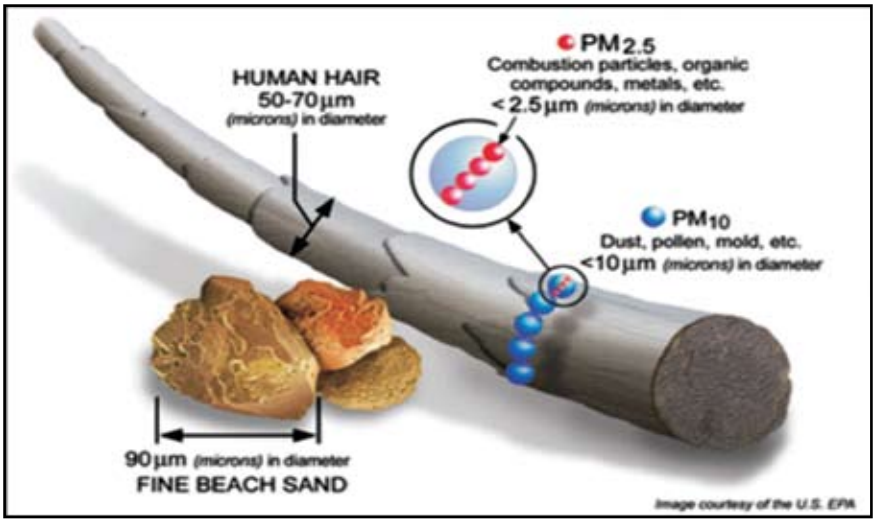
- Primary PM: Particulate matter is called primary if it is in the same chemical term in which it is emitted into the atmosphere. The primary particulate matter includes wind blown dust such as road dust, fly ash, soot etc.
- Secondary PM: Particulate matter is called secondary if it is formed by chemical reactions in the atmosphere. Secondary particulate matter include sulphates, nitrates etc.

b. Classification on size: Table 5.1, Figure 5.1 shows the classification and size of particulate matter

Table 5.1 Classification of particulate matter

Fraction	Size range
Respirable suspended particulate metter (RSPM) or PM_{10} (thoracic fraction)	<=10 μm diameter produced by mechanical attrition of industrial dusts lung deposition principally by impaction 2.5 μm – 10 μm is called coarse fraction
Accumulation mode or Fine particles or $PM_{2.5}$ (respirable fraction)	<=2.5 μm in diameter composed mainly of carbonaceous materials (organic and elemental), inorganic compounds (sulfate, nitrate, and ammonium), and trace metal compounds (iron, aluminium, nickel, copper, zinc, and lead) penetrates deeper into the lungs increases respiratory symptoms, causes irritation of the airways, coughing, or difficulty breathing, decreases lung function; aggravates asthma, chronic bronchitis, irregular heartbeat, nonfatal heart attacks, premature death in people with heart or lung disease
Ultrafine particles (UFP)	<=0.1 μm large surface area to mass ratio making them potential carriers of harmful gaseous compounds cause severe pulmonary inflammation and hemorrhage, high degree of alveolar and interstitial edema, disruption of epithelial and endothelial cell layers and even death

Figure 5.1: Particulate matter



c. Based on the generation mechanism PM are categorized into

- Dispersion Originated - the particulate originated from wind generated movement in nature as well as man made or from the breakdown from liquid or solid bulk materials, i.e. by grinding, atomization, natural dispersion, wind erosion etc. Eg. Dust (Dispersion Originated) is produced by subdivision of solid material through mechanical actions or in nature. Anthropogenic emissions are generated during grinding or milling of materials, during transfer of finely divided material as well as from agriculture, forestry and construction activities. The larger the particle diameter, they tend to settle faster. The rate of settling also depends on density and shape of particles. Particles larger than 50 μm settle rapidly.

- Condensation Originated - build up from molecular dimension after heating and cooling. Eg. Fumes (Condensation Originated) areroduced from hot solid substances by vaporization and condensation usually industrial process originated, combustion originated or from metallurgical processes.

- Mist (Dispersion & Condensation Originated) is generated from liquid by mechanical actions, evaporation and/ or condensation of vapors generated from Industrial processes, spraying, electroplating etc.

Respirable Suspended Particulate Matter or PM_{10} are the particles with upper size limited by a 50% cut at 10 μm aerodynamic diameter (USEPA, 1996). They consist of particles with a diameter up to 10 μm. The major constituents of PM_{10} are organic and elemental carbon, metals/elements like silicon, magnesium, iron, ions like sulphates, nitrates, ammonium etc. PM_{10} can be formed by physical processes of crushing, grinding and abrasion of surfaces. Mining and agricultural activities are some of the sources of large size particles. The anthropogenic source are mechanical break-up of larger solid particles, wind blown dust such as road dust, fly ash, soot, agricultural processes, physical processes of crushing, grinding and abrasion of surfaces, photochemically produced particles, such as those found in urban haze, pollen grains, mould spores, and plant and insect parts, combustion of fossil fuel (coal, heavy fuel oil in thermal power plants, office, factories), paper Industry, extraction & distribution of fossil fuels, smelting of metals (sulfide ores to produce copper, lead and zinc), petroleum refining, combustion process in diesel, petrol, natural gas driven vehicles. PM_{10} can settle in the bronchi and lungs and cause health problems like respiratory illness, visibility impairment, aggravate existing heart and lung diseases. It also causes visibility reduction. A compilation of sources and effects of PM_{10} are given in Annexure 1.

In this chapter the a detailed summary of PM_{10} levels in the country is furnished. The air quality of different cities/ towns has been compared with the respective standard.The air quality has been categorized into four broad categories based on an Exceedence Factor (the ratio of annual mean concentration of a pollutant with that of a respective standard. The four categories are low, moderate, high and critical levels. The top 10 location, cities and states with maximum PM_{10} pollution is furnished.

5.1 Locations, cities and states with highest PM_{10} values during 2010

Table 5.2 shows top ten locations in terms of annual average concentration of $PM_{10.}$ For residential / industrial / rural / other area in which highest concentration was observed at Dindayal Nagar, Gwalior, Madhya Pradesh and Table 5.3 shows sensitive area in highest concentration was observed at Gaurav Solvex Ltd. MIA, Alwar, Rajasthan. Among the cities Gwalior, Madhya Pradesh tops the list with 308 $\mu g/m^3$ $PM_{10.}$(Table 5.4). Among the states Delhi shows highest PM_{10} values 261 $\mu g/m^3$.(Table 5.5)

Table 5.2: Ten locations with higher PM_{10} values (annual average) during 2010 (residential / industrial / rural / other area)

Sl. No.	State	City	Location	Station code	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	Madhya Pradesh	Gwalior	Dindayal Nagar	479	75	110	624	361*	118	100	C
2	Delhi	Delhi	Town Hall, Chandni Chowk	146	96	76	1699	354*	201	97	C
3	Chattisgarh	Raipur	M/S Wool Worth India Pvt. Ltd. Sarora	223	51	246	431	349*	45	100	C
4	Delhi	Delhi	Janakpuri	59	78	56	681	306*	128	100	C
5	Jharkhand	West Singhbhum	Barajamda U.M. Office	615	84	59	926	302*	229	83	C
6	Uttar Pradesh	Ghaziabad	Sahibabad Industrial Area	258	97	163	503	301*	88	100	C
7	Uttar Pradesh	Ghaziabad	Bulandshaar Road Industrial Area	369	88	160	517	280*	90	100	C
8	Delhi	Delhi	Mayapuri Industrial Area	345	96	38	702	275*	146	82	C
9	Haryana	Yamunanagar	Ballarpur Industries	196	52	64	523	261*	116	92	C
10	Uttar Pradesh	Allahabad	Crossing circle of Laxmi Talkies	554	105	99	649	254*	348	99	C

** - Locations where annual mean concentration of PM_{10} exceeded the NAAQS of 60 $\mu g/m^3$ for Residential/ industrial / other area. Std. dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2.1, Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 5.3: Ten locations with higher PM_{10} values (annual average) during 2010 (Ecologically sensitive area)

Sl. No.	State	City	Location	Station code	ESA category	No. of mon. days (n)	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	% exceedence (24 hourly)	Air Quality
1	Rajasthan	Alwar	Gaurav Solvex Ltd. MIA	373	Aravali range	75	21	733	300*	163	88	C
2	Uttar Pradesh	Agra	DIC Nunhai	415	Taj-trapezium	128	33	706	248*	148	77	C
3	Uttar Pradesh	Ferozabad	CDGI	399	Taj-trapezium	104	39	332	226*	304	83	C
4	Uttar Pradesh	Ferozabad	Tilak Nagar	400	Taj-trapezium	103	37	320	212*	295	83	C
5	Uttar Pradesh	Ferozabad	Raza ka Tal	401	Taj-trapezium	101	25	312	203*	290	76	C
6	Rajasthan	Alwar	RO, Rajasthan SPCB	372	Aravali range	82	18	728	201*	135	0	C
7	Uttar Pradesh	Agra	Nunhai	324	Taj-trapezium	96	94	283	196*	258	97	C
8	Uttar Pradesh	Agra	Regional Office, Bodla	323	Taj-trapezium	89	96	311	179*	233	99	C
9	Uttar Pradesh	Agra	Etmad-uddaulah	416	Taj-trapezium	123	17	698	179*	132	67	C
10	Rajasthan	Alwar	RIICO Pump House	219	Aravali range	72	55	643	174*	105	0	C

** - Locations where annual mean concentration of PM_{10} exceeded the NAAQS of 60 $\mu g/m^3$ for sensitive areas. Std.dev:standard deviation, mon:monitoring, n:number of monitoring days; L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification,Chapter 2,Table 2.1, Data of monitoring stations with monitoring days ≥50 has only been considered*

Table 5.4: Ten cities with highest PM_{10} values (annual average) during 2010 (residential / industrial / rural / other area)

Sl. No.	State	City	Min	Max	Annual average ($\mu g/m^3$)	Std. Dev.	Air Quality
1	Madhya Pradesh	Gwalior	598	114	308*	107	C
2	Jharkhand	West Singhbhum	59	926	302*	229	C
3	Uttar Pradesh	Ghaziabad	162	510	290*	89	C
4	Chattisgarh	Raipur	207	370	289*	39	C
5	Delhi	Delhi	46	748	261*	130	C
6	Haryana	Yamunanagar	64	523	261*	116	C
7	Jharkhand	Jharia	131	370	237*	40	C
8	Punjab	Khanna	152	283	231*	23	C
9	Punjab	Gobindgarh	125	534	224*	66	C
10	Punjab	Amritsir	181	258	219*	20	C

** - Cities where annual mean concentration of PM_{10} exceeded the NAAQS of 60 $\mu g/m^3$ for Residential/ industrial / other area. L:Low, M:moderate, H:high, C:critical classification based on Pollution Level Classification, Chapter 2,Table 2.1, Data of monitoring stations with monitoring days ≥50 has only been considered*

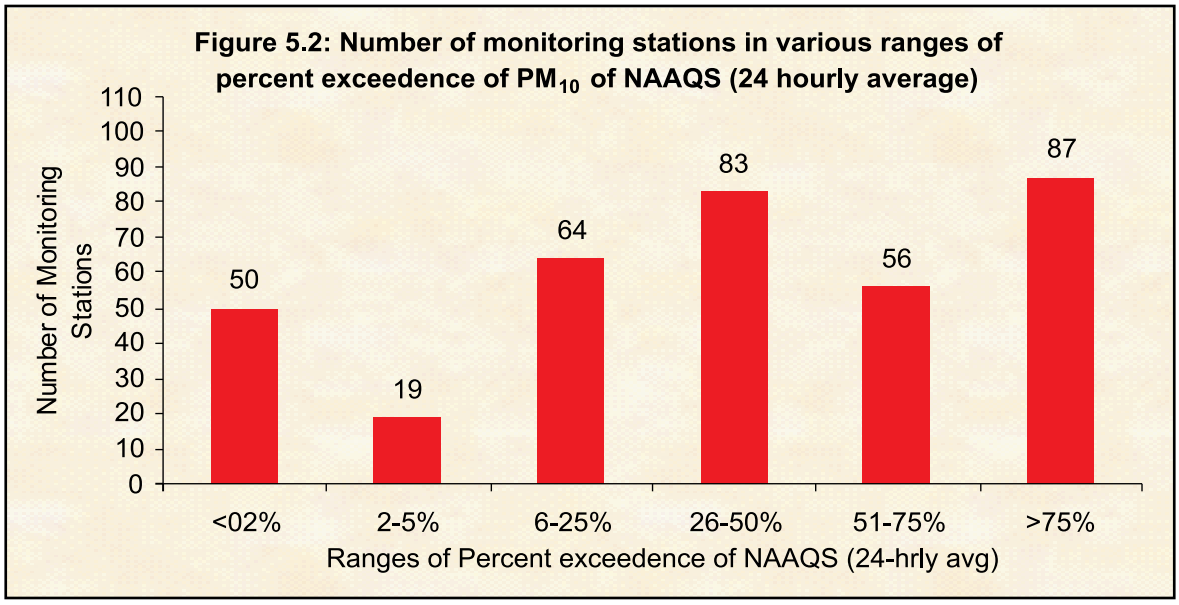
Table 5.5: Ten states with highest PM_{10} values (annual average) during 2010 (residential / industrial / rural / other & ecologically sensitive area)

Sl. No.	State	Min	Max	Annual average ($\mu g/m^3$)
1	Delhi	46	748	261*
2	Jharkhand	84	398	193*
3	Punjab	115	299	187*
4	Uttar Pradesh	96	484	181*
5	Bihar	92	504	171*
6	Chattisgarh	92	263	169*
7	Rajasthan	32	576	168*
8	Haryana	185	149	137*
9	Uttrakhand	36	656	118*
10	Madhya Pradesh	24	308	110*

** - Locations where annual mean concentration of PM_{10} exceeded the NAAQS of 60 $\mu g/m^3$ for Residential/ industrial / other area., Data of monitoring stations with monitoring days ≥50 has only been considered*

5.2 Percentage exceedence of NAAQS (24 Hourly Average)

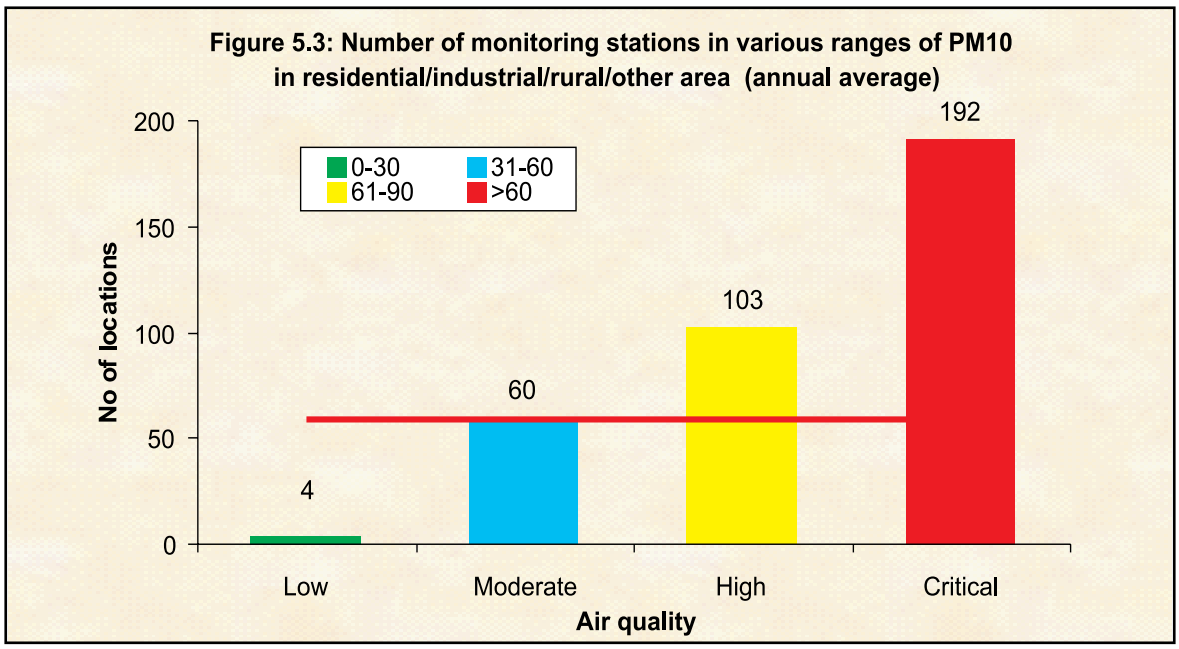
Number of monitoring stations in various ranges of percentage of exceeding limit of NAAQS (24 hourly average) of PM_{10} is depicted in Figure 5.2. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 50 monitoring stations out of 359 stations. In the remaining 309 stations, the percentage exceedence of NAAQS (24 hourly avg.) was 2% or more.



NB. Data of monitoring stations with monitoring days ≥50 has only been considered

5.3 Air Quality (Low, Moderate, High & Critical)

Number of monitoring stations with low, moderate, high and critical levels of PM_{10} is depicted in Figure 5.3. 4 locations showed low PM_{10} level, 60 locations showed moderate, 103 high and 192 location were in critical category. Therefore, 295 (82%) locations out of 359 exceeded the NAAQS.



NB. Data of monitoring stations with monitoring days ≥50 has only been considered

The annual average concentration of PM_{10} at various monitoring stations is given in Table 5.6. The data given is annual average concentration and number of observations with 16 and more hours of monitoring a day. Also, described in the table is air quality in terms of low, moderate, high and critical. PM_{10} levels at many monitoring stations (with high and critical air quality) exceeded the prescribed NAAQS.

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	PM_{10} Annual average (μg/m3)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
Andhra Pradesh	Chitoor	GNC Toll Gate Tirumala	582	RIRuO		91	A	28	66	39	31	39	45	7	0	M
	Guntur	Near Hindu College, Market Road	583	RIRuO		102	A	64	97	81*	73	82	90	7	0	H
	Hydrabad	Tarnaka, NEERI Lab.	150	RIRuO		96	A	13	164	63*	28	58	106	31	13	H
		Nacharam, Industrial Estate	151	RIRuO		95	A	10	104	38	15	35	69	21	1	M
		ABIDS Circle General Post Office Building	152	RIRuO		95	A	18	145	73*	33	71	115	31	21	H
		Balanagar	95	RIRuO		108	A	57	160	103*	84	102	122	17	55	C
		Uppal, IDA	203	RIRuO		108	A	64	170	100*	78	99	120	18	46	C
		Jublee Hills	365	RIRuO		108	A	28	277	63*	40	58	84	30	8	H
		Paradise	393	RIRuO		108	A	74	204	105*	88	104	120	20	56	C
		Charminar	394	RIRuO		108	A	72	175	104*	82	105	120	18	59	C
		Zoo Park	470	RIRuO		107	A	25	205	63*	35	58	95	27	7	H
	Kothagudem	CER Club, Khamam	581	RIRuO		103	A	41	87	62*	54	60	74	8	3	H
	Kurnool	Mourya Inn	466	RIRuO		117	A	35	163	85*	57	84	104	24	13	H
	Nalgonda	RO, APPCB	577	RIRuO		108	A	47	146	85*	66	83	110	18	19	H
	Nellore	Kamakhya Temple	580	RIRuO		94	A	52	78	65*	59	64	71	6	0	H
	Patencheru	Police Station, Ramachadrapuram	468	RIRuO		98	A	28	138	76*	40	75	106	25	18	H
	Ramagundam	Karimnagar Godavarikhani	465	RIRuO		99	A	9	168	68*	28	61	121	37	17	H
	Tirupati	Regional Science Centre, Chittoor Bypass Road	389	RIRuO		98	A	23	52	37	31	37	43	5	0	M
	Vijaywada	Benz Circle	462	RIRuO		113	A	50	158	84*	60	75	118	25	23	H
		Autonagar	469	RIRuO		113	A	51	169	102*	62	95	147	34	45	C
	Warangal	KUDA Office, Hanumakonda	579	RIRuO		102	A	13	139	52	24	43	88	27	5	M
	Vishakhapatnam	Panchayat Raj office, Mindi	234	RIRuO		108	A	21	162	72*	35	69	107	30	17	H
		Industrial Estate, Marripalem	233	RIRuO		108	A	12	178	70*	33	63	126	35	19	H
		Police Barracks	371	RIRuO		108	A	14	218	96*	45	91	156	43	40	C
		INS-Virabahu, Naval Area	387	RIRuO		108	A	23	183	60	36	58	85	23	6	M
		Seethammadhara	388	RIRuO		108	A	17	151	75*	44	73	112	28	20	H
		Ganapuram Area	467	RIRuO		108	A	22	415	87*	39	79	125	52	30	H
		Pedagantyada, Gajuwada	584	RIRuO		117	A	15	152	68*	33	61	113	32	21	H
		CWMP, RAMKY, Parawada	585	RIRuO		108	A	14	133	43	24	37	71	21	4	M
Assam	Bongaigaon	Oil India Ltd., Chirang	542	RIRuO		104	A	10	229	64*	18	50	135	50	22	H
		Barpara Office Building	520	RIRuO		104	A	9	192	52	20	44	94	35	8	M
	Daranga	BATAD, Baska	566	RIRuO		92	A	11	159	58	22	39	112	38	18	M
	Dibrugarh	Dibrugarh Office Building	538	RIRuO		103	A	13	294	38	17	27	63	36	4	M
	Golaghat	Golaghat Office Building	539	ES	Numaligarh	82	A	18	240	73*	23	62	138	50	26	H
	Guwahati	Head Office, Bamunimaidam	193	RIRuO		254	A	18	286	105*	33	83	213	67	43	C
		Boragaon, office premises of IASST, Kamrup	603	RIRuO		33	IA	31	284	71*	39	58	105	45	15	-
		Guwahati University, Kamrup	602	RIRuO		82	A	13	157	64*	28	65	101	30	11	H
		ITI Building, Gopinath Nagar	519	RIRuO		280	A	19	350	111*	37	79	222	74	44	C
		Central Dairy, Khanapara, Kamrup	596	RIRuO		105	A	29	297	109*	42	105	207	62	52	C
		Near Pragjyotish College, Santipur	541	RIRuO		264	A	21	297	104*	35	78	217	69	41	C
	Lakhimpur	Bazar Patti, North Lakhimpur	587	RIRuO		102	A	15	201	76*	26	59	149	49	31	H
	Nagaon	Water Resources Div., Christian Patty	595	RIRuO		103	A	16	328	103*	23	77	220	80	37	C

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	Nagaon	Water Resources Div., Christian Patty	595	RIRuO		103	A	16	328	103*	23	77	220	80	37	C
	Nalbari	PWD Rural Div Office Complex,	597	RIRuO		82	A	14	225	68*	27	50	112	46	17	H
	Sibsagar	Sibasagar Office Building	537	RIRuO		107	A	19	319	91*	26	69	183	67	36	C
		Usha Lodge, near ONGCL Colony	604	RIRuO		24	IA	10	53	27	17	26	38	9	0	-
	Silchar	Janiganj Govt. Boys HS School	607	RIRuO		11	IA	39	156	97*	39	102	130	36	45	-
		Office Building of RLO, Ithkola Market	567	RIRuO		92	A	17	215	66*	28	54	128	40	18	H
	Tezpur	Tezpur Office Building	536	RIRuO		104	A	12	278	68*	22	50	145	51	23	H
	Tinsukia	Digboi Carbon factory Campus, Borguri	594	RIRuO		99	A	9	220	59	21	38	122	44	21	M
		Coal India Office Complex, Margherita	586	RIRuO		97	A	17	208	52	21	40	86	33	7	M
		Shreepuria, Borguri	605	RIRuO		43	IA	18	258	62*	24	49	107	47	12	-
Bihar	Patna	Beltron Bhawan, Shastri Nagar	210	RIRuO		88	A	36	656	118*	53	104	187	80	56	C
		Gandhi Maidan Test Centre	284	RIRuO		52	A	45	489	243*	106	251	369	107	92	C
Chandigarh	Chandigarh	Modern Foods, Industrial Area	106	RIRuO		148	A	19	600	122*	54	106	202	79	52	C
		Sector-17 C	263	RIRuO		150	A	20	337	85*	37	74	132	48	25	H
		Punjab Engineering College, Sector 12	264	RIRuO		153	A	16	286	78*	33	65	145	48	36	H
		Sector-39, IMTECH	463	RIRuO		150	A	20	369	94*	45	79	158	53	33	C
		Kaimbwala Village	464	RIRuO		146	A	18	323	82*	37	70	144	51	24	H
Chattisgarh	Bhillai	Visak Hostel, Sector-4	65	RIRuO		93	A	78	113	96*	82	92	112	12	38	C
		R.O., 5/32 Banglow Office Building	67	RIRuO		94	A	59	96	82*	73	80	92	8	0	H
		M.P. Laghu Udyog Nigam	245	RIRuO		88	A	82	170	151*	314	154	168	22	92	C
	Bilaspur	RO, CECB Vyapar Vihar		RIRuO												
	Korba	HIG 21,22.Near Ghantaghar,	364	RIRuO		8	IA	108	120	116*	63	118	120	5	100	-
		Pragati Nagar NTPC Colony	249	RIRuO		97	A	45	116	89*	69	89	107	15	29	H
		I.T.I., Rampur	407	RIRuO		95	A	56	155	107*	81	112	131	21	62	C
	Raipur	New HIG-9, Hirapur	368	RIRuO		49	IA	190	347	267*	213	262	317	39	100	-
		M/S Wool Worth India, Sarora Raipur	223	RIRuO		51	A	246	431	349*	269	360	410	45	100	C
		Yatayat Thana, Jai Stambh Chowk	447	RIRuO		49	IA	185	332	251*	215	247	301	33	100	-
Dadra & Nagar Haveli	Silvassa	Khadoli Industrial Area, Village- Khadoli	558	RIRuO		94	A	18	90	39	19	26	85	27	0	M
Daman & Diu	Daman	Kadaiya Industrial Area, Village- Kadaiya	560	RIRuO		96	A	16	106	35	19	24	67	21	1	M
Delhi	Delhi	N.Y. School, Sarojini Nagar	144	RIRuO		95	A	30	634	228*	52	226	420	141	77	C
		Town Hall, Chandni Chowk	146	RIRuO		96	A	76	1699	354*	147	333	542	201	97	C
		Mayapuri Industrial Area	345	RIRuO		96	A	38	702	275*	75	295	449	146	82	C
		Pritampura	531	RIRuO		78	A	35	510	219*	85	220	346	107	85	C
		Shahadra	58	RIRuO		79	A	53	506	254*	89	256	379	112	89	C

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		Shahzada Bagh	57	RIRuO		83	A	35	885	241*	108	227	381	125	90	C
		Nizamuddin	55	RIRuO		60	A	60	568	245*	134	243	357	102	93	C
		Janakpuri	59	RIRuO		78	A	56	681	306*	149	308	476	128	100	C
		Siri Fort	60	RIRuO		80	A	34	549	230*	92	228	361	105	89	C
Goa	Panaji	Old GSPCB premises, Patto	327	RIRuO		105	A	21	221	85*	36	79	147	46	30	H
	Marmagao	Fire Brigade Station, Port Trust	435	RIRuO		118	A	19	164	59	27	49	106	31	12	M
	Vasco	Fuse Call Office of Elec. Dept., Mormugao taluka	37	RIRuO		103	A	19	178	61*	28	51	105	32	14	H
	Curchorem	Curchorem, Sanvordem, Quepem	628	RIRuO		19	IA	8	94	38	15	35	63	23	0	-
	Codli	Codli Tisk, Ponda	630	RIRuO		6	IA	70	112	90*	77	89	103	14	17	-
	Honda	Honda Junction, Sattari	631	ES	Sahyadri	8	IA	91	130	100*	92	95	112	13	38	-
	Bicholim	Bicholim	632	RIRuO		11	IA	76	118	89*	76	89	95	11	9	-
	Amona	Amona, Bicholim	633	RIRuO		16	IA	37	80	55	43	58	72	13	0	-
	Assanora	Assanora Junction, Bardez	634	RIRuO		8	IA	50	85	71*	55	74	83	12	0	-
	Usgao	Usgao Plae, Junction, Ponda	629	RIRuO		10	IA	136	314	245*	143	273	311	71	80	-
Gujarat	Ahmedabad	Naroda, G.I.D.C., Ahmadabad	101	RIRuO		104	A	84	249	151*	95	147	214	50	78	C
		Cadilla Bridge Narol	102	RIRuO		103	A	44	133	86*	68	86	108	16	17	H
		L.D. Engg. College	103	RIRuO		104	A	47	97	70*	56	68	88	11	0	H
		Shardaben Hospital, Saraspur	154	RIRuO		103	A	47	136	80*	59	79	105	18	14	H
		R.C. High School, Mirzapur	155	RIRuO		104	A	56	140	94*	70	92	119	19	38	C
		Naroda, G.I.D.C.,	347	RIRuO		104	A	54	134	87*	65	88	111	18	22	H
	Anklesvar	Rallis India Ltd.	252	RIRuO		104	A	49	110	83*	67	82	99	13	10	H
		Durga Traders, Bhavanafarm Society	253	RIRuO		104	A	46	86	71*	57	72	82	9	0	H
	Jamnagar	Fisheries Office	319	RIRuO		104	A	85	142	104*	94	105	112	8	70	C
	Rajkot	Sardhara Industrial Corporation	257	RIRuO		104	A	33	179	115*	84	117	142	26	68	C
		Regional Offce	374	RIRuO		104	A	46	166	76*	54	76	94	19	7	H
	Surat	S.V.R. Engg. College	21	RIRuO		104	A	38	86	70*	56	71	81	10	0	H
		B.R.C. High School, Udhna	22	RIRuO		114	A	59	105	83*	71	82	94	9	2	H
		Air India Office	23	RIRuO		104	A	55	92	75*	65	75	86	8	0	H
	Vadodara	GPCB Office, Geri Vasahat	50	RIRuO		96	A	31	91	51	39	52	50	9	0	M
		Dandia Bazaar	333	RIRuO		96	A	58	181	93*	75	93	111	17	30	C
		CETP Nandesari	334	RIRuO		96	A	105	168	135*	127	134	156	14	100	C
	Vapi	GEB, IIIrd Phase, GIDC, Vapi	367	RIRuO		104	A	62	105	86*	72	86	98	10	7	H
		Vapi Nagar Palika, Vapi	221	RIRuO		104	A	54	94	74*	61	75	85	9	0	H
Haryana	Faridabad	Escorts Research Centre Mathura Road	331	RIRuO		145	A	109	193	154*	124	157	181	21	100	C
		RO Haryana SPCB	330	RIRuO		96	A	143	219	174*	154	172	195	17	100	C
	Hissar	Urban Estate - II	390	RIRuO		27	IA	61	226	93*	66	74	143	38	30	-
		Guru Jambehswar University	414	RIRuO		52	A	52	1082	96*	59	73	100	140	10	C
	Yamunanagar	Ballarpur Industries	196	RIRuO		52	A	64	523	261*	121	259	400	116	92	C

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Himachal Pradesh	Baddi	Industry Department Office Building	449	RIRuO		96	A	30	361	112*	54	111	159	52	59	C
		AHC barotivala	564	RIRuO		85	A	35	241	103*	52	96	154	43	44	C
		Housing Board	563	RIRuO		11	IA	56	156	100*	59	101	143	31	82	-
	Damtal	Regional Office	268	RIRuO		150	A	21	165	61*	37	58	86	21	3	H
		Old Road	271	RIRuO		114	A	29	135	75*	47	74	102	22	38	H
	Kala Amb	Kala Amb Industrial Area	461	RIRuO		156	A	441	230	55*	141	225	319	73	98	M
		Trilokpur	530	RIRuO		157	A	24	236	102*	61	96	148	36	46	C
	Nalagarh	Municipal Council	565	RIRuO		66	A	30	221	86*	40	76	148	43	32	H
	Parwanoo	Regional Office, Sector- 4	132	RIRuO		153	A	17	292	70*	37	66	102	34	10	H
		Asst. Commissioner Building, Sector I	339	RIRuO		136	A	15	218	98*	48	93	154	41	41	C
	Paonta Sahib	Paonta Sahib	117	RIRuO		140	A	28	192	108*	69	105	145	31	59	C
		Gondhpur Industrial Area	118	RIRuO		110	A	56	363	162*	99	153	246	60	89	C
	Shimla	Tekka Bench Ridge	34	ES	Hill station	140	A	10	154	55	24	52	92	28	17	M
		Bus Stand, Winterfield	35	ES	Hill station	122	A	19	172	60	34	55	93	26	7	M
Jam-mu & Kash-mir	Jammu	Regional Office, Jammu	184	RIRuO		88	A	49	171	107*	68	106	147	51	57	C
		M.A. Stadium, Jewel Chowk, Jammu	482	RIRuO		85	A	48	188	102*	71	97	145	30	46	C
		Bari Brahamana Industrial Area, Jammu	507	RIRuO		49	IA	56	226	136*	83	129	205	136	82	-
Jharkhand	Dhanbad	EMTI, Bastacola	612	RIRuO		72	A	95	365	214*	167	208	259	50	99	C
		CGM Office, Kusunda	611	RIRuO		81	A	125	337	211*	153	211	272	47	100	C
		R.O. Dhanbad	44	RIRuO		75	A	27	390	127*	50	118	226	70	55	C
	Jamshedpur	Bistupur Vehical Testing Centre	351	RIRuO		89	A	99	199	153*	121	148	186	27	99	C
		Golmuri Vehicle Testing Centre	382	RIRuO		91	A	81	322	152*	119	156	180	30	99	C
	Jharia	M.A.D.A.	332	RIRuO		71	A	131	370	237*	188	237	274	40	100	C
	Ranchi	Albert Ekka Chowk, Main Road	402	RIRuO		111	A	66	340	172*	99	162	239	58	89	C
	Saraikela Khar-sawan	RO Building, Adityapur	614	RIRuO		86	A	68	336	169*	105	165	236	53	91	C
	Sindri	BIT / PDIL	46	RIRuO		37	IA	57	238	174*	131	179	221	41	95	-
	West Singhbhum	Barajamda U.M. Office	615	RIRuO		84	A	59	926	302*	80	214	630	229	83	C
Karnataka	Bangalore	Graphite India	77	RIRuO		59	A	22	513	133*	34	123	226	95	58	C
		Yeshwanthpura police station	457	RIRuO		100	A	23	306	110*	46	101	192	63	51	C
		Peenya Industrial Area	405	RIRuO		99	A	31	505	88*	52	80	127	56	18	H
		KHB Industrial Area, Yelahanka	404	RIRuO		106	A	14	265	63*	31	51	100	41	10	H
		AMCO Batteries, Mysore Road	78	RIRuO		100	A	24	227	76*	43	63	135	40	19	H
		Inanabharathi , Bangalore University	598	RIRuO		104	A	14	73	42	34	41	48	7	0	M
		R V College of Engineering	589	RIRuO		22	IA	29	71	56	40	56	70	13	0	-
		TERI office, Vital Medi healthcare Pvt.Ltd		RIRuO		14	IA	45	350	163*	55	148	310	103	57	-
		Victoria hospital	406	RIRuO		29	IA	35	201	70*	43	61	98	32	7	-
	Belgaum	Karnataka SPCB Office Building	460	ES	Sahyadri	83	A	3	76	33	10	31	57	18	0	M
	Gulburga	Government Hospital	459	RIRuO		77	A	38	140	65*	46	62	80	19	6	H
	Hassan	KSRTC bus stand building	458	RIRuO		84	A	17	92	45	30	43	60	14	0	M
	Hubli-Dharwad	Lakamanahali Industrial Area, Dharwad	432	RIRuO		69	A	36	173	79*	46	64	134	35	28	H
		Rani Chennamma Circle, Hubli	431	RIRuO		95	A	43	291	104*	53	88	169	52	42	C

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	Mangalore	Stides Premises, Baikampady Industrial Area	488	RIRuO		105	A	21	148	48	32	41	68	21	6	M
	Mysore	K.R.Circle	40	RIRuO		94	A	23	113	46	33	46	59	13	2	M
		KSPCB Bldg. Hebbal Ind. Area	328	RIRuO		117	A	14	73	42	24	41	63	15	0	M
Kerala	Alappuzha	District Office, Alissery Road	618	RIRuO		120	A	5	135	40	17	35	64	22	2	M
		DC Mills, Pathirappally	617	RIRuO		120	A	7	174	49	17	41	89	32	8	M
	Kochi	Eloor I	149	RIRuO		90	A	9	214	25	12	20	42	23	1	L
		Eloor II	29	RIRuO		91	A	12	186	31	15	25	50	22	1	M
		Irumpanam	30	RIRuO		109	A	8	123	37	14	29	72	24	1	M
		Ernakulum South	338	RIRuO		109	A	15	86	36	20	30	57	16	0	M
		VYTTILA	562	RIRuO		108	A	10	95	41	19	35	68	20	0	M
		MG Road Bank Ernakulum	147	RIRuO		109	A	7	78	35	15	29	64	18	0	M
		Kalamassery	346	RIRuO		108	A	7	115	46	19	44	77	22	1	M
	Kollam	KSPCB, District Office, Kadappakada	621	RIRuO		117	A	22	133	57	31	52	87	23	4	M
		KMML Chavara	620	RIRuO		56	A	11	117	37	18	30	67	21	4	M
	Kottayam	Kottayam	187	RIRuO		96	A	47	60	54	50	55	57	3	0	M
		Vadavathoor	361	RIRuO		96	A	33	50	41	34	42	47	5	0	M
	Kozhikode	Kozhikode City	360	RIRuO		108	A	26	55	39	29	37	50	8	0	M
		Nallalam	359	RIRuO		108	A	23	82	45	30	45	56	11	0	M
	Malapuram	Kakkanchery Sijmak oils	623	RIRuO		108	A	11	42	30	22	32	36	6	0	L
	Palakkad	SEPR Refractories India Ltd.	311	RIRuO		121	A	6	70	32	20	30	47	11	0	M
	Pathanamthitta	Near District Office KSPCB, Makkam-kunnu	619	RIRuO		120	A	10	41	27	19	26	35	7	0	L
	Thissur	KSPCB, District Office, Poonkunnam	624	RIRuO		93	A	10	142	31	15	23	54	25	3	M
	Wayanad	Sulthan Bathery	622	RIRuO		119	A	23	62	46	34	49	56	9	0	M
	Trivandrum	PRS Hospital/COSMO	419	RIRuO		108	A	38	63	50	44	50	58	5	0	M
		SMV School	181	RIRuO		109	A	33	274	55	44	52	64	23	1	M
		VELI	357	RIRuO		106	A	36	98	67*	50	68	82	13	0	H
		PETTAH	358	RIRuO		107	A	35	79	49	43	48	57	6	0	M
Madhya Pradesh	Bhopal	Hamidia Road, M.P. Hastshilp Vikas Nigam	122	RIRuO		73	A	29	486	144*	50	126	240	92	64	C
		C E T P Govindpura	123	RIRuO		74	A	19	444	121*	28	107	223	91	54	C
	Dewas	EID Perry (I) Limited	525	RIRuO		88	A	211	32	100*	40	60	90	163	40	C
		Dewas Metal Section	524	RIRuO		58	A	112	27	70*	53	69	99	23	7	H
		Vikas Nagar	523	RIRuO		88	A	191	26	86*	56	85	117	30	20	H
	Gwalior	Dindayal Nagar	479	RIRuO		75	A	110	624	361*	224	347	520	118	100	C
		Maharaj Bada	478	RIRuO		75	A	117	571	254*	157	231	380	95	100	C
	Indore	Polo Ground	127	RIRuO		89	A	35	341	129*	58	115	200	66	62	C
		Kothari Market, M.G. Road	128	RIRuO		94	A	40	336	131*	61	124	214	60	70	C
		Telephone Nagar, Kanadia Road	131	RIRuO		91	A	30	210	101*	51	104	148	40	54	C
	Jabalpur	Vijay Nagar	248	RIRuO		21	IA	150	119	135*	123	135	146	9	100	-
	Nagda	B C I Labour Club	84	RIRuO		97	A	109	55	89*	78	90	100	10	9	H
		Grasim Kalyan Kendra	246	RIRuO		100	A	116	59	101*	86	102	112	11	65	C

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			532	RIRuO		16	IA	100	42	66*	48	64	88	16	0	-
Maharashtra	Sagar	Pt.Deendayal Nagar, Housing Board Colony														
	Satna	Sub-divisional Office E/M LightMachniery	343	RIRuO		80	A	391	80	252*	116	255	334	75	93	C
		Regional Office MPPCB	342	RIRuO		96	A	277	74	135*	99	127	193	41	88	C
	Singrauli	Jayant Township	515	RIRuO		13	IA	84	67	77*	70	77	83	5	0	-
		N.T.P.C., Vidyanagar	514	RIRuO		19	IA	67	46	59	53	59	64	5	0	-
		Waidhan	516	RIRuO		13	IA	46	36	40	37	39	43	3	0	-
	Ujjain	District Office	527	RIRuO		74	A	183	60	118*	81	119	157	29	68	C
		Regional Office	526	RIRuO		48	IA	90	29	54	36	54	71	14	0	-
		Mahakal Temple	528	RIRuO		59	A	105	40	69*	52	63	91	16	2	H
	Amravati	M/s Apurva Oil and Industries Pvt. Ltd	549	RIRuO		88	A	79	165	121*	93	121	145	19	88	C
		Govt College of Engineering	548	RIRuO		97	A	37	121	74*	56	74	92	15	3	H
		Rajkamal Square	547	RIRuO		96	A	79	201	159*	128	154	194	27	99	C
	Aurangabad	S.B.E.S. College	511	RIRuO		110	A	42	201	91*	56	88	134	32	32	C
		Collector Ofiice	512	RIRuO		108	A	29	116	68*	43	69	92	19	4	H
		C.A.D.A. Ofiice, Garkheda	513	RIRuO		103	A	32	128	65*	36	62	97	24	9	H
	Badlapur	BIWA Office	649	RIRuO		92	A	31	212	112*	57	113	163	40	60	C
	Chandrapur	Grampanchat Ghughus	267	RIRuO		93	A	30	396	214*	81	215	341	99	80	C
		MIDC Chandrapur	281	RIRuO		96	A	44	376	148*	78	143	210	58	78	C
		Nagar Parishad	396	RIRuO		97	A	28	200	86*	45	78	144	38	26	H
		Gadchandur Gram Panchayat, Rajura	640	RIRuO		74	A	13	389	110*	31	105	182	69	53	C
		MIDC, Tadali	638	RIRuO		54	A	35	488	223*	80	201	373	113	83	C
		Muncipal Council, Ballarshah	639	RIRuO		94	A	18	492	132*	44	134	209	73	67	C
	Jalgaon	B. J. Market	644	RIRuO		69	A	74	153	115*	87	116	143	20	72	C
		Girna water tank	645	RIRuO		68	A	74	155	118*	98	118	135	15	87	C
		MIDC Jalgaon	646	RIRuO		70	A	68	204	134*	100	134	174	28	89	C
	Kolhapur	University Campus, Shivaji University,	508	ES	Sahyadri	101	A	42	64	54	48	55	60	5	0	M
		Ruikar Trust, Dabholkar Corner, ST Stand	509	ES	Sahyadri	92	A	76	137	104*	83	102	126	15	60	C
		Mahadwar Road, Near Mahalaxmi Temple	510	ES	Sahyadri	102	A	65	127	92*	73	92	108	13	26	C
	Latur	MIDC Water Works	641	RIRuO		99	A	19	174	85*	33	87	126	35	34	H
		Terrace of Kshewraj Vidyalaya Shyamnagar	642	RIRuO		104	A	29	224	126*	88	122	177	34	83	C
		Terrace of Sidhheshwar Sahakari Bank Ganigolai	643	RIRuO		61	A	55	233	108*	69	105	148	34	56	C
	Lote	MIDC Chalkewadi	489	RIRuO		12	IA	54	247	129*	62	119	198	60	58	-
		Pump House, CETP	490	RIRuO		18	IA	20	301	109*	28	101	198	74	50	-
	Mahad	Water treatment plant, Bhirwadi	569	RIRuO		66	A	33	210	94*	45	90	142	38	39	C
		EHS, M/s Privi organics Ltd	570	RIRuO		56	A	24	159	89*	43	88	138	35	43	H
		Mahatma Phule Hall, MNP	571	RIRuO		50	A	33	234	97*	48	89	152	46	44	C
	Mumbai	Kalbadevi	169	RIRuO		83	A	28	177	78*	35	72	143	40	28	H
		Parel , Ambedkar Road	170	RIRuO		98	A	38	339	113*	50	93	202	62	45	C
		Worli	349	RIRuO		103	A	22	217	100*	45	100	150	43	64	C

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	Nagpur	Institution of Engineers	287	RIRuO		87	A	41	329	110*	67	101	164	46	51	C
		Govt. Polytechnic College, Sadar	314	RIRuO		88	A	37	360	104*	62	96	154	45	45	C
		MIDC Office Hingana Road	288	RIRuO		83	A	27	295	129*	68	114	214	58	63	C
		MIDC Industrial Area, MIDC Office, Hingna	165	RIRuO		80	A	44	725	147*	60	120	231	104	65	C
		Maskasath, Itwari	166	RIRuO		98	A	17	347	106*	36	100	171	60	50	C
		NEERI Lab, Nehru Marg	167	RIRuO		96	A	13	221	81*	30	78	131	41	29	H
	Nashik	R.T.O. Colony Tank	259	RIRuO		112	A	22	204	73*	37	67	113	31	21	H
		VIP Industrial Area, MIDC Satpura	269	RIRuO		113	A	19	208	80*	35	78	128	38	28	H
		Nashik Municipal Council Building	280	RIRuO		111	A	23	189	77*	44	71	125	31	23	H
	Navi Mumbai	T.B.I.A, Rabale , Airoli, TTC	491	RIRuO		102	A	27	271	102*	55	92	161	44	37	C
		Dr. D.Y. Patil College, Nerul, TTC	492	RIRuO		104	A	22	246	86*	36	80	143	46	34	H
		MPCB Central Lab, Mhape	493	RIRuO		96	A	43	224	99*	57	94	149	37	45	C
		CIDCO Nodal Office Kharghar	494	RIRuO		105	A	19	393	95*	49	87	150	50	32	C
		Panvel Residential Area, Taloja	495	RIRuO		96	A	31	312	99*	49	91	153	51	39	C
		MIDC Collom Faciolity Building	496	RIRuO		99	A	63	389	198*	101	193	315	80	90	C
	Pune	Maratha Chamber of commerce, Bhosari	312	RIRuO		104	A	15	219	83*	27	73	161	51	33	H
		State Electricity Board BLDG Nalstop	379	RIRuO		105	A	22	370	84*	33	78	133	50	34	H
		Swargate Police Chawki	381	RIRuO		105	A	11	236	80*	24	75	152	47	30	H
	Roha	Roha Industrial Association office	572	RIRuO		64	A	29	197	85*	45	79	136	37	28	H
		Filter House of MIDC Water works	573	RIRuO		61	A	30	209	93*	51	91	143	37	34	C
	Sangli	Udyog bhavan / SRO, MPCB Sangli	574	RIRuO		105	A	9	114	50	19	41	88	28	7	M
		Sangli- Miraj Primary school Building	575	RIRuO		104	A	14	163	62*	22	50	116	38	19	H
		Krishna Valley School	576	RIRuO		104	A	17	155	73*	26	71	132	40	29	H
	Solapur	WIT Campus	299	RIRuO		106	A	34	118	68*	47	64	94	18	6	H
		Voronoko School / Chitale Clinic	300	RIRuO		107	A	34	128	64*	44	63	88	18	3	H
	Thane	Maternity Hospital,Dhobighat,Kopri	303	RIRuO		114	A	45	61	49	46	48	56	4	0	M
	Thane	Terrace of Shahu Market,Naupada	304	RIRuO		117	A	47	67	52	48	50	58	4	0	M
		Kolshet and Balkum, Thane West	305	RIRuO		37	IA	46	61	50	47	49	54	3	0	-
	Ulhasnagar	Smt. C. H. M. College Campus	647	RIRuO		99	A	28	161	96*	52	100	129	31	49	C
		Octroi Naka	648	RIRuO		94	A	49	250	117*	64	114	163	41	68	C
Meghalaya	Byrnihat	EPIP, Ri-Bhoi district	568	RIRuO		87	A	143	257	175*	157	174	195	19	100	C
	Dawki	Terrace building, Jaintia Hills District	588	RIRuO		68	A	27	123	71*	41	67	100	24	12	H
	Tura	Office building of Add Chief Engineer, Garo Hills District	608	RIRuO		34	IA	44	77	63*	52	63	73	8	0	-
	Shillong	State Tuberculosis Hospital	340	ES	Hill station	79	A	65	124	103*	89	104	115	10	68	C
		Boards Office Permises, Lumpyngngad	120	ES	Hill station	54	A	40	75	56	45	55	66	8	0	M
Mizoram	Aizawl	Khatla, M.G-Road, Roof Top of Mizoram SPCB	450	ES	Hill station	104	A	26	78	43	31	43	57	11	0	M
	Aizawl	Laipuitlang, Residence of Chairman, MPCB	451	ES	Hill station	104	A	17	64	33	23	30	47	9	0	M
	Aizawl	Bawngkawn , Roof Top of Mr.K.L. Berema's residence	452	ES	Hill station	104	A	30	81	49	38	47	64	10	0	M

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Nagaland	Dimapur	Bank Colony	317	RIRuO		93	A	12	201	77*	24	65	153	48	30	H
		Dhobinala	448	RIRuO		93	A	12	202	75*	23	71	129	44	28	H
	Kohima	Opposite NST Office	609	ES	Hill station	51	A	9	112	53*	16	43	100	33	14	M
		Opposite War Cemetery	610	ES	Hill station	42	IA	21	141	79*	29	70	132	41	36	-
Orissa	Angul	Industrial Estate	70	RIRuO		114	A	45	215	146*	77	157	194	44	69	C
		NALCO Township	231	RIRuO		100	A	27	179	75*	49	75	103	23	13	H
	Balasore	Sahadevkhunta	428	RIRuO		100	A	39	104	73*	53	73	97	17	5	H
	Berhampur	Regional Office Orissa SPCB	429	RIRuO		95	A	19	177	58	37	55	81	23	12	M
	Bhubneshwar	Capital Police Station	424	RIRuO		105	A	37	381	97*	43	88	146	54	39	C
		IRC Village	423	RIRuO		98	A	22	144	70*	44	64	111	26	15	H
		SPCB Building	322	RIRuO		113	A	32	173	84*	47	85	118	27	28	H
	Cuttack	Roof of Traffic Tower, Badambadi	426	RIRuO		105	A	33	186	77*	41	65	139	37	22	H
		R.O. Cuttack Office, Surya Vihar	425	RIRuO		45	IA	26	260	71*	34	51	143	48	24	-
	Rayagada	Regional Office Orissa SPCB	428	RIRuO		103	A	12	77	54	26	58	70	17	0	M
		LPS High School, Jaykaypur	229	RIRuO		103	A	15	80	61*	32	65	75	16	0	H
	Rourkela	Regional Office, ORPB	370	RIRuO		94	A	77	141	111*	97	111	128	12	82	C
		IDL Police Out-post, Sonaparbat	227	RIRuO		104	A	73	117	99*	86	98	110	9	42	C
	Sambalpur	Filter Plant, PHD Office, Modipara	427	RIRuO		84	A	33	82	50	37	51	63	10	0	M
	Talcher	Coal Field Area / MCL AREA	471	RIRuO		66	A	66	253	137*	95	134	186	38	82	C
		T.T.P.S.Colony	68	RIRuO		103	A	39	202	96*	66	96	112	28	38	C
Punjab	Amritsar	R.O. Focal Point, Amritsar	487	RIRuO		53	A	168	257	215*	188	221	236	21	100	C
		A-1,Platers, Amritsar / VMC	486	RIRuO		57	A	193	260	224*	198	221	253	19	100	C
	Bhatinda	Ms Milk Plant, Ropar	506	RIRuO		96	A	120	338	216*	130	230	300	67	100	C
	Dera Bassi	M/s Punjab Chemicals and Crop Protection Ltd.	504	RIRuO		128	A	78	316	184*	110	163	278	67	92	C
		M/s Winsome Yarns Ltd., Barwala Road, Derabassi	505	RIRuO		87	A	50	223	140*	100	141	181	32	90	C
	Pathankot/	C-PYTE Building at Dera Baba Nanak	590	RIRuO		56	A	55	97	76*	63	75	87	9	0	H
	Gobindgarh	M/s Modi Oil and General Mills	302	RIRuO		107	A	95	519	214*	158	207	251	66	99	C
		M/s Raj Steel Rolling Mills	301	RIRuO		123	A	147	543	232*	181	220	276	64	100	C
		United Rolling Mills, Mandi Gobindgarh	483	RIRuO		97	A	131	540	225*	163	214	264	67	100	C
	Jalandar	Municipal Council Tubewell	353	RIRuO		25	IA	119	151	144*	139	146	150	6	100	-
	Khanna	Markfed Vanaspati, Khanna	485	RIRuO		123	A	136	284	233*	208	233	262	22	100	C
		AS School, Khanna	484	RIRuO		134	A	167	282	229*	197	232	258	24	100	C
	Ludhiana	Bharat Nagar Chowk	422	RIRuO		24	IA	118	214	154*	123	147	204	31	100	-
		Nahar Spining Mills, Dholewal Chawk	76	RIRuO		115	A	163	341	245*	201	247	270	31	100	C
		Milk plant, Ferozpur Road	61	RIRuO		131	A	143	276	224*	173	231	255	30	100	C
		Vishavkarma Chowk	335	RIRuO		126	A	139	301	232*	183	237	260	30	100	C
	Naya Nangal	M/s Punjab Alkalis & Chemicals Ltd.	420	RIRuO		111	A	35	161	87*	47	89	123	29	35	H
		M/s NFL Guest House	421	RIRuO		59	A	42	168	101*	62	101	131	27	53	C
	Patiala	Ceylon Industries	600	RIRuO		76	A	95	260	142*	105	138	187	35	95	C
		Fire Brigade Station, Bahera Road,	599	RIRuO		70	A	105	209	143*	120	142	165	19	100	C

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Puducherry	Puducherry	DSTC Office Upstairs, AnnaNagar	64	RIRuO		90	A	13	72	38	24	38	54	12	0	M
		PIPDIC Ind. Estate Mettupalayam	93	RIRuO		82	A	18	97	47	31	45	69	16	0	M
		Chamber Of Commerce	337	RIRuO		83	A	12	53	28	17	26	39	9	0	L
Rajasthan	Alwar	Regional Office, Rajasthan SPCB	372	ES	Aravali range	82	A	18	728	201*	63	184	341	135	0	C
		Gaurav Solvex Ltd. MIA	373	ES	Aravali range	75	A	21	733	300*	78	294	533	163	88	C
		RIICO Pump House, MIA	219	ES	Aravali range	72	A	55	643	174*	77	148	284	105	0	C
	Jaipur	Aimeri Gate	296	RIRuO		1	IA	21	388	131*	50	96	249	83	5200	-
		RJPB Office,Jhalana Doongari	298	RIRuO		109	A	17	593	107*	30	82	197	91	39	C
		Office of District Education Officer, Chandpole	408	RIRuO		93	A	55	513	197*	97	194	314	85	89	C
		RIICO Office, M.I.A.	410	RIRuO		102	A	26	436	103*	37	87	175	69	41	C
		Regional Office (North), RSPCB, Vidyadhar Nagar	409	RIRuO		109	A	18	828	199*	62	199	331	117	79	C
		VKIA	297	RIRuO		114	A	62	637	246*	93	252	395	122	63	C
	Jodhpur	DIC Office, Industrial Estate	413	RIRuO		96	A	27	671	156*	54	144	239	110	65	C
		Sojati Gate	273	RIRuO		103	A	55	536	208*	106	192	321	91	92	C
		Basni Industrial Area, RIICO Office	274	RIRuO		97	A	38	1100	198*	93	172	311	137	86	C
		Maha Mandir Police Thane	376	RIRuO		99	A	37	604	203*	87	177	349	116	87	C
		Office of Housing Board, Chopasani Road	411	RIRuO		98	A	29	617	143*	50	126	235	104	67	C
		Shastri Nagar Police Thana	412	RIRuO		102	A	22	778	174*	65	147	300	116	75	C
	Kota	Regional Office, RJPB, Anantpura	17	RIRuO		102	A	24	436	155*	41	142	272	91	69	C
		Municipal Corporation Building	326	RIRuO		101	A	22	303	119*	39	107	203	69	55	C
		Samcore Glass Ltd.	325	RIRuO		103	A	20	428	120*	32	110	207	77	55	C
	Udaipur	Ambamata	320	RIRuO		92	A	30	188	83*	44	74	126	35	33	H
		Town Hall	294	RIRuO		95	A	29	321	103*	43	90	175	56	0	C
		Regional Office,MIA	321	RIRuO		86	A	45	423	163*	75	144	283	84	80	C
Tamilnadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam	38	RIRuO		100	A	29	213	78*	46	74	113	31	15	H
		Govt. High School, Manali	71	RIRuO		102	A	29	239	80*	55	73	127	34	25	H
		Thiruvottiyur	72	RIRuO		93	A	31	242	84*	51	76	130	35	26	H
		Madras Medical College	159	RIRuO		93	A	13	80	39	21	37	37	14	0	M
		NEERI, CSIR Campus	160	RIRuO		95	A	9	95	33	17	29	52	16	0	M
		Thiruvottiyur Municipal Office	161	RIRuO		95	A	14	107	38	19	35	59	17	0	M
	Coimbatore	Poniarajapuram, On the top of DEL	371	RIRuO		81	A	10	147	50	18	41	99	33	10	M
		G.D.Matric Hr.Sec.School	238	RIRuO		100	A	12	250	55	26	50	66	30	3	M
		SIDCO Office Kurichi	237	RIRuO		93	A	23	1184	127*	78	111	167	118	61	C
	Madurai	Highway (Project -I) Building	306	RIRuO		103	A	20	125	51	33	49	72	18	3	M
		Fenner (I) Ltd. Susee Cars & Trucks	307	RIRuO		93	A	19	83	39	25	37	54	13	0	M
		Kunnathur Chatram Girls HS School	308	RIRuO		97	A	26	136	50	33	47	66	18	2	M
	Salem	Sowdeswari College Building	309	RIRuO		118	A	30	835	85*	47	71	123	76	27	H
	Tuticorin	Fisheries College	239	RIRuO		100	A	17	347	75*	39	65	122	42	19	H
		Raja Agencies	240	RIRuO		90	A	49	601	163*	78	140	264	88	79	C
Uttar Pradesh	Agra	Regional Office, Bodla	323	ES	Taj-trapezium	89	A	96	311	179*	46	123	179	233	99	C
		Nunhai	324	ES	Taj-trapezium	96	A	94	283	196*	46	135	195	258	97	C
		Taj Mahal	1	ES	Taj-trapezium	286	A	13	592	167*	27	168	296	105	71	C
		DIC Nunhai	415	ES	Taj-trapezium	128	A	33	706	248*	61	249	452	148	77	C

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		Etmad-uddaulah	416	ES	Taj-trapezium	123	A	17	698	179*	34	156	352	132	67	C
		Rambagh	417	ES	Taj-trapezium	118	A	21	431	143*	36	125	280	97	61	C
	Allahabad	Square crossing circle of Laxmi Talkies	554	RIRuO		105	A	99	649	254*	92	160	245	348	99	C
		Bharat Yantra Nigam Ltd	555	RIRuO		105	A	58	466	181*	63	107	179	261	92	C
	Anpara	Anpara Colony, Sonabhadra	6	RIRuO		104	A	86	312	128*	21	113	126	139	98	C
		Renusagar Colony, Sonabhadra	7	RIRuO		96	A	93	166	129*	16	114	127	151	100	C
	Ferozabad	Center for Development of Glass Industry (CDGI)	399	ES	Taj-trapezium	104	A	39	332	226*	87	74	262	304	83	C
		Tilak Nagar	400	ES	Taj-trapezium	103	A	37	320	212*	87	60	243	295	83	C
		Raza ka Tal	401	ES	Taj-trapezium	101	A	25	312	203*	89	59	240	290	76	C
	Gajraula	Raunaq Auto Ltd, J.P. Nagar	140	RIRuO		88	A	70	132	94*	79	92	108	13	26	C
		Indira Chowk, J.P. Nagar	139	RIRuO		71	A	54	170	81*	65	81	94	16	7	H
	Ghaziabad	M/s Atlas Cycles Industries Ltd, Sahibabad Industrial Area	258	RIRuO		97	A	163	503	301*	200	306	398	88	100	C
	Ghaziabad	Bulandshaar Road Industrial Area	369	RIRuO		88	A	160	517	280*	177	283	376	90	100	C
	Jhansi	Jail Chauraha	517	RIRuO		120	A	92	292	131*	106	132	146	25	94	C
		Veeranga Nagar	518	RIRuO		120	A	72	184	106*	81	107	123	17	66	C
	Kanpur	Forest & Training Centre, Kidwai Nagar	212	RIRuO		98	A	137	248	200*	163	207	226	26	100	C
		Chamber Of Commerce, Darshanpurwa	98	RIRuO		91	A	159	252	207*	180	209	233	22	100	C
		Fazalganj	86	RIRuO		81	A	145	273	221*	189	222	253	29	100	C
		Dabauli	391	RIRuO		80	A	131	308	196*	151	201	222	30	100	C
		Awas Vikas, Jajmau	395	RIRuO		93	A	126	254	194*	167	196	220	23	100	C
	Khurja	Central Glass & Ceramic Research Institute	534	RIRuO		58	A	157	292	191*	161	174	265	38	100	C
		Ahirpara	535	RIRuO		58	A	136	200	155*	139	150	178	17	100	C
	Lucknow	Mahanagar	377	RIRuO		74	A	135	228	185*	146	189	217	27	100	C
		Chandganj Garden, Aliganj	398	RIRuO		109	A	103	6307	243*	151	194	220	587	100	C
		Kapoor Hotel, Hazratganj	109	RIRuO		82	A	129	236	192*	153	194	223	26	100	C
		Talkatora	113	RIRuO		81	A	150	243	205*	163	212	232	26	100	C
		S.M.K Chowk, Aminabad	397	RIRuO		102	A	147	304	194*	155	197	226	31	100	C
	Meerut	Begum Bridge	550	RIRuO		69	A	109	286	178*	119	197	240	54	100	C
		Thana Railway Road, Kesarganj	551	RIRuO		42	IA	104	280	155*	110	124	222	53	100	-
	Muradabad	Budh Bazar		RIRuO		28	IA	57	569	221*	88	219	294	102	86	-
		PTC		RIRuO		30	IA	46	480	169*	90	167	237	83	83	-
	Noida	Regional Office, UP PCB	403	RIRuO		95	A	65	168	130*	103	132	147	21	91	C
		Gee-Pee Electroplating and Engineering Work	378	RIRuO		96	A	71	194	134*	108	136	156	22	8800	C
	Varanasi	Regional Office, Jawahar Nagar	362	RIRuO		24	IA	122	136	128*	124	127	133	4	100	-
		Sigra	553	RIRuO		8	IA	126	128	127*	126	127	128	1	100	-
Uttarakhand	Dehradun	Raipur Road, Near parag Diary	90	ES	Doon valley	30	IA	80	169	121*	93	120	153	22	83	-
		Clock Tower, PWD Guest House	89	ES	Doon valley	50	A	92	263	169*	129	164	220	36	98	C
		Himalaya Drug Co. Near ISBT	637	ES	Doon valley	3	IA	158	236	195*	191	214	232	39	100	-
	Haldwani	Govt. Women Hospital	625	RIRuO		1	IA	-	-	196*	-	-	-	-	-	-
	Haridwar	SIDCUL, Haridwar	635	RIRuO		3	IA	100	179	139*	107	119	139	40	200	-
	Kashipur	BSNL Office, Kashipur	627	RIRuO		1	IA	-	-	46	-	-	-	-	-	-
	Rishikesh	Nagar Palika Parishad	636	ES	Hill station	3	IA	186	238	212*	191	199	212	26	100	-

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	PM_{10} Annual average ($\mu g/m3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hourly)	Air Quality
West Bengal	Asansol	Asansol Municipal Corporation	386	RIRuO		105	A	28	396	132*	58	104	250	84	50	C
		Kangsabati Spinning Mill, Barjora	593	RIRuO		105	A	25	367	137*	57	107	293	95	61	C
		Burnpur Town Department, Burnpur	592	RIRuO		105	A	22	434	152*	55	137	279	99	57	C
	Barrackpore	Barrackpore Municiaplity	655	RIRuO		102	A	27	234	110*	45	104	185	55	53	C
		Dum Dum Telephone Exchange	653	RIRuO		101	A	34	290	120*	52	112	210	60	54	C
		Khardah Municipality	654	RIRuO		102	A	31	316	132*	52	122	233	67	63	C
	Durgapur	DMC Water Works, Angadpur	591	RIRuO		105	A	27	340	132*	37	113	235	80	56	C
		Kwality Hotel, Bhiringi More, Benachiti	384	RIRuO		105	A	32	371	136*	56	105	253	80	69	C
		Bidhannagar, PCBL Club, Muchipara	385	RIRuO		105	A	24	227	90*	36	84	149	45	38	H
		Dew India Limited, PCBL More, Durgapur	383	RIRuO		105	A	47	578	207*	74	167	391	133	70	C
	Haldia	Bhabanipur, Debhog Milan Viyapith	663	RIRuO		108	A	21	149	65*	33	58	110	30	16	H
		Driver's Hut of M/s. MCC PTA, Bhunia Raichak	664	RIRuO		108	A	28	117	56	37	51	85	19	15	M
		Supermarket Building, Durgachak	15	RIRuO		108	A	20	126	47	25	37	90	26	7	M
		WBIIDC Durgachak	14	RIRuO		108	A	23	125	60	31	55	99	27	25	M
	Howrah	Howrah Municipal Corporation Building	8	RIRuO		103	A	28	273	127*	52	104	229	69	65	C
		Naskarpara Pump House, Ghuseri	10	RIRuO		103	A	23	310	117*	46	94	224	70	48	C
		CDS & Health Centre, Bator	11	RIRuO		103	A	23	229	102*	41	75	199	63	38	C
		Howrah Municipality School, Bandhaghat	9	RIRuO		103	A	25	281	127*	57	99	229	68	50	C
	Kolkata	Salt Lake, Rooftop of CK Market	474	RIRuO		103	A	18	257	83*	26	51	192	64	32	H
		Moulali, Rooftop of KMC office Building	473	RIRuO		104	A	22	391	103*	31	71	216	82	38	C
		Minto Park, Inside Park AJC Bose Road	475	RIRuO		102	A	17	211	68*	22	43	143	52	27	H
		Dunlop Bridge, National Sample Survey Building	472	RIRuO		102	A	16	336	100*	31	57	226	81	38	C
		Behala Chowrasta, Traffic Guard Building	476	RIRuO		103	A	16	364	98*	33	63	220	76	37	C
		Baishnabghata, Upanagari Sporting Club	477	RIRuO		101	A	14	306	77*	21	41	183	69	30	H
		Cossipore Police Station, B.T. Road	162	RIRuO		96	A	12	573	142*	31	108	275	111	52	C
		Lal-Bazar, Dalhousie Square	163	RIRuO		96	A	23	401	112*	36	77	223	81	42	C
		Kasba	348	RIRuO		96	A	10	376	111*	28	73	234	90	44	C
	Raniganj	Raniganj Municipality	662	RIRuO		105	A	50	487	197*	74	182	359	115	69	C
		Mangalpur, SKS School Mangalpur	660	RIRuO		105	A	41	376	150*	62	146	256	78	63	C
		Jamuria Municipality	661	RIRuO		105	A	29	345	130*	48	123	224	73	56	C
	Sankrail	Bharat Co-operative Housing Society	657	RIRuO		104	A	19	212	95*	40	77	177	53	40	C
		Bagan Police Station, Bagan	659	RIRuO		104	A	24	263	115*	47	94	209	64	48	C
		Dhulagar Gram Pachayat	656	RIRuO		104	A	22	273	108*	44	90	202	63	43	C
		P Mukherjee's House, Near SBI Amta	658	RIRuO		104	A	15	223	81*	30	59	161	54	30	H
	South Suburban	Chanditala Water Supply Pump House, Tollygunge	652	RIRuO		102	A	14	272	80*	24	44	188	67	34	H
		Bauipur Police Station, Baruipur	650	RIRuO		105	A	15	290	86*	24	53	197	72	35	H
		P Roy Industrial Training Institute, Amtala	651	RIRuO		103	A	15	262	81*	20	51	181	67	32	H

*Note: * - Locations where annual mean concentration of PM_{10} exceeded the NAAQS of 60 $\mu g/m^3$ for Residential/ industrial / other area and 60 $\mu g/m^3$ for sensitive area. '-' Data not available/ outlier/not classified as monitoring days <50daysRIRuO – Residential/industrial/rural/other area, ES – Ecologically sensitive area, mon- monitoring Std dev. – Standard deviation, n – number of days monitored for 16 and more hours a day L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedence factor (calculated for n ≥ 50 days) classification based on Pollution Level Classification, Chapter 2,Table 2.1; % violation – percentage violation of NAAQS (24 hourly average) BDL = Below Detection Limit (Concentration less than 5 $\mu g/m^3$ for PM_{10}).*

Particulate matter (PM) is a complex mixture of suspended solid and liquid particle in semi equilibrium with surrounding gases. The high Suspended particulate matter (SPM) levels lead to greater prevalence of health effects depicting sub-clinical effects, impaired pulmonary function, respiratory symptoms, medication use, excess doctor room visit, asthma and bronchitis. The majority of the symptoms are reversible because of better health facilities and greater awareness about diseases. The wide spread criticality of SPM problem in the country is due to the synergistic effect of natural factors like presence of extensively large arid and semi arid region in north west region, loss of moisture from top soil strata, distribution of sea salts with sea winds, natural formation of sulfate and nitrates during secondary reactions. The anthropogenic factors responsible for high SPM are extensive urbanization and construction activities, vehicular population increase, frequent use of captive power generation unit/domestic generation, extensive use of fossil fuel and biomass (wood, leaves etc.) as well as particulate contribution from biological debris.

As the SPM are the bigger than coarse particles, these settle down fast and does not reach the respiratory tract. Therefore they have less adverse effect on health. As a result it has not been included in the revised standard. However, as it had been measured during 2010 the data is being given in this chapter.

6.1 Annual average concentration of SPM

The annual average concentration of SPM at various monitoring stations is given in Table 6.1. The data given is annual average concentration and number of observations with 16 and more hours of monitoring a day. In addition to above the spread of the data has been given in terms of standard deviation.

Table 6.1: SPM levels (Annual average) in Ambient Air Quality Stations under NAMP during 2010

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
Andhra Pradesh	Chitoor	GNC Toll Gate Tirumala	582	RIRuO		91	A	86	137	112	13
	Guntur	Near Hindu College, Market Road	583	RIRuO		102	A	157	285	206	24
	Hydrabad	Tarnaka, NEERI Lab.	150	RIRuO		96	A	48	345	170	54
		Nacharam, Industrial Estate	151	RIRuO		95	A	21	225	107	47
		ABIDS Circle General Post Office Building	152	RIRuO		95	A	58	300	156	56
		Balanagar	95	RIRuO		108	A	194	413	302	38
		Uppal, IDA	203	RIRuO		108	A	183	361	282	37
		Jublee Hills	365	RIRuO		108	A	69	379	167	52
		Paradise	393	RIRuO		108	A	204	536	298	39
		Charminar	394	RIRuO		108	A	202	397	296	36
		Zoo Park	470	RIRuO		107	A	70	338	174	60
	Kothagudem	CER Club, Khamam	581	RIRuO		103	A	86	178	124	18
	Kurnool	Mourya Inn	466	RIRuO		117	A	133	400	214	56
	Nalgonda	RO, APPCB	577	RIRuO		108	A	118	315	192	36
	Nellore	Kamakhya Temple	580	RIRuO		94	A	88	156	130	13
	Patencheru	Police Station, Ramachadrapuram	468	RIRuO		98	A	81	301	188	51
	Ramagundam	Karimnagar Godavarikhani	465	RIRuO		99	A	39	788	224	133
	Tirupati	Regional Science Centre, Chittoor Bypass Road	389	RIRuO		98	A	77	151	110	15
	Vijaywada	Benz Circle	462	RIRuO		113	A	128	331	224	51
		Autonagar	469	RIRuO		113	A	120	430	261	86
	Warangal	KUDA Office, Hanumakonda	579	RIRuO		102	A	43	351	140	65
	Vishakhapatnam	Panchayat Raj office, Mindi	234	RIRuO		108	A	50	267	133	44
		Industrial Estate, Marripalem	233	RIRuO		108	A	29	388	152	72
		Police Barracks	371	RIRuO		108	A	33	491	222	97
		INS-Virabahu, Naval Area	387	RIRuO		108	A	47	356	120	45
		Seethammadhara	388	RIRuO		108	A	49	361	156	58
		Ganapuram Area	467	RIRuO		108	A	49	797	192	108
		Pedagantyada, Gajuwada	584	RIRuO		117	A	33	262	131	51
		CWMP, RAMKY, Parawada	585	RIRuO		108	A	33	207	87	33
Assam	Bongaigaon	Oil India Ltd. Chirang	542	RIRuO		104	A	29	403	121	98
		Barpara Office Building	520	RIRuO		104	A	22	419	104	74
	Daranga	BATAD, Baska	566	RIRuO		92	A	30	347	123	79
	Dibrugarh	Dibrugarh Office Building	538	RIRuO		103	A	26	332	81	49
	Golaghat	Golaghat Office Building	539	ES	Numaligarh	82	A	28	340	123	73
	Guwahati	Head Office, Bamunimaidam	193	RIRuO		254	A	29	599	194	119
		Boragaon, office premises of IASST, Kamrup	603	RIRuO		33	IA	51	595	133	92
		Guwahati University, Kamrup	602	RIRuO		82	A	35	408	130	64
		ITI Building, Gopinath Nagar	519	RIRuO		280	A	40	597	202	128

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
Assam		Central Dairy, Khanapara, Kamrup	596	RIRuO		106	A	56	494	190	98
		Near Pragjyotish College, Santipur	541	RIRuO		264	A	36	539	178	112
	Lakhimpur	Bazar Patti, North Lakhimpur	587	RIRuO		102	A	38	348	143	81
	Nagaon	Water Resources Div., Christian Patty	595	RIRuO		103	A	32	649	198	137
	Nalbari	PWD Rural Div Office Complex,	597	RIRuO		82	A	30	418	139	84
	Sibsagar	Sibasagar Office Building	537	RIRuO		107	A	33	399	147	83
		Usha Lodge, near ONGCL Colony	604	RIRuO		24	IA	20	195	65	37
	Silchar	Janiganj Govt. Boys HS School	607	RIRuO		11	IA	87	288	204	64
		Office Building of RLO, Ithkola Market	567	RIRuO		92	A	37	376	125	61
	Tezpur	Tezpur Office Building	536	RIRuO		104	A	24	606	135	95
	Tinsukia	Digboi Carbon factory Campus, Borguri	594	RIRuO		99	A	22	252	136	61
		Coal India Office Complex, Margherita	586	RIRuO		97	A	22	352	96	56
		Shreepuria, Borguri	605	RIRuO		43	IA	34	323	110	64
Bihar	Patna	Beltron Bhawan, Shastri Nagar	210	RIRuO		88	A	82	883	268	145
		Gandhi Maidan Test Centre	284	RIRuO		52	A	137	1526	720	371
Chandi-garh	Chandigarh	Modern Foods, Industrial Area	106	RIRuO		148	A	65	1129	240	146
		Sector-17 C	263	RIRuO		150	A	42	709	174	97
		Punjab Engineering College, Sector 12	264	RIRuO		153	A	31	641	151	87
		Sector-39, IMTECH	463	RIRuO		150	A	41	563	182	92
		Kaimbwala Village	464	RIRuO		146	A	38	664	170	108
Chattisgarh	Bhillai	Visak Hostel, Sector-4	65	RIRuO		93	A	156	200	182	11
		R.O., 5/32 Banglow Office Building	67	RIRuO		94	A	116	184	163	14
		M.P. Laghu Udyog Nigam	245	RIRuO		88	A	163	296	269	33
	Bilaspur	RO, CECB Vyapar Vihar		RIRuO		35	IA	170	645	394	81
	Korba	HIG 21,22.Near Ghantaghar,	364	RIRuO		93	A	114	281	205	47
		Pragati Nagar NTPC Colony	249	RIRuO		97	A	93	243	184	34
		I.T.I., Rampur	407	RIRuO		95	A	109	316	220	45
	Raipur	New HIG-9, Hirapur	368	RIRuO		46	IA	262	532	407	60
		M/S Wool Worth India, Sarora Raipur	223	RIRuO		53	A	382	642	539	61
		Yatayat Thana, Jai Stambh Chowk	447	RIRuO		50	A	273	471	375	43
Dadra & Nagar Haveli	Silvassa	Khadoli Industrial Area, Village- Khadoli	558	RIRuO		94	A	37	290	110	104
Daman & Diu	Daman	Kadaiya Industrial Area, Village- Kadaiya	560	RIRuO		96	A	32	254	93	79
Delhi	Delhi	N.Y. School, Sarojini Nagar	144	RIRuO		91	A	53	1045	426	224
		Town Hall, Chandni Chowk	146	RIRuO		93	A	94	1127	560	239
		Mayapuri Industrial Area	345	RIRuO		96	A	102	1039	576	228
		Pritampura	531	RIRuO		79	A	124	959	444	172
		Shahadra	58	RIRuO		77	A	95	1090	501	207
		Shahzada Bagh	57	RIRuO		79	A	137	1132	527	190
		Nizamuddin	55	RIRuO		80	A	104	853	456	164
		Janakpuri	59	RIRuO		72	A	141	860	511	161
		Siri Fort	60	RIRuO		79	A	73	766	448	171

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
Delhi	Delhi	N.Y. School, Sarojini Nagar	144	RIRuO		91	A	53	1045	426	224
		Town Hall, Chandni Chowk	146	RIRuO		93	A	94	1127	560	239
		Mayapuri Industrial Area	345	RIRuO		96	A	102	1039	576	228
		Pritampura	531	RIRuO		79	A	124	959	444	172
		Shahadra	58	RIRuO		77	A	95	1090	501	207
		Shahzada Bagh	57	RIRuO		79	A	137	1132	527	190
		Nizamuddin	55	RIRuO		80	A	104	853	456	164
		Janakpuri	59	RIRuO		72	A	141	860	511	161
		Siri Fort	60	RIRuO		79	A	73	766	448	171
Goa	Panaji	Old GSPCB premises, Patto	327	RIRuO		105	A	39	332	134	60
	Marmagao	Fire Brigade Station, Port Trust	435	RIRuO		118	A	15	310	103	48
	Vasco	Fuse Call Office of Elec. Dept., Mormugao taluka	37	RIRuO		103	A	38	319	119	64
Gujarat	Ahmedabad	Naroda, G.I.D.C., Ahmadabad	101	RIRuO		157	A	611	180	383	104
		Cadilla Bridge Narol	102	RIRuO		103	A	108	257	190	28
		L.D. Engg. College	103	RIRuO		104	A	84	198	147	25
		Shardaben Hospital, Saraspur	154	RIRuO		103	A	114	243	182	34
		R.C. High School, Mirzapur	155	RIRuO		104	A	108	253	189	30
		Naroda, G.I.D.C.,	347	RIRuO		104	A	125	243	184	27
	Anklesvar	Rallis India Ltd.	252	RIRuO		104	A	110	219	170	27
		Durga Traders, Bhavanafarm Society	253	RIRuO		104	A	93	188	147	21
	Jamnagar	Fisheries Office	319	RIRuO		104	A	149	281	195	16
	Rajkot	Sardhara Industrial Corporation	257	RIRuO		104	A	64	306	208	40
		Regional Offce	374	RIRuO		104	A	87	297	142	32
	Surat	S.V.R. Engg. College	21	RIRuO		104	A	83	197	151	23
		B.R.C. High School, Udhna	22	RIRuO		24	IA	131	242	179	114
		Air India Office	23	RIRuO		104	A	122	226	164	21
	Vadodara	GPCB Office, Geri Vasahat	50	RIRuO		96	A	69	167	111	19
		Dandia Bazaar	333	RIRuO		96	A	134	320	210	34
		CETP Nandesari	334	RIRuO		96	A	201	402	322	36
	Vapi	GEB, IIIrd Phase, GIDC, Vapi	367	RIRuO		104	A	124	219	178	21
		Vapi Nagar Palika, Vapi	221	RIRuO		104	A	108	201	154	20
Haryana	Faridabad	Escorts Research Centre Mathura Road	331	RIRuO		145	A	81	110	95	7
		RO Haryana SPCB	330	RIRuO		96	A	362	469	397	24
	Hissar	Urban Estate - II	390	RIRuO		27	IA	118	262	166	33
		Guru Jambehswar University	414	RIRuO		52	A	104	2253	216	299
	Yamunanagar	Ballarpur Industries	196	RIRuO		52	A	105	636	361	121
Himachal Pradesh	Baddi	Industry Department Office Building	449	RIRuO		96	A	62	610	218	96
		AHC barotiwala	564	RIRuO		85	A	66	494	208	84
		Housing Board	563	RIRuO		11	IA	123	270	197	49
	Damtal	Regional Office	268	RIRuO		150	A	72	268	137	40
		Old Road	271	RIRuO		114	A	77	261	160	36

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
	Kala Amb	Kala Amb Industrial Area	461	RIRuO		156	A	106	892	396	149
		Trilokpur	530	RIRuO		157	A	48	372	181	65
	Nalagarh	Municipal Council	565	RIRuO		67	A	62	537	189	102
	Parwanoo	Regional Office, Sector- 4	132	RIRuO		61	A	32	385	126	153
		Asst. Commissioner Building, Sector I	339	RIRuO		78	A	44	385	178	136
	Paonta Sahib	Paonta Sahib	117	RIRuO		140	A	89	405	203	56
		Gondhpur Industrial Area	118	RIRuO		119	A	106	594	284	94
	Shimla	Tekka Bench Ridge	34	ES	Hill station	140	A	14	286	103	52
		Bus Stand, Winterfield	35	ES	Hill station	122	A	40	309	121	48
Jammu & Kashmir	Jammu	Regional Office, Jammu	184	RIRuO		88	A	79	258	171	46
		M.A. Stadium, Jewel Chowk, Jammu	482	RIRuO		85	A	78	275	166	40
		Bari Brahamana Industrial Area, Jammu	507	RIRuO		49	IA	83	292	197	61
Jharkhand	Dhanbad	EMTI, Bastacola	612	RIRuO		72	A	174	472	277	59
		CGM Office, Kusunda	611	RIRuO		81	A	162	474	280	65
		R.O. Dhanbad	44	RIRuO		83	A	49	443	179	75
	Jamshedpur	Bistupur Vehical Testing Centre	351	RIRuO		89	A	218	410	322	54
		Golmuri Vehicle Testing Centre	382	RIRuO		91	A	229	662	320	62
	Jharia	M.A.D.A.	332	RIRuO		46	IA	182	433	302	71
	Ranchi	Albert Ekka Chowk, Main Road	402	RIRuO		111	A	192	787	390	105
	Saraikela Khar-sawan	RO Building, Adityapur	614	RIRuO		86	A	155	699	357	110
	Sindri	BIT / PDIL	46	RIRuO		37	IA	96	321	228	49
	West Singhbhum	Barajamda U.M. Office	615	RIRuO		84	A	132	2040	661	514
Karnataka	Bangalore	Graphite India	77	RIRuO		59	A	64	821	296	176
		Yeshwanthpura police station	457	RIRuO		100	A	81	654	238	110
		Peenya Industrial Area	405	RIRuO		99	A	80	1114	207	121
		KHB Industrial Area, Yelahanka	404	RIRuO		107	A	54	918	303	217
		AMCO Batteries, Mysore Road	78	RIRuO		100	A	60	558	160	76
		Jnanabharathi , Bangalore University	598	RIRuO		104	A	27	142	59	19
		R V College of Engineering	589	RIRuO		22	IA	67	130	103	18
		TERI office, Vital Medi healthcare Pvt.Ltd		RIRuO		15	IA	62	223	136	51
		Victoria hospital	406	RIRuO		29	IA	86	396	184	64
	Belgaum	Karnataka SPCB Office Building	460	ES	Sahyadri	83	A	10	196	65	43
	Gulburga	Government Hospital	459	RIRuO		77	A	107	418	178	61
	Hassan	KSRTC bus stand building	458	RIRuO		84	A	58	238	127	36
	Hubli-Dharwad	Lakamanahali Industrial Area, Dharwad	432	RIRuO		69	A	57	340	151	59
		Rani Chennamma Circle, Hubli	431	RIRuO		95	A	66	400	193	78
	Mangalore	Stides Premises, Baikampady Industrial Area	488	RIRuO		105	A	38	301	98	47
	Mysore	K.R.Circle	40	RIRuO		94	A	45	215	93	26
		KSPCB Bldg. Hebbal Ind. Area	328	RIRuO		117	A	27	143	78	27

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Kerala	Alappuzha	District Office, Alissery Road	618	RIRuO		120	A	20	212	71	34
		DC Mills, Pathirappally	617	RIRuO		120	A	26	266	76	39
	Kochi	Eloor I	149	RIRuO		90	A	24	306	65	40
		Eloor II	29	RIRuO		91	A	27	237	83	39
		Irumpanam	30	RIRuO		109	A	18	147	50	29
		Ernakulum South	338	RIRuO		109	A	22	118	53	23
		VYTTILA	562	RIRuO		108	A	20	123	57	26
		MG Road Bank Ernakulum	147	RIRuO		109	A	21	130	52	24
		Kalamassery	346	RIRuO		108	A	14	148	62	29
	Kollam	KSPCB, District Office, Kadappakada	621	RIRuO		117	A	43	275	107	42
		KMML Chavara	620	RIRuO		56	A	22	132	54	24
	Kottayam	Kottayam	187	RIRuO		96	A	50	63	57	3
		Vadavathoor	361	RIRuO		96	A	35	53	43	6
	Kozhikode	Kozhikode City	360	RIRuO		108	A	55	115	80	15
		Nallalam	359	RIRuO		108	A	49	115	85	15
	Malapuram	Kakkanchery Sijmak oils	623	RIRuO		108	A	27	70	43	7
	Palakkad	SEPR Refractories India Ltd.	311	RIRuO		121	A	17	137	61	22
	Pathanamthitta	Near District Office KSPCB, Makkamkunnu	619	RIRuO		120	A	22	64	42	8
	Thissur	KSPCB, District Office, Poonkunnam	624	RIRuO		93	A	37	284	82	49
	Wayanad	Sulthan Bathery	622	RIRuO		119	A	54	94	70	8
	Trivandrum	PRS Hospital/COSMO	419	RIRuO		108	A	46	73	59	6
		SMV School	181	RIRuO		109	A	39	305	65	25
		VELI	357	RIRuO		106	A	43	110	77	14
		PETTAH	358	RIRuO		107	A	43	85	57	6
Madhya Pradesh	Bhopal	Hamidia Road, M.P. Hastshilp Vikas Nigam	122	RIRuO		73	A	80	803	363	171
		C E T P Govindpura	123	RIRuO		74	A	41	753	277	158
	Dewas	EID Perry (I) Limited	525	RIRuO		88	A	681	66	255	420
		Dewas Metal Section	524	RIRuO		58	A	278	57	173	58
		Vikas Nagar	523	RIRuO		88	A	455	85	203	71
	Gwalior	Dindayal Nagar	479	RIRuO		75	A	715	172	474	131
		Maharaj Bada	478	RIRuO		75	A	713	174	366	116
	Indore	Polo Ground	127	RIRuO		79	A	59	628	256	103
		Kothari Market, M.G. Road	128	RIRuO		87	A	132	580	278	98
		Telephone Nagar, Kanadia Road	131	RIRuO		81	A	84	408	214	63
	Jabalpur	Vijay Nagar	248	RIRuO		21	IA	337	250	294	21
	Nagda	B C I Labour Club	84	RIRuO		97	A	174	81	134	17
		Grasim Kalyan Kendra	246	RIRuO		100	A	186	86	156	19
	Sagar	Pt.Deendayal Nagar, Housing Board Colony	532	RIRuO		72	A	481	108	268	100
	Satna	Sub-divisional Office E/M LightMachniery	343	RIRuO		80	A	622	104	359	109
		Regional Office MPPCB	342	RIRuO		96	A	509	106	185	78
	Singrauli	Jayant Township	515	RIRuO		13	IA	420	317	374	33
		N.T.P.C., Vidyanagar	514	RIRuO		19	IA	297	213	270	22
		Waidhan	516	RIRuO		13	IA	174	135	157	12
	Ujjain	District Office	527	RIRuO		74	A	376	117	244	58
		Regional Office	526	RIRuO		48	IA	193	62	113	27
		Mahakal Temple	528	RIRuO		59	A	219	83	146	33

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Maharashtra	Aurangabad	S.B.E.S. College	511	RIRuO		111	A	103	478	266	95
		Collector Ofiice	512	RIRuO		108	A	60	286	169	46
		C.A.D.A. Ofiice, Garkheda	513	RIRuO		103	A	67	306	170	66
	Badlapur	BIWA Office	649	RIRuO		92	A	37	299	141	57
	Chandrapur	Grampanchat Ghughus	267	RIRuO		93	A	66	1733	643	364
		MIDC Chandrapur	281	RIRuO		96	A	156	924	428	164
		Nagar Parishad	396	RIRuO		97	A	44	1017	233	144
		Gadchandur Gram Panchayat, Rajura	640	RIRuO		74	A	42	1284	329	241
		MIDC, Tadali	638	RIRuO		54	A	89	1617	623	408
		Muncipal Council, Ballarshah	639	RIRuO		94	A	25	1203	385	207
	Jalgaon	B. J. Market	644	RIRuO		69	A	131	291	191	37
		Girna water tank	645	RIRuO		68	A	120	262	195	33
		MIDC Jalgaon	646	RIRuO		70	A	133	268	207	37
	Kolhapur	University Campus, Shivaji University,	508	ES	Sahyadri	101	A	86	134	113	10
		Ruikar Trust, Dabholkar Corner, ST Stand	509	ES	Sahyadri	92	A	169	436	290	55
		Mahadwar Road, Near Mahalaxmi Temple	510	ES	Sahyadri	102	A	142	306	226	39
	Latur	MIDC Water Works	641	RIRuO		99	A	51	334	179	67
		Terrace of Kshewraj Vidyalaya Shyamnagar	642	RIRuO		104	A	91	622	297	108
		Terrace of Sidhheshwar Sahakari Bank Ganjgolai	643	RIRuO		61	A	116	765	253	104
	Lote	MIDC Chalkewadi	489	RIRuO		12	IA	144	341	215	54
		Pump House, CETP	490	RIRuO		18	IA	68	410	193	88
	Mahad	Water treatment plant, Bhirwadi	569	RIRuO		66	A	65	384	164	62
		EHS, M/s Privi organics Ltd	570	RIRuO		56	A	46	281	148	53
		Mahatma Phule Hall, MNP	571	RIRuO		50	A	63	343	156	77
	Mumbai	Kalbadevi	169	RIRuO		84	A	52	421	206	95
		Parel , Ambedkar Road	170	RIRuO		98	A	70	568	246	110
		Worli	349	RIRuO		89	A	57	323	176	62
	Nagpur	Institution of Engineers	287	RIRuO		87	A	73	384	141	51
		Govt. Polytechnic College, Sadar	314	RIRuO		88	A	68	398	135	51
		MIDC Office Hingana Road	288	RIRuO		83	A	45	367	164	71
		MIDC Industrial Area, MIDC Office, Hingna	165	RIRuO		55	A	73	486	239	102
		Maskasath, Itwari	166	RIRuO		87	A	39	691	226	124
		NEERI Lab, Nehru Marg	167	RIRuO		61	A	40	457	128	68
	Nashik	R.T.O. Colony Tank	259	RIRuO		112	A	28	355	145	75
		VIP Industrial Area, MIDC Satpura	269	RIRuO		113	A	31	366	140	78
		Nashik Municipal Council Building	280	RIRuO		111	A	29	380	150	87
	Navi Mumbai	T.B.I.A, Rabale , Airoli, TTC	491	RIRuO		102	A	35	582	203	100
		Dr. D.Y. Patil College, Nerul, TTC	492	RIRuO		104	A	37	710	180	100
		MPCB Central Lab, Mhape	493	RIRuO		96	A	61	459	226	93
		CIDCO Nodal Office Kharghar	494	RIRuO		105	A	38	509	192	90
		Panvel Residential Area, Taloja	495	RIRuO		96	A	43	641	195	106
		MIDC Collom Faciolity Building	496	RIRuO		99	A	112	821	497	182

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	Pune	Maratha Chamber of commerce, Bhosari	312	RIRuO		192	A	104	45	104	57
		State Electricity Board BLDG Nalstop	379	RIRuO		105	A	41	495	204	104
		Swargate Police Chawki	381	RIRuO		105	A	34	420	203	108
	Roha	Roha Industrial Association office	572	RIRuO		64	A	67	301	152	44
		Filter House of MIDC Water works	573	RIRuO		160	A	61	68	249	39
	Sangli	Udyog bhavan / SRO, MPCB Sangli	574	RIRuO		105	A	21	150	79	33
		Sangli- Miraj Primary school Building	575	RIRuO		104	A	32	212	92	43
		Krishna Valley School	576	RIRuO		104	A	28	207	108	44
	Solapur	WIT Campus	299	RIRuO		106	A	145	280	208	31
		Voronoko School / Chitale Clinic	300	RIRuO		107	A	145	291	207	30
	Thane	Maternity Hospital,Dhobighat,Kopri	303	RIRuO		114	A	70	93	76	5
	Thane	Terrace of Shahu Market,Naupada	304	RIRuO		117	A	74	92	80	4
		Kolshet and Balkum, Thane West	305	RIRuO		37	IA	71	90	78	5
	Ulhasnagar	Smt. C. H. M. College Campus	647	RIRuO		99	A	45	229	120	43
		Octroi Naka	648	RIRuO		94	A	61	338	148	55
Mizoram	Aizawl	Khatla, M.G-Road, Roof Top of Mizoram SPCB	450	ES	Hill station	104	A	56	174	90	23
	Aizawl	Laipuitlang, Residence of Chairman, MPCB	451	ES	Hill station	20	IA	37	130	69	104
	Aizawl	Bawngkawn , Roof Top of Mr.K.L. Berema's residence	452	ES	Hill station	104	A	63	176	100	23
Nagaland	Dimapur	Bank Colony	317	RIRuO		93	A	19	287	135	74
		Dhobinala	448	RIRuO		93	A	23	318	140	71
	Kohima	Opposite NST Office	609	ES	Hill station	51	A	19	202	88	49
		Opposite War Cemetery	610	ES	Hill station	42	IA	41	292	155	86
Orissa	Angul	Industrial Estate	70	RIRuO		118	A	75	446	295	95
		NALCO Township	231	RIRuO		100	A	65	414	149	45
	Balasore	Sahadevkhunta	428	RIRuO		100	A	84	206	160	32
	Berhampur	Regional Office Orissa SPCB	429	RIRuO		95	A	62	396	143	56
	Bhubneshwar	Capital Police Station	424	RIRuO		105	A	65	547	172	95
		IRC Village	423	RIRuO		98	A	42	343	148	59
		SPCB Building	322	RIRuO		113	A	65	418	179	71
	Cuttack	Roof of Traffic Tower, Badambadi	426	RIRuO		105	A	99	445	231	80
		R.O. Cuttack Office, Surya Vihar	425	RIRuO		45	IA	78	397	162	97
	Rayagada	Regional Office Orissa SPCB	428	RIRuO		103	A	18	303	87	34
		LPS High School, Jaykaypur	229	RIRuO		103	A	24	139	92	25
	Rourkela	Regional Office, ORPB	370	RIRuO		94	A	170	274	213	21
		IDL Police Out-post, Sonaparbat	227	RIRuO		104	A	172	247	208	15
	Sambalpur	Filter Plant, PHD Office, Modipara	427	RIRuO		84	A	95	165	131	15
	Talcher	Coal Field Area / MCL AREA	471	RIRuO		66	A	123	438	277	69
		T.T.P.S.Colony	68	RIRuO		103	A	84	363	203	55

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Punjab	Dera Bassi	M/s Winsome Yarns Ltd., Barwala Road, Derabassi	505	RIRuO		51	A	208	330	264	31
	Naya Nangal	M/s NFL Guest House	421	RIRuO		45	IA	132	191	158	12
	Patiala	Ceylon Industries	600	RIRuO		50	A	148	260	202	22
		Fire Brigade Station, Bahera Road,	599	RIRuO		50	A	162	235	194	21
Puducherry	Puducherry	DSTC Office Upstairs, AnnaNagar	64	RIRuO		90	A	30	94	60	13
		PIPDIC Ind. Estate Mettupalayam	93	RIRuO		82	A	36	123	70	18
		Chamber Of Commerce	337	RIRuO		83	A	23	71	45	10
Rajasthan	Alwar	Regional Office, Rajasthan SPCB	372	ES	Aravali range	82	A	54	1953	403	288
		Gaurav Solvex Ltd. MIA	373	ES	Aravali range	75	A	48	1483	520	277
		RIICO Pump House, MIA	219	ES	Aravali range	72	A	87	961	281	153
	Jaipur	Ajmeri Gate	296	RIRuO		1	IA	47	1190	345	184
		RJPB Office,Jhalana Doongari	298	RIRuO		108	A	23	1056	235	188
		Office of District Education Officer, Chandpole	408	RIRuO		92	A	153	1076	488	162
		RIICO Office, M.I.A.	410	RIRuO		102	A	42	1399	249	215
		Regional Office (North), RSPCB, Vidyadhar Nagar	409	RIRuO		109	A	74	2485	474	350
		VKIA	297	RIRuO		114	A	98	2015	547	290
	Jodhpur	DIC Office, Industrial Estate	413	RIRuO		96	A	78	992	348	194
		Sojati Gate	273	RIRuO		103	A	106	1180	453	205
		Basni Industrial Area, RIICO Office	274	RIRuO		97	A	125	1300	422	226
		Maha Mandir Police Thane	376	RIRuO		99	A	78	1235	451	242
		Office of Housing Board, Chopasani Road	411	RIRuO		98	A	73	1058	342	196
		Shastri Nagar Police Thana	412	RIRuO		102	A	72	1210	418	223
	Kota	Regional Office, RJPB, Anantpura	17	RIRuO		102	A	38	886	287	166
		Municipal Corporation Building	326	RIRuO		101	A	37	688	230	127
		Samcore Glass Ltd.	325	RIRuO		103	A	31	552	214	132
	Udaipur	Ambamata	320	RIRuO		92	A	130	493	284	90
		Town Hall	294	RIRuO		93	A	132	660	313	120
		Regional Office,MIA	321	RIRuO		83	A	166	807	407	145
Tamilnadu	Chennai	Kathivakkam, Municipal Kalyana Mandapam	38	RIRuO		100	A	63	335	174	58
		Govt. High School, Manali	71	RIRuO		102	A	47	407	161	64
		Thiruvottiyur	72	RIRuO		93	A	72	362	165	66
		Madras Medical College	159	RIRuO		88	A	39	204	99	36
		NEERI, CSIR Campus	160	RIRuO		95	A	29	158	83	28
		Thiruvottiyur Municipal Office	161	RIRuO		95	A	24	258	99	40
	Coimbatore	Poniarajapuram, On the top of DEL	371	RIRuO		81	A	21	206	100	51
		G.D.Matric Hr.Sec.School	238	RIRuO		100	A	34	506	140	73
		SIDCO Office Kurichi	237	RIRuO		93	A	77	1403	262	153
	Madurai	Highway (Project -I) Building	306	RIRuO		103	A	52	226	111	38
		Fenner (I) Ltd. Susee Cars & Trucks	307	RIRuO		93	A	54	166	94	22
		Kunnathur Chatram Girls HS School	308	RIRuO		97	A	64	267	120	41
	Salem	Sowdeswari College Building	309	RIRuO		118	A	52	267	120	47
	Tuticorin	Fisheries College	239	RIRuO		78	A	38	586	143	100
		Raja Agencies	240	RIRuO		90	A	72	724	289	140

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Uttar Pradesh	Agra	Regional Office, Bodla	323	ES	Taj-trapezium	89	A	181	511	315	75
		Nunhai	324	ES	Taj-trapezium	96	A	169	583	364	81
		Taj Mahal	1	ES	Taj-trapezium	283	A	24	1046	337	203
		DIC Nunhai	415	ES	Taj-trapezium	123	A	65	1194	523	279
		Etmad-uddaulah	416	ES	Taj-trapezium	122	A	64	889	417	223
		Rambagh	417	ES	Taj-trapezium	116	A	60	913	357	202
	Allahabad	Square crossing circle of Laxmi Talkies	554	RIRuO		105	A	229	1144	518	146
		Bharat Yantra Nigam Ltd	555	RIRuO		105	A	154	739	377	105
	Anpara	Anpara Colony, Sonabhadra	6	RIRuO		104	A	168	312	248	24
		Renusagar Colony, Sonabhadra	7	RIRuO		96	A	152	329	249	37
	Ferozabad	Center for Development of Glass Industry (CDGI)	399	ES	Taj-trapezium	104	A	98	638	446	164
		Tilak Nagar	400	ES	Taj-trapezium	103	A	94	620	424	158
		Raza ka Tal	401	ES	Taj-trapezium	101	A	65	606	405	164
	Gajraula	Raunaq Auto Ltd, J.P. Nagar	140	RIRuO		88	A	202	596	353	81
		Indira Chowk, J.P. Nagar	139	RIRuO		68	A	150	316	210	39
	Ghaziabad	M/s Atlas Cycles Industries Ltd, Sahibabad Industrial Area	258	RIRuO		97	A	330	933	565	154
	Ghaziabad	Bulandshaar Road Industrial Area	369	RIRuO		88	A	308	905	516	155
	Jhansi	Jail Chauraha	517	RIRuO		120	A	199	518	271	44
		Veeranga Nagar	518	RIRuO		120	A	144	413	223	35
	Kanpur	Forest & Training Centre, Kidwai Nagar	212	RIRuO		98	A	271	542	455	61
		Chamber Of Commerce, Darshanpurwa	98	RIRuO		91	A	355	677	470	52
		Fazalganj	86	RIRuO		81	A	288	582	493	60
		Dabauli	391	RIRuO		80	A	303	559	447	53
		Awas Vikas, Jajmau	395	RIRuO		93	A	305	603	442	53
	Khurja	Central Glass & Ceramic Research Institute	534	RIRuO		58	A	260	509	384	71
		Ahirpara	535	RIRuO		58	A	162	305	204	46
	Lucknow	Mahanagar	377	RIRuO		74	A	277	477	381	56
		Chandganj Garden, Aliganj	398	RIRuO		109	A	288	478	387	53
		Kapoor Hotel, Hazratganj	109	RIRuO		82	A	275	481	396	53
		Talkatora	113	RIRuO		81	A	296	524	422	54
		S.M.K Chowk, Aminabad	397	RIRuO		101	A	303	490	395	57
	Meerut	Begum Bridge	550	RIRuO		66	A	415	621	486	45
		Thana Railway Road, Kesarganj	551	RIRuO		42	IA	320	571	427	46

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
	Muradabad	Budh Bazar		RIRuO		28	IA	59	758	310	153
		PTC		RIRuO		30	IA	42	632	220	127
	Noida	Regional Office, UP PCB	403	RIRuO		95	A	147	652	438	94
		Gee-Pee Electroplating and Engineering Work	378	RIRuO		96	A	198	694	442	96
	Varanasi	Regional Office, Jawahar Nagar	362	RIRuO		24	IA	377	412	398	10
		Sigra	553	RIRuO		8	IA	389	398	396	3
Uttarakhand	Dehradun	Raipur Road, Near parag Diary	90	ES	Doon valley	30	IA	178	367	273	52
		Clock Tower, PWD Guest House	89	ES	Doon valley	50	A	180	604	369	89
		Himalaya Drug Co. Near ISBT	637	ES	Doon valley	3	IA	344	521	454	96
	Haldwani	Govt. Women Hospital	625	RIRuO		1	IA			343	
	Haridwar	SIDCUL, Haridwar	635	RIRuO		3	IA	232	279	263	27
	Kashipur	BSNL Office, Kashipur	627	RIRuO		1	IA			153	
	Rishikesh	Nagar Palika Parishad	636	ES	Hill station	3	IA	481	505	495	12
West Bengal	Asansol	Asansol Municipal Corporation	386	RIRuO		105	A	56	817	287	174
		Kangsabati Spinning Mill, Barjora	593	RIRuO		105	A	67	747	297	190
		Burnpur Town Department, Burnpur	592	RIRuO		105	A	42	901	325	203
	Barrackpore	Barrackpore Municiaplity	655	RIRuO		102	A	59	425	219	100
		Dum Dum Telephone Exchange	653	RIRuO		101	A	70	522	250	113
		Khardah Municipality	654	RIRuO		102	A	65	492	253	114
	Durgapur	DMC Water Works, Angadpur	591	RIRuO		105	A	60	699	284	161
		Kwality Hotel, Bhiringi More, Benachiti	384	RIRuO		105	A	81	753	291	161
		Bidhannagar, PCBL Club, Muchipara	385	RIRuO		105	A	54	473	196	94
		Dew India Limited, PCBL More, Durgapur	383	RIRuO		105	A	105	1190	436	266
	Haldia	Bhabanipur, Debhog Milan Viyapith	663	RIRuO		108	A	56	323	157	66
		Driver's Hut of M/s. MCC PTA, Bhunia Raichak	664	RIRuO		108	A	37	281	140	44
		Supermarket Building, Durgachak	15	RIRuO		108	A	31	327	119	64
		WBIIDC Durgachak	14	RIRuO		108	A	37	318	146	61
	Howrah	Howrah Municipal Corporation Building	8	RIRuO		103	A	58	525	255	122
		Naskarpara Pump House, Ghuseri	10	RIRuO		103	A	49	493	227	115
		CDS & Health Centre, Bator	11	RIRuO		103	A	43	434	206	108
		Howrah Municipality School, Bandhaghat	9	RIRuO		103	A	52	560	247	119
	Kolkata	Salt Lake, Rooftop of CK Market	474	RIRuO		103	A	54	493	187	118
		Moulali, Rooftop of KMC office Building	473	RIRuO		104	A	65	696	228	146
		Minto Park, Inside Park AJC Bose Road	475	RIRuO		102	A	50	415	157	101
		Dunlop Bridge, National Sample Survey Building	472	RIRuO		150	A	42	617	222	102
		Behala Chowrasta, Traffic Guard Building	476	RIRuO		103	A	51	554	218	134

State	City	Location	Station code	Type	Category of ES	No. of mon. days (n)	A/IA	Min	Max	SPM Annual average (µg/m3)	Std. Dev.
		Lal-Bazar, Dalhousie Square	163	RIRuO		96	A	71	807	307	155
		Kasba	348	RIRuO		96	A	28	883	296	164
	Raniganj	Raniganj Municipality	662	RIRuO		105	A	93	989	414	230
		Mangalpur, SKS School Mangalpur	660	RIRuO		104	A	83	765	313	159
		Jamuria Municipality	661	RIRuO		105	A	59	704	278	149
	Sankrail	Bharat Co-operative Housing Society	657	RIRuO		104	A	41	410	196	102
		Bagan Police Station, Bagan	659	RIRuO		104	A	44	513	222	114
		Dhulagar Gram Pachayat	656	RIRuO		104	A	38	453	218	111
		P Mukherjee's House, Near SBI Amta	658	RIRuO		104	A	33	372	157	88
	South Suburban	Chanditala Water Supply Pump House, Tollygunge	652	RIRuO		102	A	39	494	178	123
		Bauipur Police Station, Baruipur	650	RIRuO		105	A	44	578	185	128
		P Roy Industrial Training Institute, Amtala	651	RIRuO		103	A	43	493	177	121

Note: RIRuO – Residential/industrial/rural/other area, ES – Ecologically sensitive area, mon- monitoring Std dev. – Standard deviation, n – number of days monitored for 16 and more hours a day BDL = Below Detection Limit (Concentration less than 5 µg/m^3 for SPM).

A metropolitan area is a region consisting of a populous urban core with an agglomeration of peripheral zones not themselves necessarily urban in character, but closely bound to the center socio-economically by employment or commerce. It is characterized by urbanization which is a process of human movement and centralization towards and into cities and urban areas with the associated industrialization, urban sprawl and lifestyle. Urbanization in India is more rapid around the major cities in India. The population growth has been mainly centered around cities due primarily to the large scale migration of rural population accelerated by high population growth rates. Increase in industrial activities, population both endemic and floating and vehicular population etc. have led to a rapid increase in environmental problems, one of them being air pollution.

An inventory of air pollutants is a necessary first step towards control of air pollution. Air pollutants can be natural or may be the result of various anthropogenic activities like industrial emissions. Further the air pollutants can be primary or secondary depending upon their formation mechanism. Primary pollutants are directly emitted from the source and secondary pollutants are formed in the atmosphere. Meteorological factors play a critical role in ambient concentrations of air pollutants. Even though the total discharge of air pollutants into the atmosphere may remain constant, the ambient concentrations of air pollutants may vary depending upon the meteorological conditions. Keeping all these factors in mind, an attempt is made to address the problem of air pollution in seventeen cities in India identified by Honorable Supreme Court as polluted cities. These include the metropolitan cities of India which has been classified by Census of India 2001 as metropolitan cities.

Ambient air quality monitoring is required to determine the existing quality of air, evaluation of the effectiveness of control programme and to identify areas in need of restoration and their prioritization.

This chapter gives an insight into the trends of air pollutants for SO_2, NO_2 and PM_{10} in the 35 metropolitan cities (population $\geq$ 10 lacs; Census 2001). An analysis of ten years data revels a decreasing trend of SO_2. This may be attributed to various interventions that have taken place in recent years such as reduction in sulphur in diesel, use of cleaner fuel such as CNG in metro cities, change in domestic fuel from coal to LPG etc. NO_2 concentration has remained more or less stable over the years despite increase in sources like vehicles. 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. PM_{10} concentration shows fluctuating trend. Vehicular emission are a major source of PM_{10}. Increasing number of vehicles may be a reason for this trend. The other reasons being emission from gensets, small scale industries, biomass incineration, suspension of traffic dust, natural dust, commercial and domestic use of fuel etc.

7.1 Air Quality Monitoring Stations in Metropolitan Cities

There are 144 monitoring stations in 35 metropolitan cities. These are listed in Table 7.1

Table 7.1 Details of the Air Quality Monitoring Stations in Metropolitan Cities

Indian Zone	State	City	Total No. of Operating Stations
North Zone	Delhi (9)	Delhi	9
	Haryana (2)	Faridabad	2
	Punjab (6)	Amritsar	2
		Ludhiana	4
	Uttar Pradesh (23)	Agra	6
		Allahabad	2
		Kanpur	6
		Lucknow	5
		Meerut	2
		Varanasi	2
East Zone	Bihar (2)	Patna	2
	Jharkhand (3)	Dhanbad	1
		Jamshedpur	2
	West Bengal (11)	Asansol	1
		Kolkata	10
South Zone	Andhra Pradesh (19)	Hyderabad	9
		Vijayawada	2
		Visakhapatnam	8
	Karnataka (6)	Bangalore	6
	Kerala (7)	Kochi	7
	Tamilnadu (12)	Chennai	6
		Coimbatore	3
		Madurai	3
West Zone	Gujarat (15)	Ahmedabad	6
		Rajkot	2
		Surat	3
		Vadodara	4
	Maharashtra (15)	Pune	3
		Mumbai	3
		Nagpur	6
		Nashik	3
	Rajasthan (6)	Jaipur	6
Central Zone	Madhya Pradesh (8)	Bhopal	4
		Indore	3
		Jabalpur	1
5	15	35	144

NB. Figures within parentheses represent total number of monitoring stations in the state

7.2 Air quality in metropolitan cities during 2010

The analysis of air quality in metropolitan cities with respect to SO_2 revels all the cities except Jamshedpur and Pune are in the low category and all are within the prescribed standard. As for NO_2, 9 cities are in the low category, 20 cities are in the moderate category, 3 in high and 2 in critical category in the residential / industrial / rural / commercial areas. With respect to PM_{10}, 8 under high and 24 cities fall in the critical category (Table6.2). Table 7.4 gives an insight to the annual average and categories of the metropolitan cities.

Table 7.2: Number of metropolitan cities with low, moderate, high & critical air quality (residential/industrial/commercial/rural and sensitive)

Category	Number of Metropolitan cities (population > 10 lacs)					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low	32	9	0	1	0	0
Moderate	2	20	2	0	1	0
High	0	3	8	0	0	0
Critical	0	2	24	0	0	1
Total cities	**34**	**34**	**34**	**1**	**1**	**1**

NB. Low, moderate, high, critical classification based on Pollution Level Classification, Chapter 2,Table 2.1.

Of the 35 metropolitan cities 5 (15%) and 32 (94%) cities exceed the NAAQS with respect to NO_2 and PM_{10} in the residential / industrial / rural / commercial areas None of the cities exceed the standard limit with respect to SO_2 (Table 7.3)

Table 7.3: Number of metropolitan cities exceeding the NAAQS (Based on annual average data)

Category	Number of Metropolitan cities (population > 10 lacs)					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Not exceeding NAAQS	34	29	2	1	1	0
Exceeding NAAQS	0	5	32	0	0	1
Total cities	**34**	**34**	**34**	**1**	**1**	**1**

Table 7.4: Air quality of metropolitan in India (Based on annual average data)

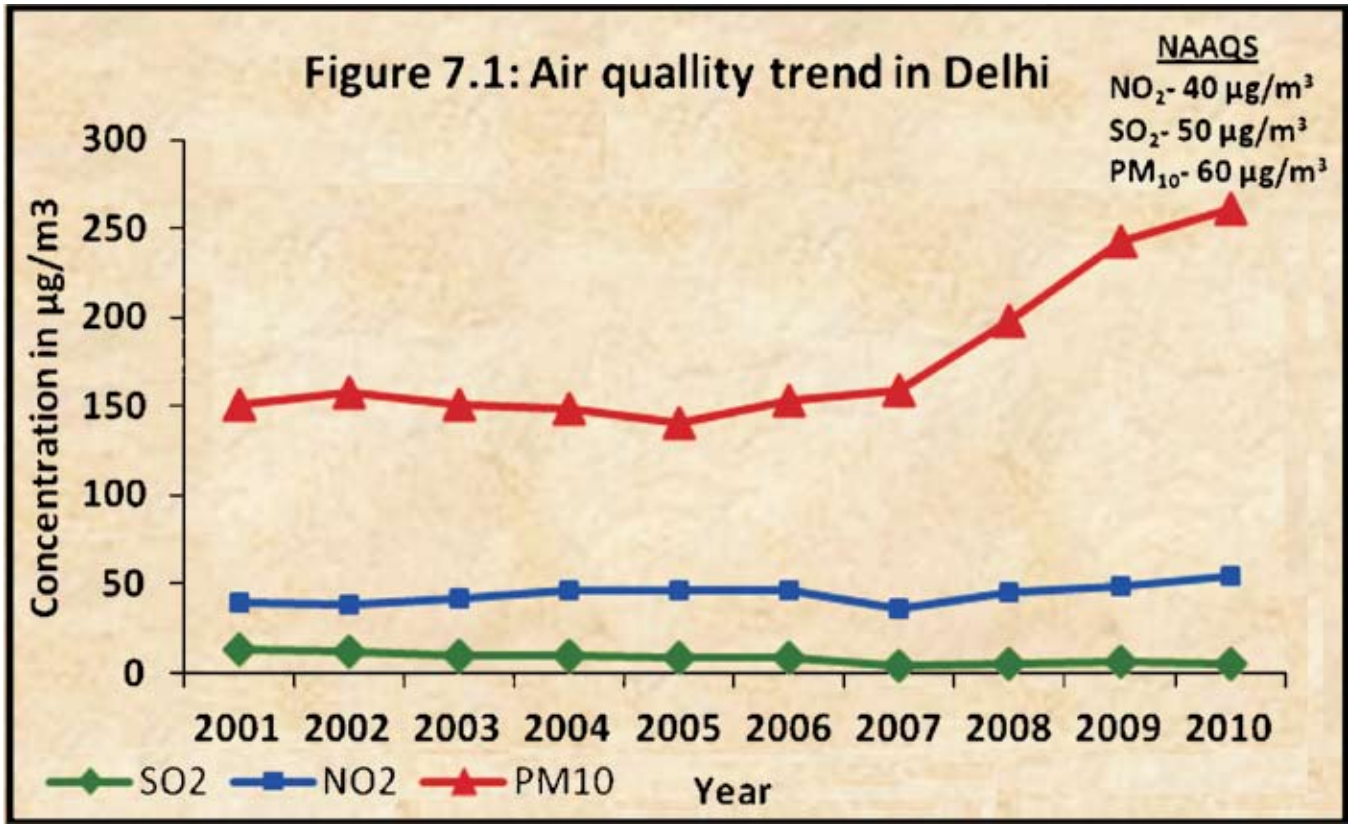
State	City	Type	SO_2		NO_2		PM_{10}	
			Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality	Annual average ($\mu g/m^3$)	Air quality
Andhra Pradesh	Hydrabad	RIRuO	5	L	24	M	79*	H
	Vijaywada	RIRuO	6	L	14	L	93*	C
	Vishakhapatnam	RIRuO	7	L	16	L	71*	H
Bihar	Patna	RIRuO	7	L	40	M	181*	C
Delhi	Delhi	RIRuO	5	L	55*	H	261*	C
Gujarat	Ahmedabad	RIRuO	15	L	21	M	95*	C
	Rajkot	RIRuO	13	L	17	L	96*	C
	Surat	RIRuO	16	L	24	M	76*	H
	Vadodara	RIRuO	17	L	29	M	93*	C
Haryana	Faridabad	RIRuO	18	L	29	M	164*	C
Jharkhand	Dhanbad	RIRuO	15	L	36	M	184*	C
	Jamshedpur	RIRuO	35	M	48*	H	153*	C
Karnataka	Bangalore	RIRuO	14	L	31	M	89*	H
Kerala	Kochi	RIRuO	4	L	17	L	61*	H
Madhya Pradesh	Bhopal	RIRuO	9	L	18	L	133*	C
	Indore	RIRuO	14	L	18	L	120*	C
	Jabalpur	RIRuO	2	L	25	M	135*	C
Maharashtra	Mumbai	RIRuO	4	L	19	L	97*	C
	Nagpur	RIRuO	7	L	33	M	113*	C
	Nashik	RIRuO	21	L	26	M	76*	H
	Pune	RIRuO	29	M	39	M	82*	H
Punjab	Amritsar	RIRuO	14	L	36	M	219*	C
	Ludhiana	RIRuO	9	L	32	M	214*	C
Rajasthan	Jaipur	RIRuO	6	L	37	M	164*	C
Tamilnadu	Chennai	RIRuO	9	L	15	L	59	M
	Coimbatore	RIRuO	5	L	27	M	78*	H
	Madurai	RIRuO	11	L	25	M	47	M
Uttar Pradesh	Agra	ES (Taj-trapezium)	5	L	20	M	185*	C
	Allahabad	RIRuO	4	L	24	M	218*	C
	Kanpur	RIRuO	7	L	34	M	203*	C
	Lucknow	RIRuO	8	L	34	M	204*	C
	Meerut	RIRuO	8	L	47*	H	166*	C
	Varanasi	RIRuO	18	L	20	L	127*	C
West Bengal	Asansol	RIRuO	8	L	66*	C	141*	C
	Kolkata	RIRuO	11	L	62*	C	99*	C

*L: Low, M: Moderate, H: High, C: Critical *Concentration exceeding NAAQS; Low, moderate, high, critical classification based on Pollution Level Classification, Chapter 2,Table 2.1, '-' inadequate data; Data of monitoring stations with monitoring days ≥50 has only been considered*

7.3 Air quality trend in metropolitan cities

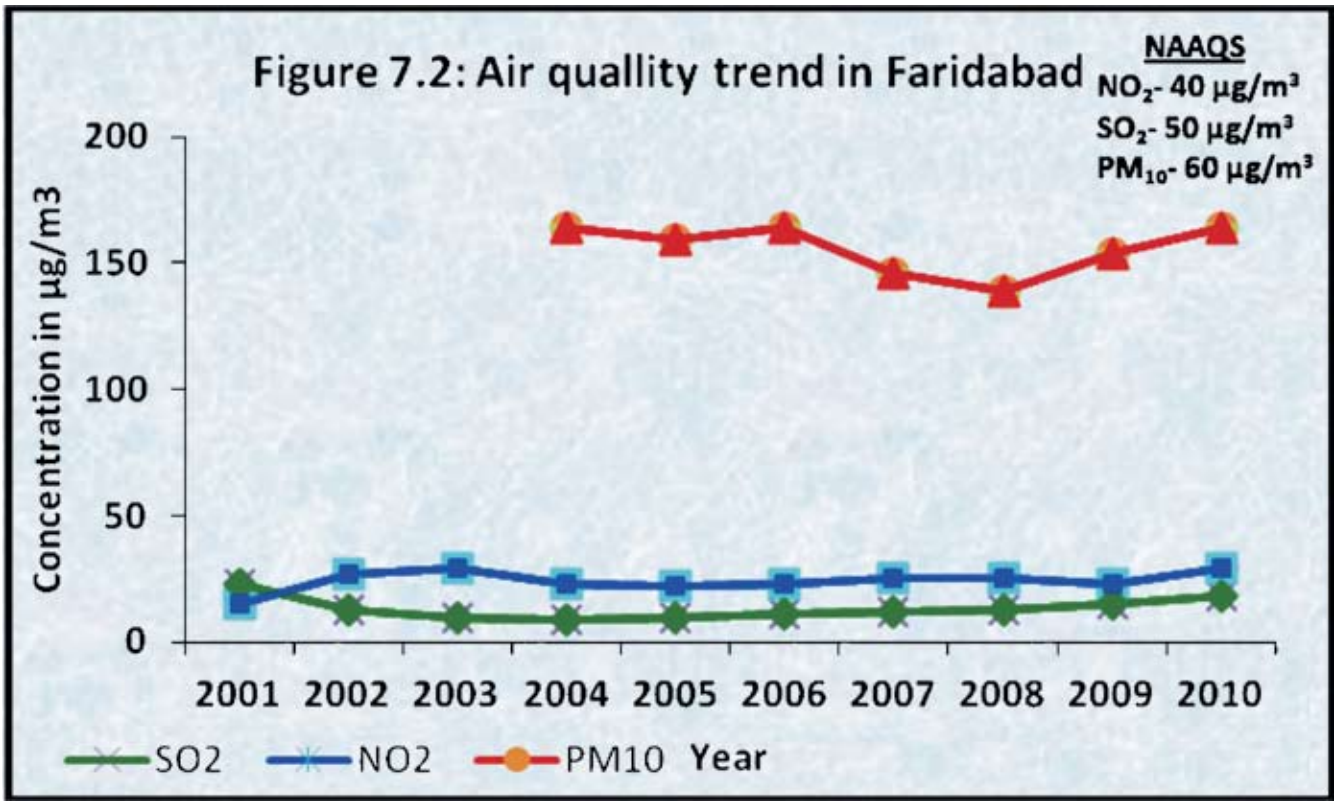
7.3.1 DELHI – the capital city

State	Delhi, largest metropolis by area and the second-largest metropolis by population in India
Location	28°22'48"N and 77°7'12"E
Area	1,484 km^2 (573 sq mi) of which 783 km^2 (302 sq mi) is rural, and 700 km^2 (270 sq mi) urban. Maximum length 51.9 km (32 mi) and maximum width 48.48 km (30 mi).
Population	1,27,9,458 (as per Census 2001)
Climate	Humid subtropical. Summers are long and extremely hot (early April to mid-October). Monsoon winds advent from end of June. Reversal in the wind direction from the north-western direction to the south-western in early March brings hot waves (called loo) from Rajasthan. Winter starts in late November and peaks in January accompanied by heavy fog. Temperature: 45°C in summers to 4°C in winters Rainfall: Average annual rainfall is 714 mm (28.1 inches)
Geography	The river Yamuna flows through the city having huge catchment area distributed at both the banks. Mixed type of soil deposits. Quartz rock and extends from south part to west bank of the Yamuna River for about 35 km.
Industries	Engineering goods, textile, chemical, electronics, electrical goods, dyes and paints, steel, plastic, rubber, automobiles, thermal power stations (Badarpur thermal power station, Indraprastha thermal power station, Rajghat thermal power station and Gas turbine thermal power station)
Air quality stations	11 (3 residential, 8 industrial)
Air quality trend	Analysis of nine year air quality data shows an increasing trend for PM_{10}, a decreasing trend for SO_2 and fluctuating for NO_2 (Figure 7.1). The increasing trend for PM_{10} may be attributed to the increasing number of vehicles and natural dust.



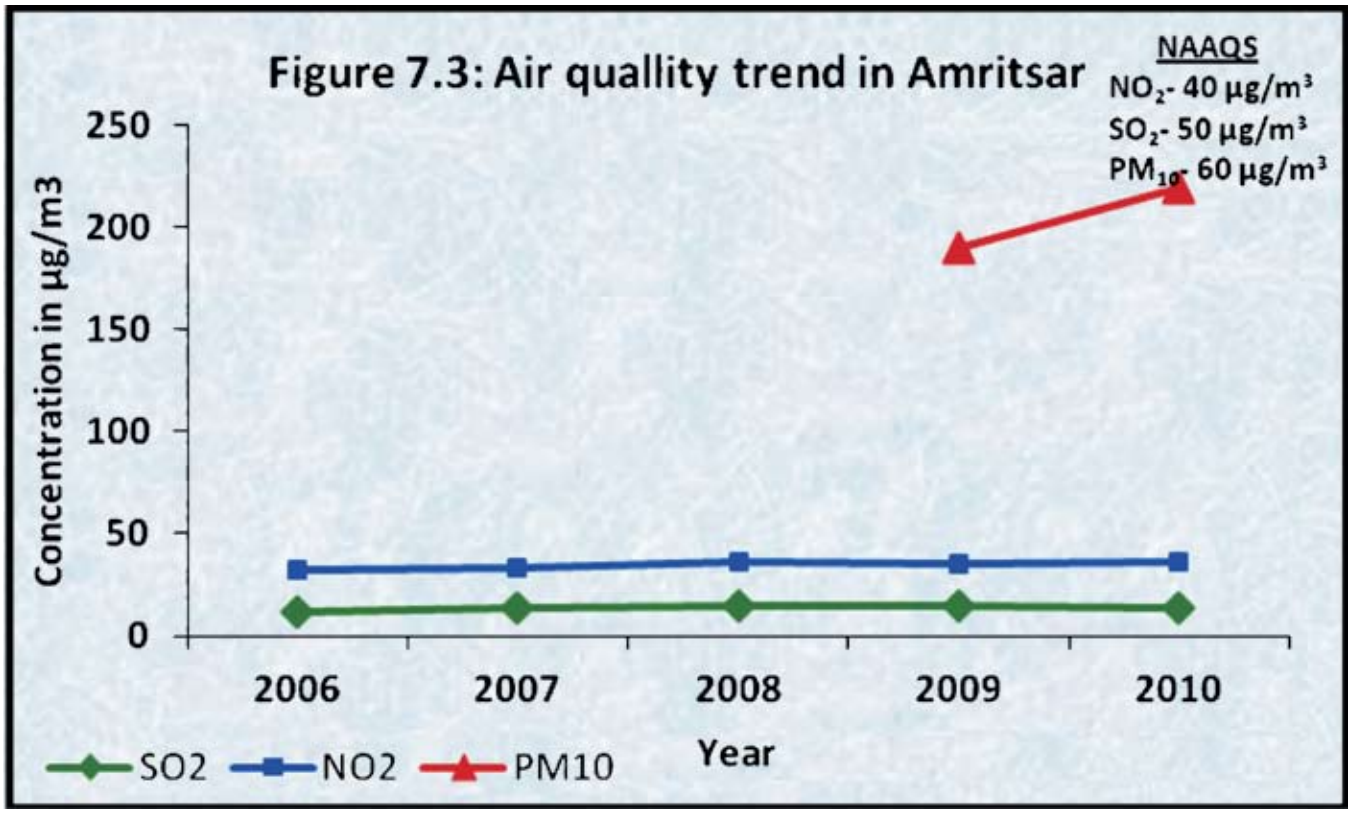
7.3.2 FARIDABAD

State	Haryana
Location	28° 15' N and 77° 13' 12" E
Area	216.4 km^2
Population	10, 54, 981
Climate	Temperature: extreme conditions of summer and cold with maximum and minimum temperatures of 45 and 5°C respectively Rainfall: July to September with 562.9 mm
Geography	Alluvium and pre-combrian sediments systems. The stratifgraphic units are windblown sands, newer alluvium, older alluvium, slates, phyllites, quartzites, mica sheets, pagamite intrusions, silts, gravel, sand, clay and kankar
Industries	Drugs & pharmaceuticals, plastics, metal casting, agriculture equipments, automobile parts, electricals, garments, Chemicals, petrochemicals, Gas & other engineering industries. 15,000 small, medium and large scale industries are in operation.
Air quality stations	2 (1 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows an increasing trend for PM_{10}, a decreasing trend for SO_2 and a stable trend for NO_2 (Figure 7.2).



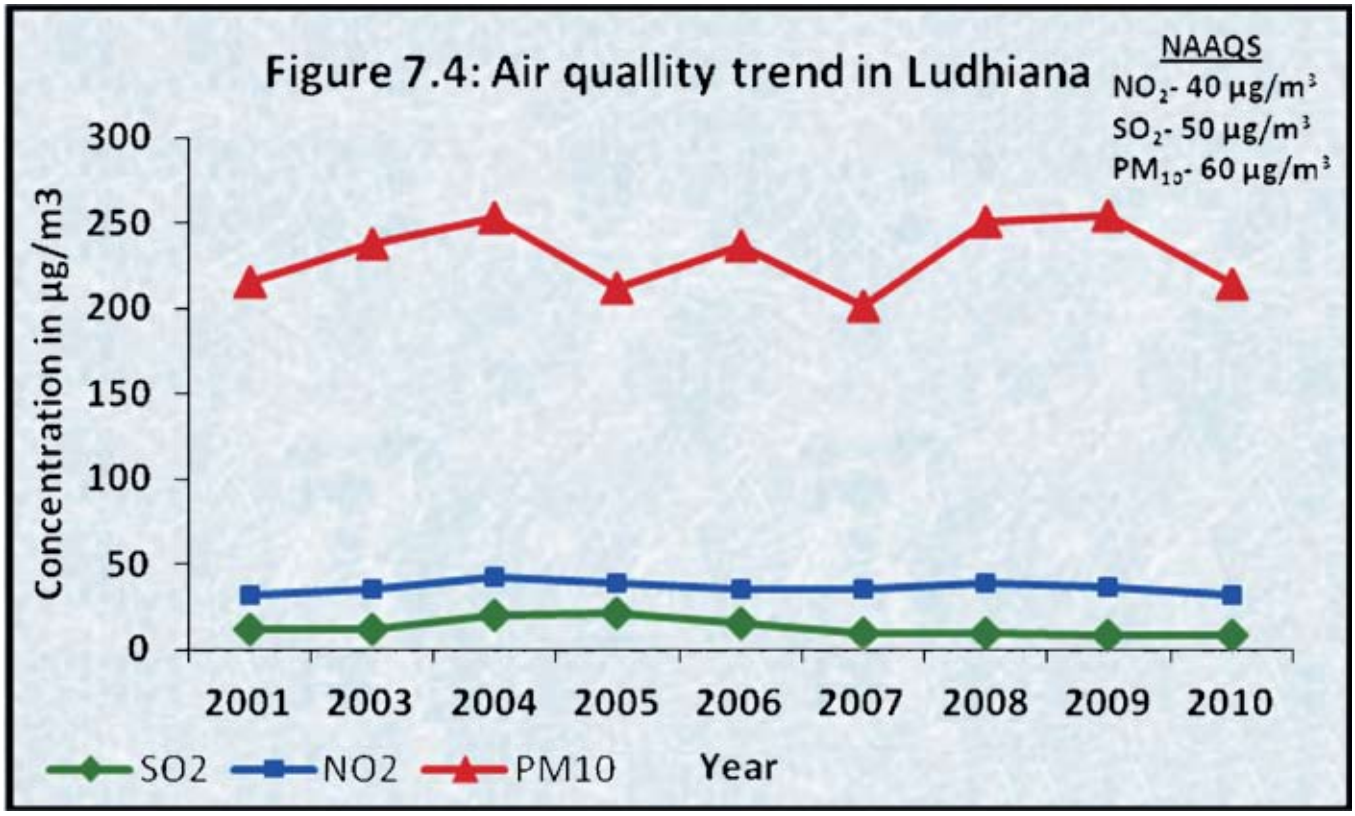
7.3.3 AMRITSAR

State	Punjab
Location	31°38' N and 74°52' E
Area	50 km^2
Population	10, 11,327
Climate	Tropical type with three well defined seasons winter, summer and monsoon Rainfall: annual average normal rainfall is 700 mm
Geography	Alluvial deposits of quaternary age which are a part of Indus basin
Industries	Food, textile, readymade garments and tailoring, leather goods, wood based, paper, dying & chemical, detergent, medicine, machine, agriculture, electrical goods and appliances, surgical items, auto and cycle parts, floor mills, cold storages etc. The total number of small scale industries functioning is approximately 8000
Air quality stations	2 (2 residential)
Air quality trend	Analysis of four year air quality data shows a more or less stable trend for both SO_2 and NO_2, both lying within the NAAQS. (Figure 7.3).



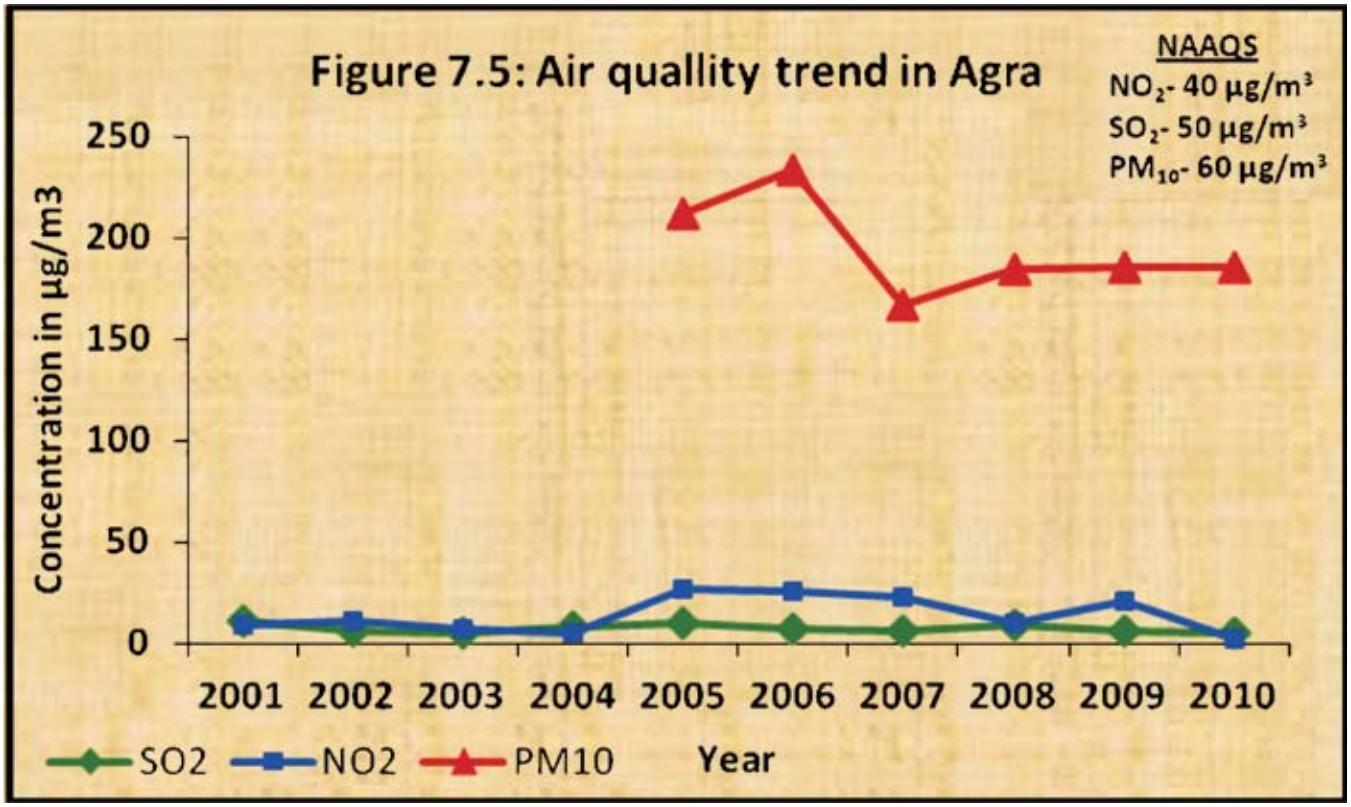
7.3.4 LUDHIANA

State	Punjab
Location	Between 30-34' N and 30"01'N and 75-18'E and 76-20'E. Average elevation of 244 metres (798 ft).
Area	310 km^2
Population	13.93 lacs
Climate	Semi humid in the North and North East to semi arid to arid in the South. Summer, winter and rainy season. Rainfall: average normal rainfall is 670 mm approx. and the annual average rainfall is 437 mm.
Geography	Soil is of yellow sandstone and granite, forming small hillocks, plateaus and dips The city stands on the Sutlej River's old bank, 13 km south of its present course
Industries	Knitwear factories, hosiery yarn mills, bicycles factories, factories for machine tools, sewing machines, generators, diesel engines, tyres & tubes, and other consumer goods
Air quality stations	4 (2 residential, 2 industrial)
Air quality trend	Analysis of nine year air quality data shows fluctuating trend for PM_{10}, a decreasing trend for SO_2 and a stable trend for NO_2 (Figure 7.4).



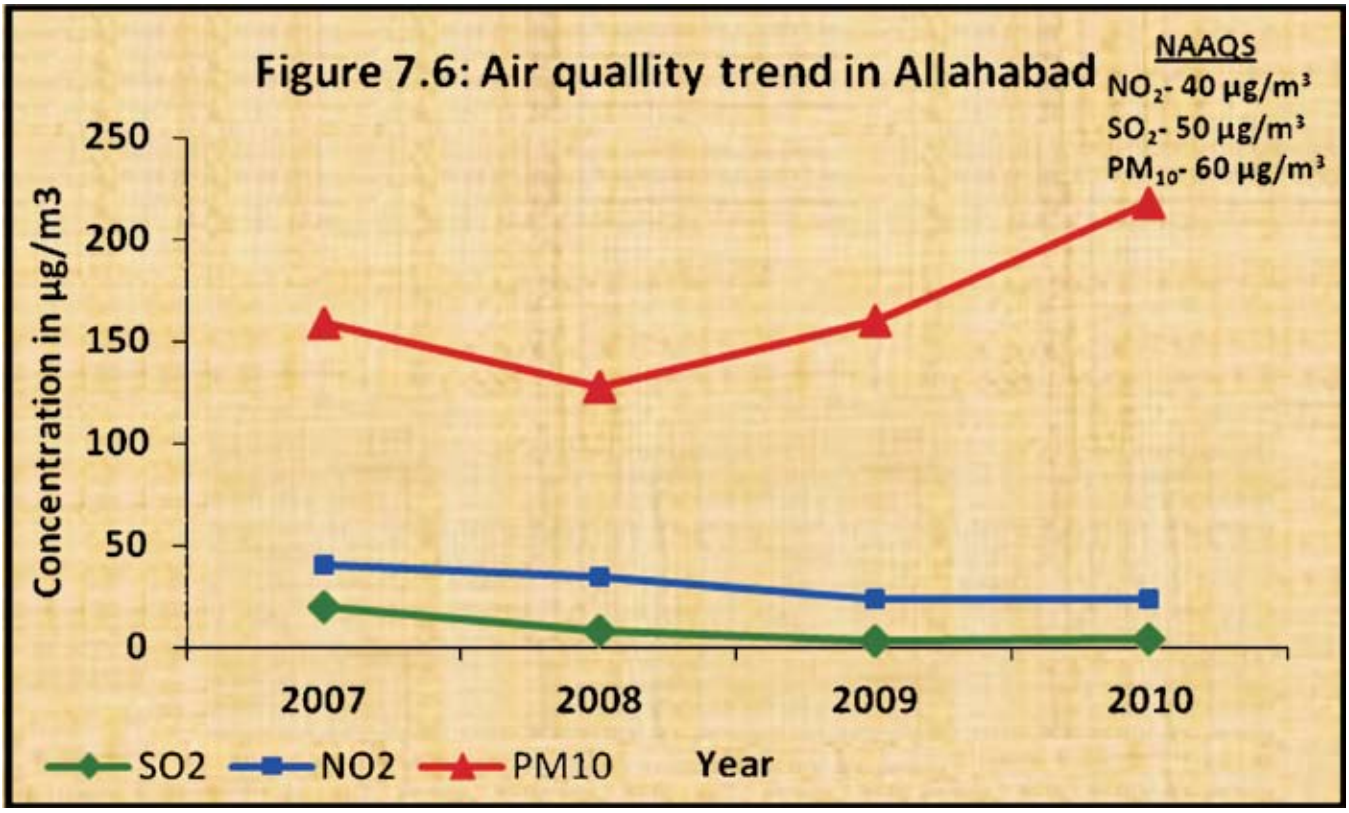
7.3.5 AGRA

State	Uttar Pradesh
Location	27°8' to 27°14' N and 77°57' to 78°04' E
Area	140 km^2
Population	13, 21,410
Climate	Semiarid climate that borders on a humid subtropical climate. Mild winters, hot and dry summers and a monsoon season Temperature: extreme temperature Rainfall: The average rainfall in the region is 685 mm
Geography	Bounded by Thar Desert on its southwest, west and northwest peripheries. Drained by Yamuna river.
Industries	73 industries and 2 industrial clusters. Textiles, hosiery items, woolen, jute, footwear, leather, metal processing, machinery parts, marble, food processing and handicrafts 6,463 small-scale units of various handicraft items like Zari work, leather craft, and marble craft and carpet craft.
Air quality stations	6 (1 residential, 1 industrial, 4 sensitive)
Air quality trend	Analysis of five year air quality data for PM_{10} shows a decreasing trend and nine year trend for SO_2 shows a stable trend. As for NO_2 for the trend slightly increased during 2005, 2006 and 2007 but again declined in the later years (Figure 7.5)



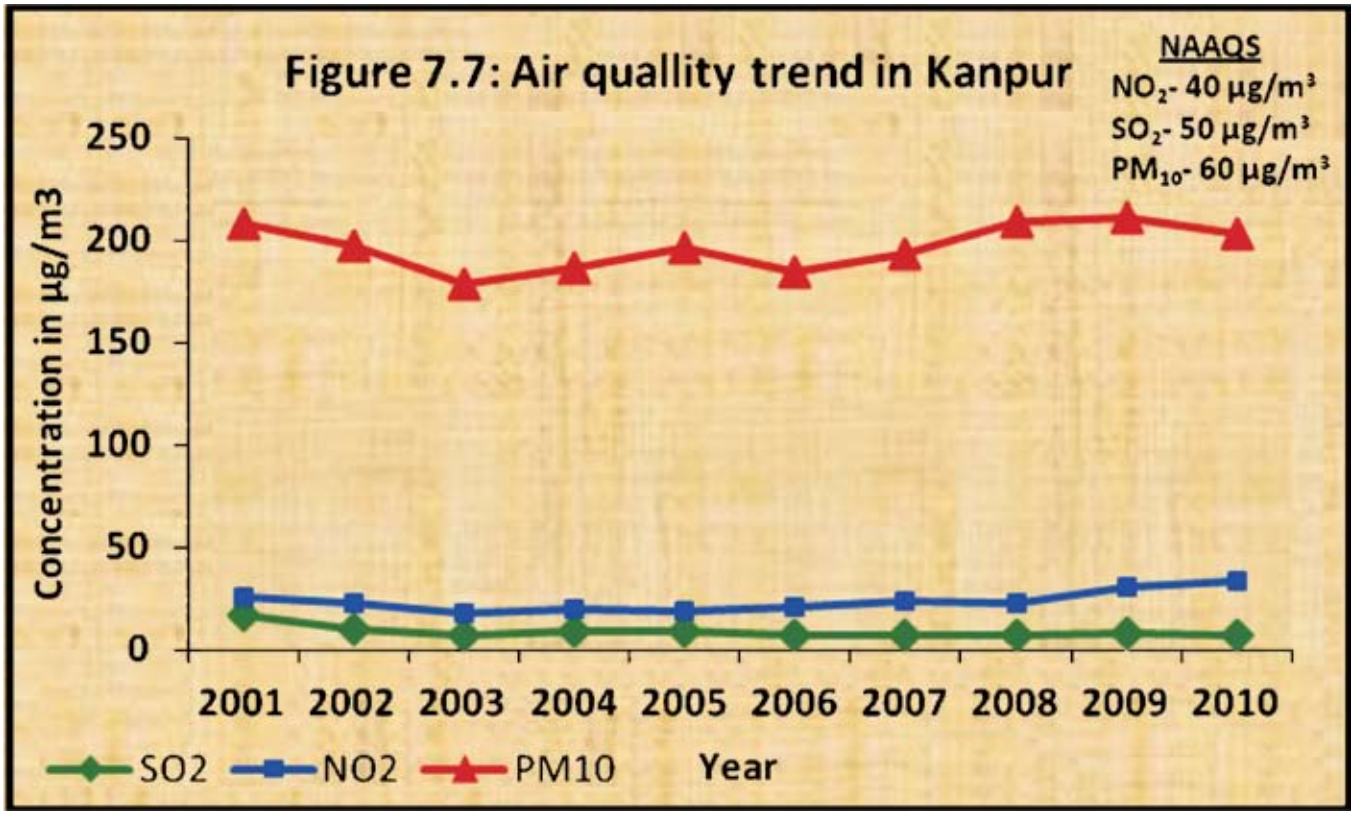
7.3.6 ALLAHABAD

State	Uttar Pradesh
Location	Between 24° 47' and 25° 47' N and 81° 19' and 82° 29' E. Elevation of 98 metres (322 ft)
Area	Length from east to west is 117 km and breadth from north to south is 101 km. Area 7261 sq. kms.
Population	15 lacs
Climate	Humid subtropical climate with hot dry summer, cool dry winter and warm humid monsoon. Monsoon begins in early July and lasts till September. Temperature: ranging between 22 °C (72 °F) and 10 °C (50 °F). Severe fog in January Rainfall: average rainfall of the city is varies from min 520.6 mm to the highest of 1276.5 mm
Geography	Soil fertile but not too moist. The southern and eastern parts are dry and rocky. Stands at the confluence of two rivers the Ganges and Yamuna
Industries	Glass and wire based industries, fertilizer complex based on naphtha as feed stock, three mega thermal power projects
Air quality stations	2 (2 residential)
Air quality trend	Analysis of three year air quality data shows a more or less stable trend for both SO_2 and NO_2, both lying within the NAAQS (Figure 7.6).



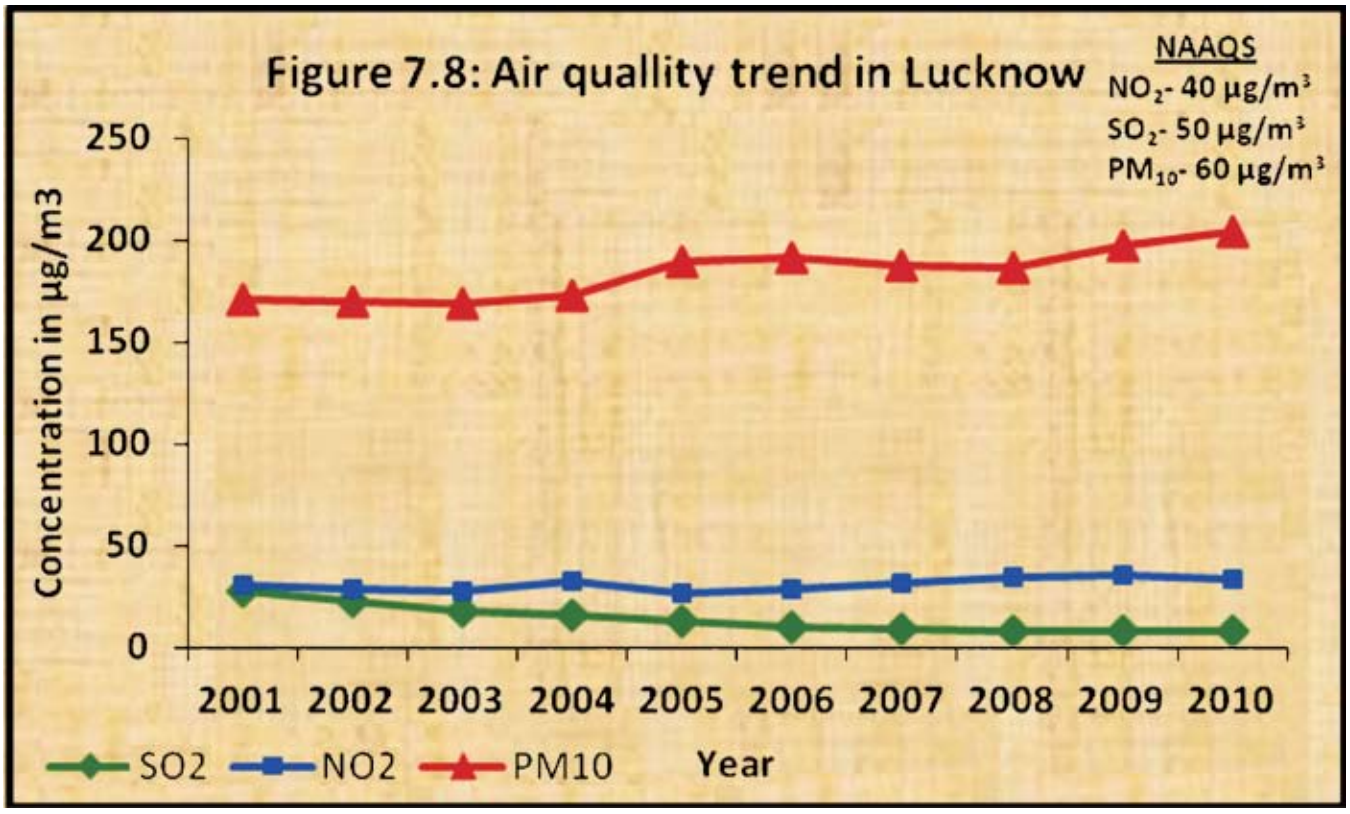
7.3.7 KANPUR

State	Uttar Pradesh
Location	26°28'N and 80°21' E
Area	278 km^2
Population	26,90,486
Climate	Humid subtropical climate with very hot summers, mild and relatively short winters, dust storms and a monsoon season. Severe fog in December and January. Summer excessive dry heat is accompanied by dust storms and loo. Rains appear between July and September almost at the end of regular monsoon season. Temperature: mean maximum monthly temperatures 41.7°C during May and minimum 22.8°C in January Rainfall: average normal annual rainfall is 833.5 mm
Geography	The area is underlain by Indo-Gangetic alluvium of quaternary age formed by fluvial processes comprising of clay, silts, sands of various texture and kankar in varying proportion Surrounded by two main rivers of India, the Ganges in the northeast and the Pandu River (Yamuna) in the south.
Industries	Biggest producers of textile and leather products. Fertilizer, chemicals, two wheelers, soaps, pan masala, hosiery and engineering industries are also present. The total number of small scale industries registered is 12000
Air quality stations	7 (4 residential, 3 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for both SO_2 and NO_2, both lying within the NAAQS. For PM_{10} however, a fluctuating trend is seen which exceeds the NAAQS (Figure 7.7).



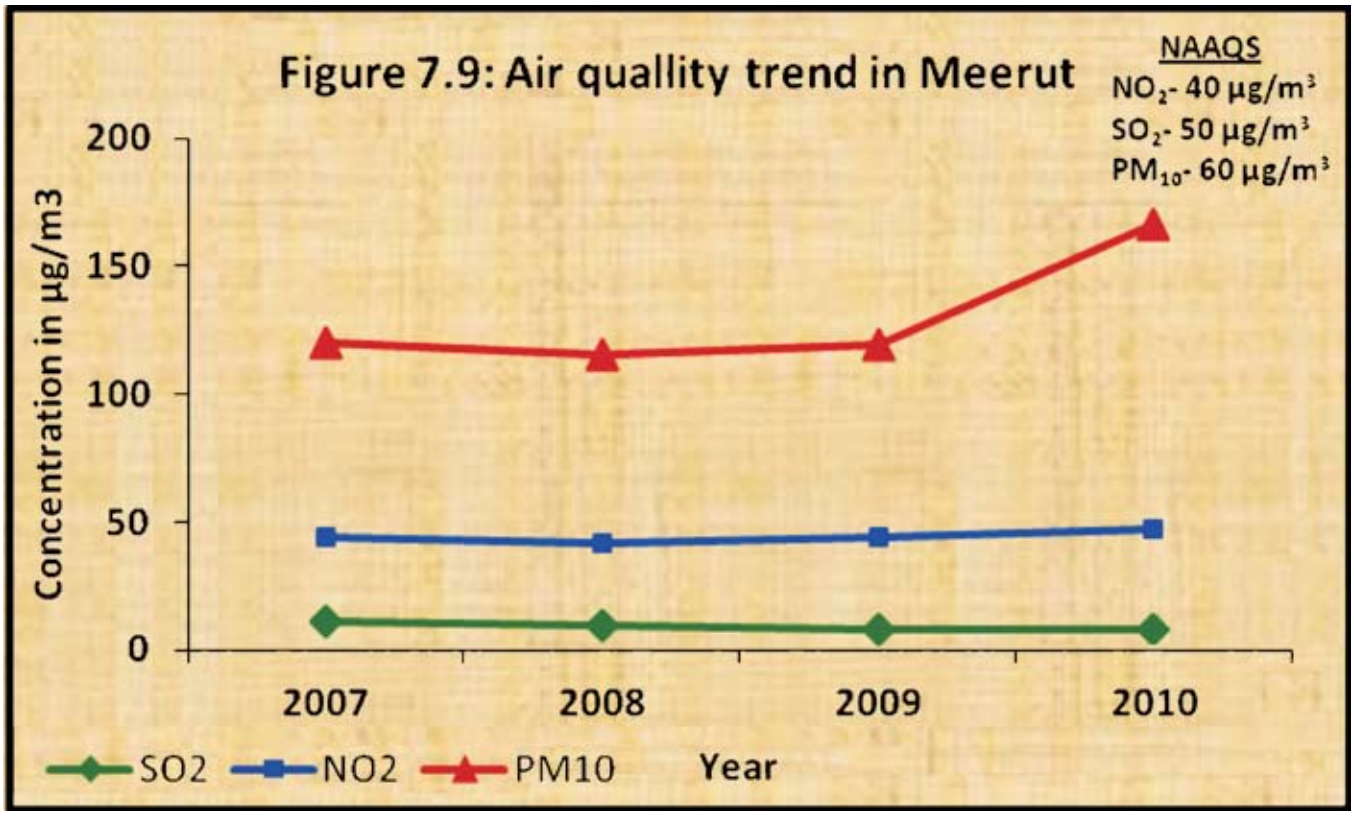
7.3.8 LUCKNOW

State	Uttar Pradesh
Location	26" 30' and 27" 10' N and 80" 34' and 81" 12' E
Area	2528 sq.kms
Population	25 lacs
Climate	Humid subtropical climate with cool, dry winters from December to February and dry, hot summers from April to June. The rainy season is from mid-June to mid-September. Fog is quite common from late December to late January. Dry except during Southwest monsoon period Temperature: In winter the maximum temperature is around 25 ^{0}C and the minimum is in the 6 to 8 ^{0}C. Summers are very hot with temperatures rising to the 40 to 45 ^{0}C Rainfall: average normal rainfall of the city is approximately 1100 mm
Geography	Situated in gangetic plain and drained by Gomti river. Located in the seismic zone
Industries	Pharmaceutical industries, sugarcane plantations and sugar industries ,small scale industries that are based on unique styles of embroidery, producer of tobacco products and handicrafts such as pottery, earthen toys, silver and gold foil work, and bone carving products.
Air quality stations	5 (4 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for SO_2 and a declining trend for NO_2, both lying within the NAAQS. For PM_{10} however, an increasing trend is seen which exceeds the NAAQS (Figure 7.8).



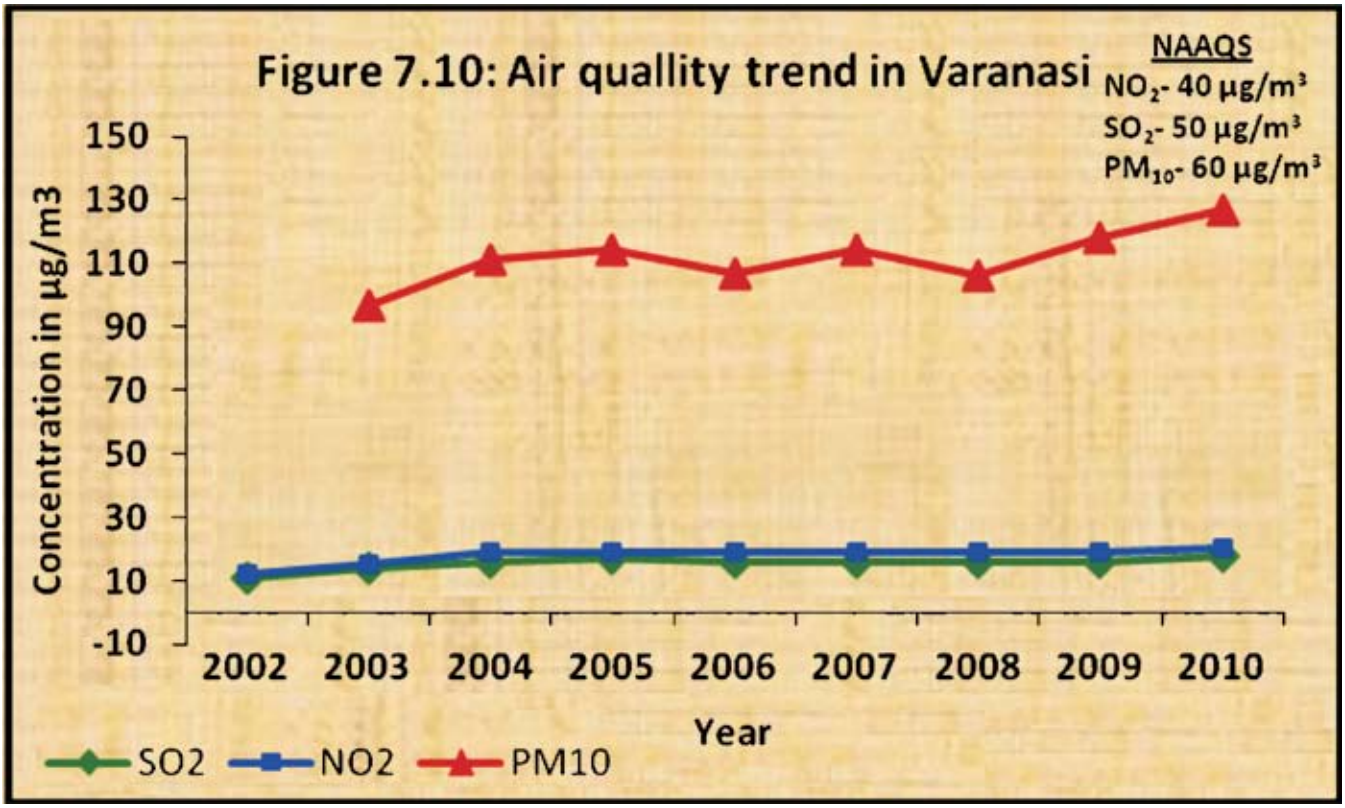
7.3.9 MEERUT

State	Uttar Pradesh
Location	28°57' to 29°02' N and 77°40' to 77°45' E
Area	142 km^2
Population	11,67,399
Climate	Moderate type of climate. Very hot summers and very cold winters. Visibility is almost zero during November to January due to fog. Temperature: summers can reach 48 degree Celsius. Lowest temperature recorded is 0.5 degrees. Rainfall: average annual rainfall is about 1000 mm
Geography	The ground is not rocky and there are no mountains. Meerut lies between plains of rivers Ganges and Yamuna
Industries	14,000 registered industrial units in the metropolitan city of Meerut, out of which only about 9,000 units are functional at present. Distillery and small scale industries like sports goods, chemicals, food processing, surgical goods, engineering works, petrochemicals, rubber, plastic, leather goods, flour mills and readymade garments predominate in the area
Air quality stations	2 (2 residential)
Air quality trend	Analysis of three year air quality data shows a more or less stable trend for all the pollutants. PM_{10} however, exceeds the NAAQS (Figure 7.9).



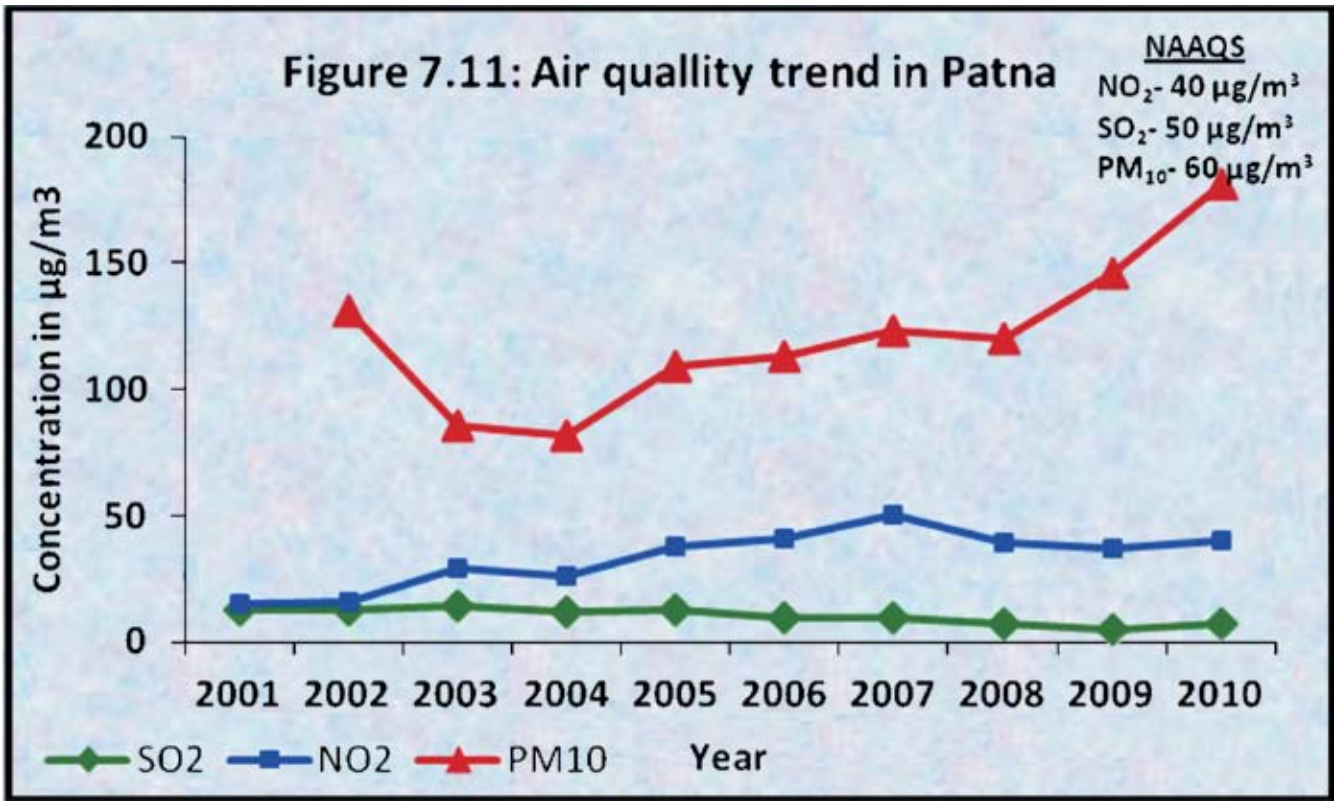
7.3.10 VARANASI

State	Uttar Pradesh
Location	Between 82° 15' to 83° 30' E and 24° 35' to 25° 30' N
Area	112.26 km^2 (approximately 43 mi^2). Mean elevation is 80.71m
Population	14 lacs
Climate	Humid subtropical climate with large variations between summer and winter temperatures. Summers are long, from early April to October, with intervening monsoon seasons and are also extremely hot. Winters in Varanasi sees very large diurnal variations, with warm days and downright cold nights. Cold waves from the Himalayan region Temperature: The temperature ranges between 32°C – 46 °C (90°F – 115 °F) in the summers and below 5 °C during December to February Rainfall: average normal rainfall of the city is varied from min 3.3 mm to the highest of1113.4 mm
Geography	Divided into two physical regions, the northern alluvial plain and the southern plateau area. The northern alluvial plain is drained by the Ganga and its tributaries namely the Gomti and the Varuna rivers and Assi .
Industries	Diesel locomotive factory, oxygen plant, small cottage industries include silk making making, the production of textiles such as hand-woven carpets, and handicrafts
Air quality stations	2 (2 residential)
Air quality trend	Analysis of three year air quality data shows a more or less stable trend for SO_2 and. PM_{10} however, shows an increasing trend and exceeds the NAAQS (Figure 7.10).



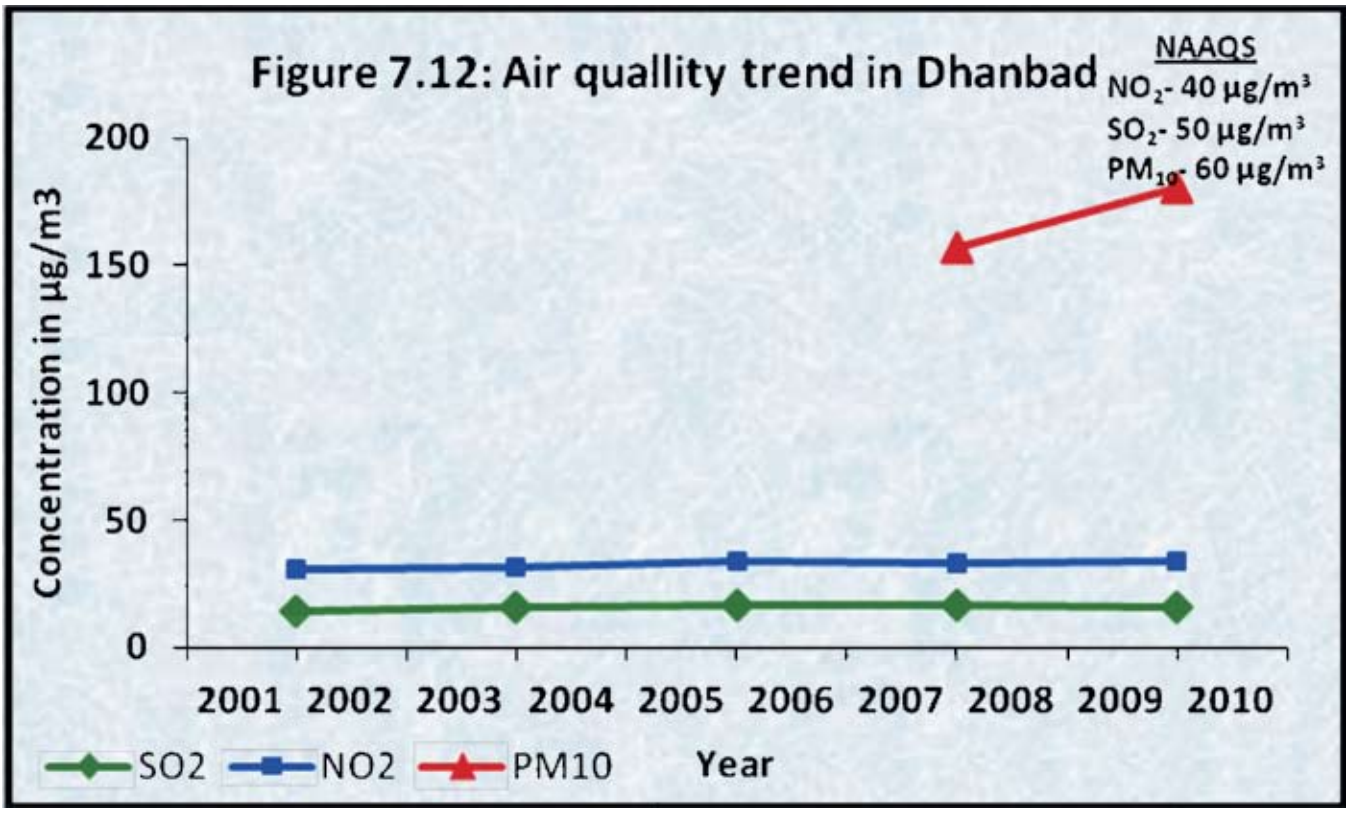
7.3.11 PATNA

State	Bihar
Location	25°22'12" N and 85°7'48" E
Area	125 km^2
Population	17,07,429
Climate	Tropical type characterized by three distinct seasons Temperature: maximum temperature is 31.6 °C varying between 23.6°C in January to 38.9°C in the month of May while the night temperature varies between 11 to 27.1°C with mean annual value of 20.8 °C Rainfall: relative humidity is comparatively higher over the year ranging between 41 to 83% lowest being in the month of April. The bulk of the annual rainfall (1109.8mm) is received through South Western monsoon between the period June to September.
Geography	River Punpun flows south of township limit and Ganga River is it's Northern limit. The township and surrounding is underlain by thick fluvial sediments deposited by the river Ganga and its right bank tributaries, Sone and Punpun. Basically the deposits belong to Quaternary period and are flood plain deposits. The sediments are admixture of clay and sand of different grades.
Industries	Plastic and steel
Air quality stations	2 (2 residential)
Air quality trend	Analysis of three year air quality data shows a more or less stable trend for SO_2 and. PM_{10} however, shows an increasing trend and exceeds the NAAQS (Figure 7.11).



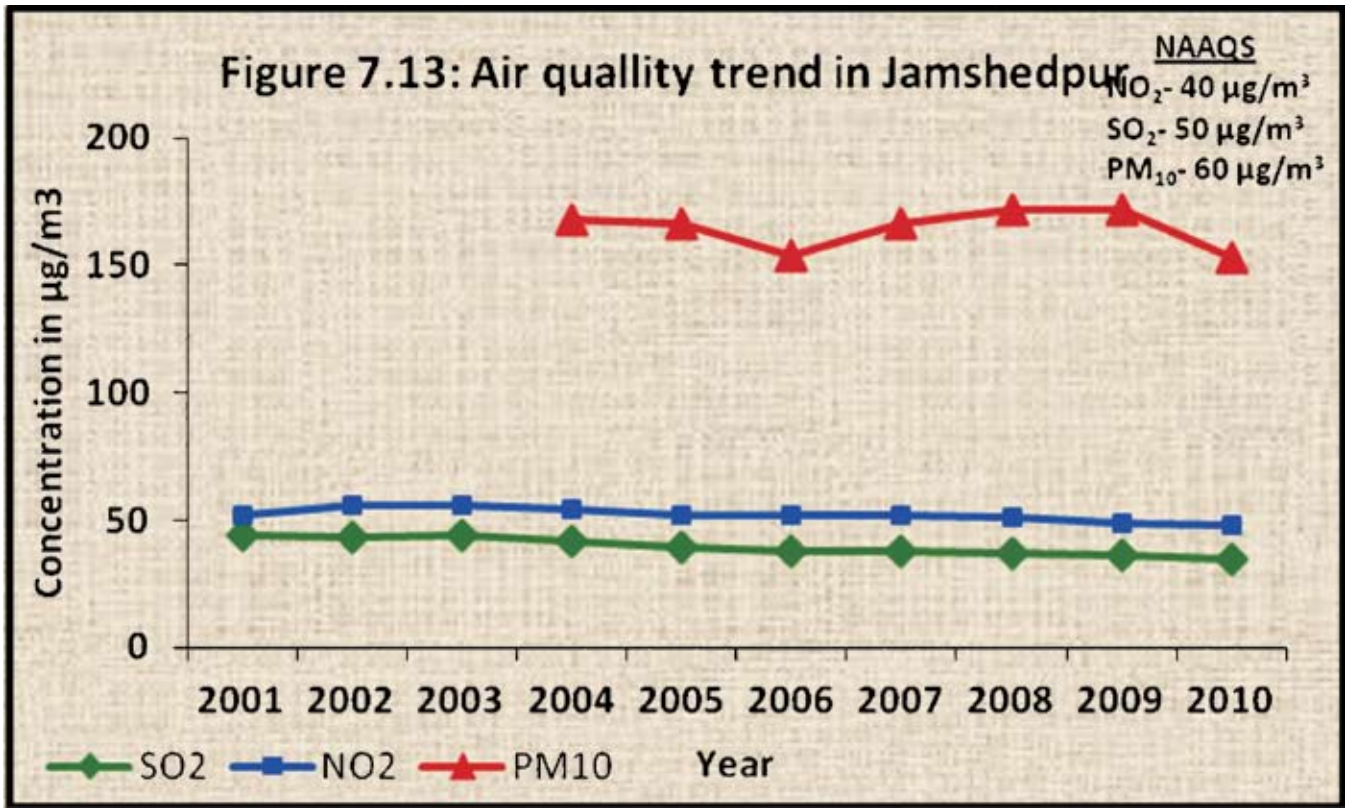
7.3.12 DHANBAD

State	Jharkhand
Location	23°48' N and 86°27' E
Area	355.77 km^2
Population	10,64,357
Climate	Dry and hot summer and a dry and cold winter with an intermediate monsoon period from the middle of June to the end of September. The summer is extremely hot, whereas the winter from November to February is very pleasant Temperature: varies from 8°C to 34°C. After February, the climate becomes warmer till the rains break in the middle of June. The temperature during these four months from March to June usually varies from 13°C to 45.5°C. July to October, which include the rainy season, temperature usually ranges from 15°C to 36°C. Rainfall: Average rainfall of the area is 1310.6 mm
Geography	Crystalline metamorphites of Archaean (Dharwar) age which form the basement. Over these rocks were deposited in slowly sinking faulted troughs (basins), the Lower Gondwana group of sedimentary strata including the coal-bearing beds
Industries	Coal and coal based industries. The total number of small scale industries registered is about 300, out of which 150 are coal based and 150 of other types.
Air quality stations	1 (1 residential)
Air quality trend	Analysis of three year air quality data shows a more or less stable trend for SO_2 and. PM_{10} however, shows an increasing trend and exceeds the NAAQS (Figure 7.12).



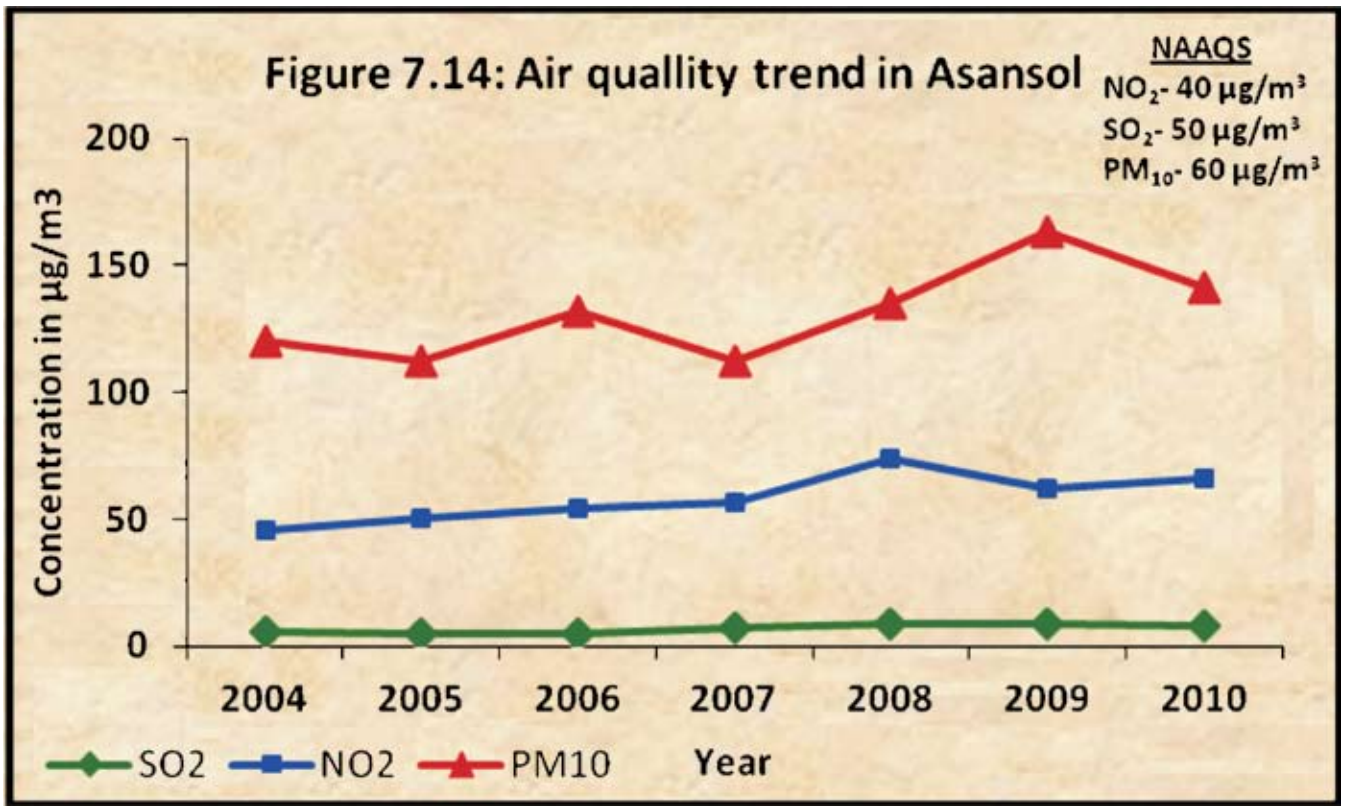
7.3.13 JAMSHEDPUR

State	Jharkhand
Location	22°48' N and 86°11' E
Area	149.23 km^2
Population	11,01,804
Climate	Humid climate due to inland position and presence of hills Temperature: day temperature is quite high in summer, generally around 43°C occasionally reaching up to 48°C Rainfall: annual rainfall in Singhbhum district is recorded as 1434 mm.
Geography	Diverse rock types are developed with a none-too-simple structure of Dunn. The areas surrounding Jamshedpur are rich in minerals, including iron ore, coal, manganese and lime.
Industries	The main industries include iron and steel, truck manufacturing, tinplate production, cement, plastic and rubber, chemicals, food and beverage, pharmaceutical, electrical, sponge foam, LPG bottling plant and other small and medium scale industries.
Air quality stations	2 (2 industrial)
Air quality trend	Analysis of six year air quality data of PM10 shows a slight increase and is above NAAS. SO_2 and. PM_{10} however, shows a stable trend (Figure 7.13).



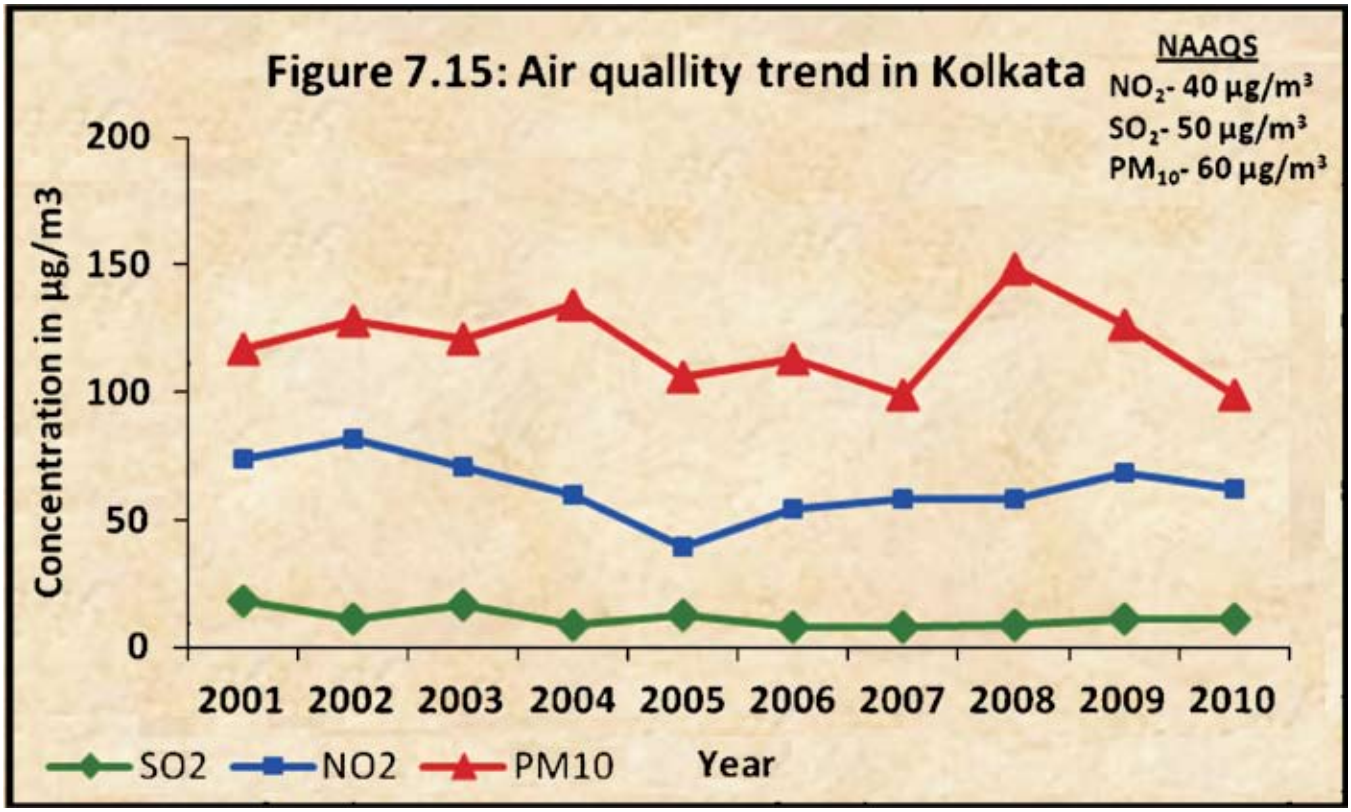
7.3.14 ASANSOL

State	West Bengal
Location	23°41' N and 86°59' N E
Area	127.237 km^2
Population	10,64,357
Climate	Dry and hot in summer and dry and cold in winter with an intermediate monsoon period from the middle of June to the end of September Temperature: Maximum temperature 35°C during summer and minimum of 4°C during winter Rainfall: Maximum of 533 mm during July
Geography	Lies on Gondwana rocks between rivers Damodar and Ajay. A small rivulet, Nunia, flows flows past Asansol
Industries	Coal mines, irol and steel, polymer industries, cement, plastic, musturd oil, rubber, leather products, polymer pipes, fabrication, paint and varnish, flour mills, PVC pipes, aromatic chemicals, food product packing etc. The total number of small scale industries registered is about 500
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of six year air quality data of PM10 shows fluctuating trend and is above NAAQS. SO_2 and. NO_2, shows a stable trend. (Figure 7.14).



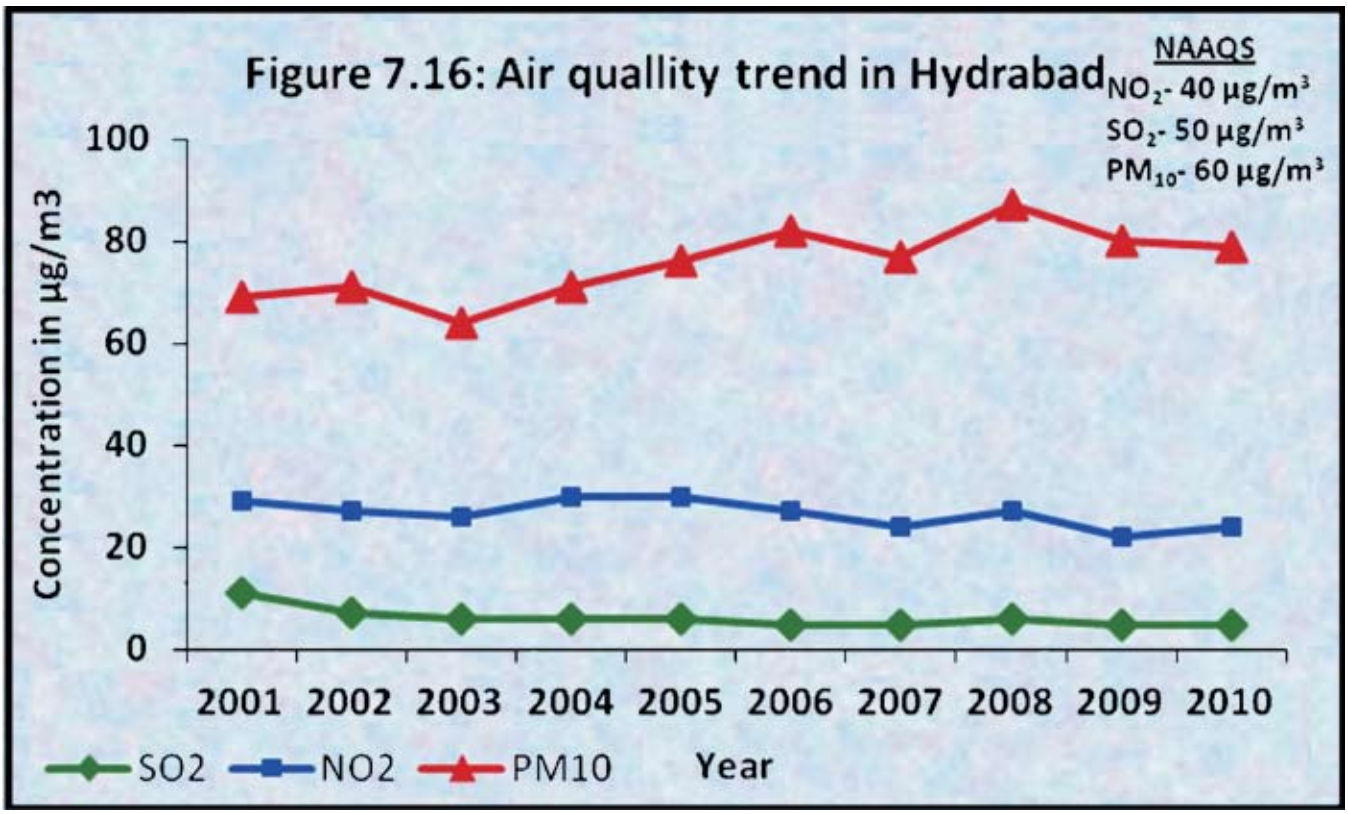
7.3.15 KOLKATA

State	West Bengal
Location	22°33' N and 88°20' E
Area	1750 km². elevation ranging between 1.5 m (5 ft) to 9 m (30 ft)[
Population	1,32,16,546
Climate	Tropical wet-and-dry climate. Summers are hot and humid with temperatures in the low 30's and during dry spells the maximum temperatures often exceed 40 °C (104 °F) during May and June. Winter tends to last for only about two and a half months, with seasonal lows dipping to 9 °C – 11 °C (54 °F – 57 °F) between December and January. Dusty squalls followed by thunderstorm or hailstorms and heavy rains with ice sleets lash during early summer. Southeast monsoon rains lash the city between June and September Temperature: annual mean temperature is 26.8°C; monthly mean temperatures range from 19°C to 30°C Rainfall: annual rainfall of 1,582 mm
Geography	Spread linearly along the banks of the River Hooghly in a north-south direction. Soil type is alluvial. Quaternary sediments consisting of clay, silt, various grades of sand and gravel. These sediments are sandwiched between two clay beds, the lower one at depths between 250 m (820 ft) and 650 m (2,133 ft) and the upper one ranging between 10 m (33 ft) and 40 m (131 ft) in thickness. The town falls under seismic zone-III and wind and cyclone zone
Industries	Electronics to jute.
Air quality stations	10 (7 residential, 3 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows a fluctuating trend. However, 2009 shors a reduction in the pollutant. NO2 shows a shlightly increasing trend. Both PM_{10} and NO_2 exceeds the NAAQS. SO_2 seems stable and well within limits. (Figure 7.15).



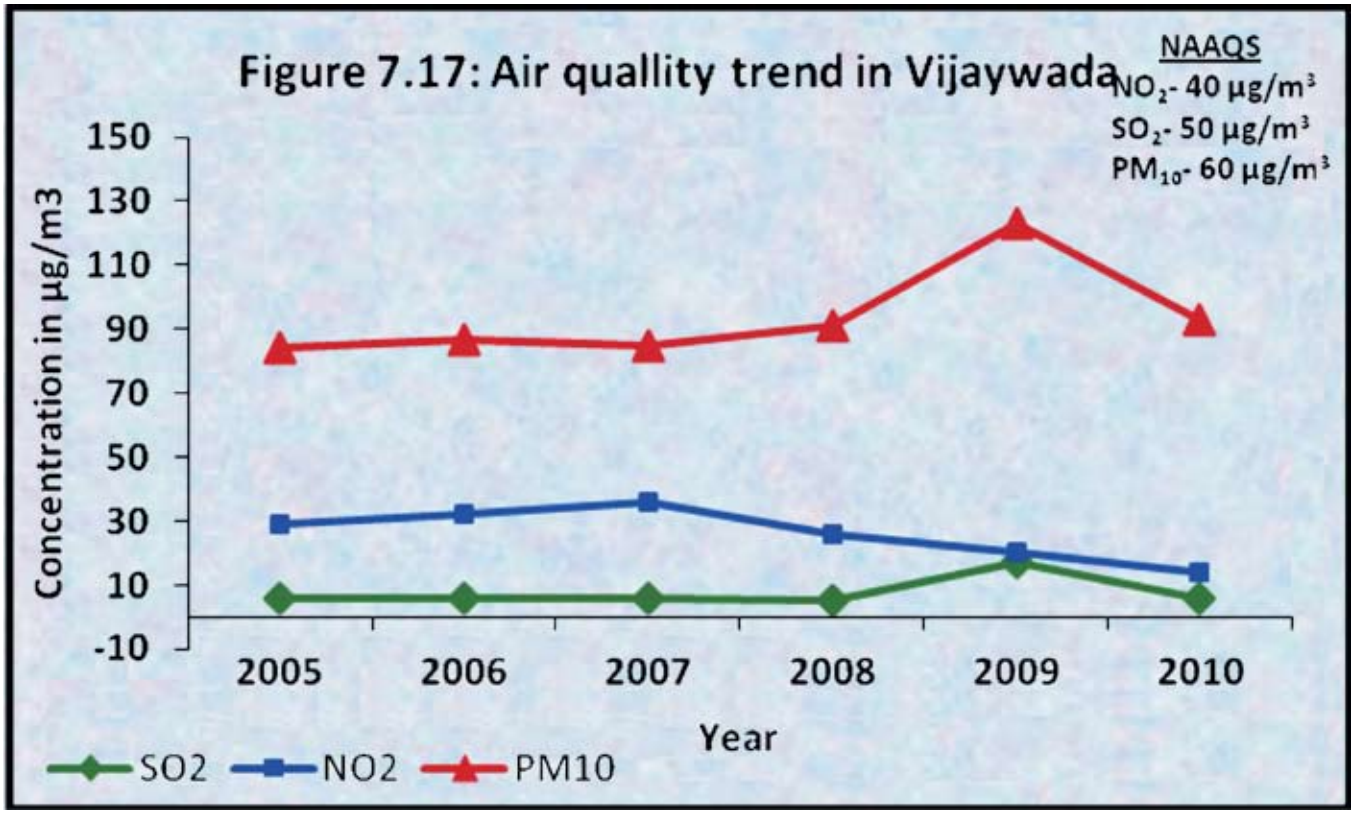
7.3.16 HYDRABAD

State	Andhra Pradesh
Location	17°12' N and 78°18' E. Average elevation of about 536 metres above sea level (1,607 ft)
Area	1000 km^2
Population	55,33,640
Climate	Combination of a tropical wet and dry climate that borders on a hot semi-arid climate with hot summers from late February to early June, the monsoon season from late June to early October and a pleasant winter from late October to early February.. Temperature: Moderate annual range of temperature Rainfall: The normal rainfall of the area is 805 mm with 76% from South-West monsoon
Geography	Situated on the Deccan Plateau. Most of the area has a rocky terrain and some areas are hilly. Spreads on the North and South bank of the river Musi, a tributary of Krishna. The Hussain Sagar Lake is centrally located in the city and connecting the Hyderabad and Secunderabad twin cities Geomorphologically the area is divided into (1) Residual Hills (2) Pediment inselberg complex (3) Shallow to moderate weathered pediplains and (4) Valley hills.
Industries	Cotton, cigarettes, refrigerators, machine tools, oil, drugs, pharmaceuticals, printing material, mint
Air quality stations	9 (5 residential, 3 industrial, 1 sensitive)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows a fluctuating trend. However, 2009 shors a reduction in the pollutant. NO_2 shows a shlightly increasing trend. Both PM_{10} and NO_2 exceeds the NAAQS. SO_2 seems stable and well within limits. (Figure 7.16).



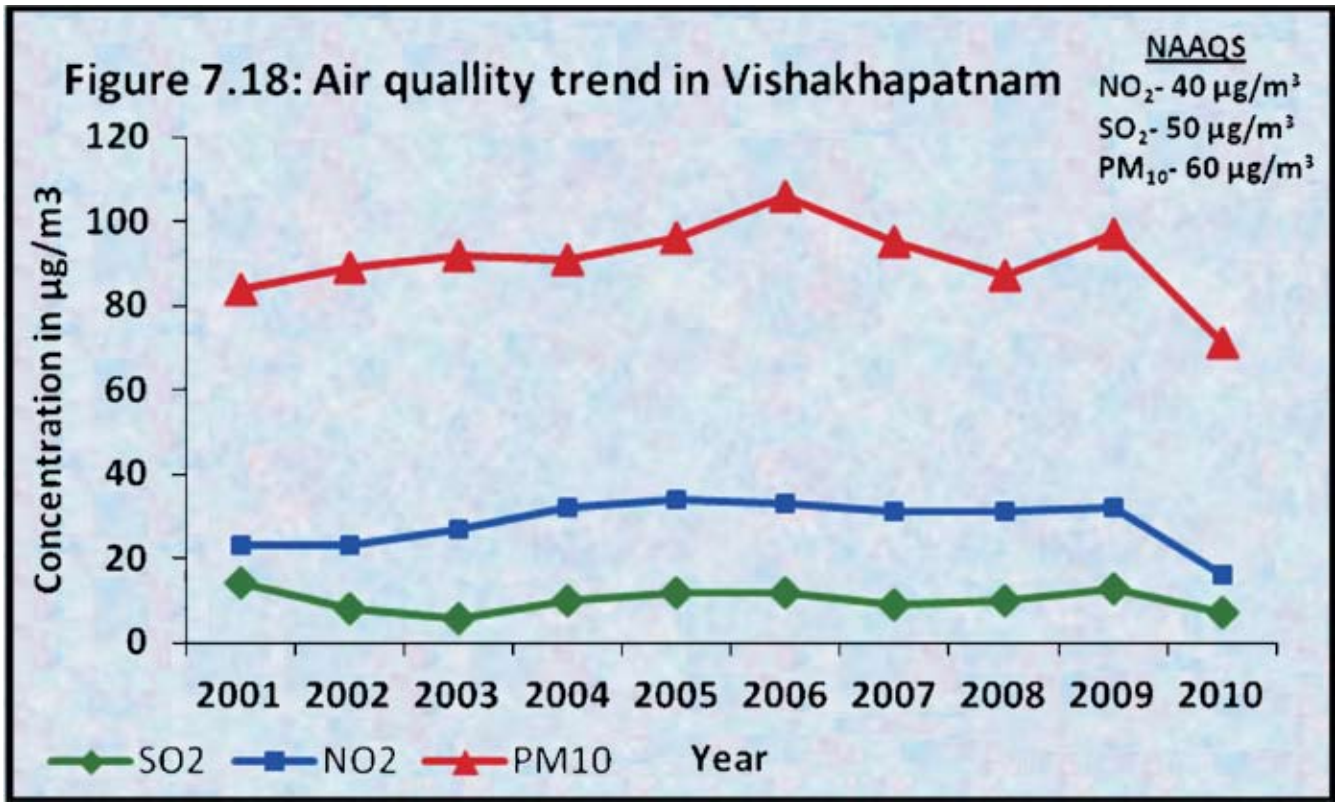
7.3.17 VIJAYWADA

State	Andhra Pradesh
Location	16°31' N and 80°39' E
Area	73 km^2
Population	10,11,152.
Climate	Tropical, specifically a tropical wet and dry climate, with hot summers and moderate winters. Temperature: peak temperature reaches 47 °C (117 °F) in May-June, while the winter temperature is 20-27 C Rainfall: normal rainfall of the district is 1028 mm
Geography	located on the banks of the Krishna River and bounded by the Indrakiladri Hills on the West and the Budameru River on the North. Soil is very fertile and cultivated intensively.
Industries	Rice mills, edible oil, beverages, tobacco products, cotton textiles, wood and wood products, paper and paper products, leather, rubber, plastic products, motor vehicle spare parts, utensils, scientific instruments, dall and flour mills, chemicals, pharmaceuticals, oil refinery of used motor oils, brawn oil companies, ayurvedic medicines, pickle companies
Air quality stations	2 (1 residential, 1 industrial)
Air quality trend	Analysis of five year air quality data of PM_{10} and SO_2 shows an fluctuating trend, NO_2 shows a decreasing trend. However NO_2 and SO_2 are within NAAQS (Figure 7.17).



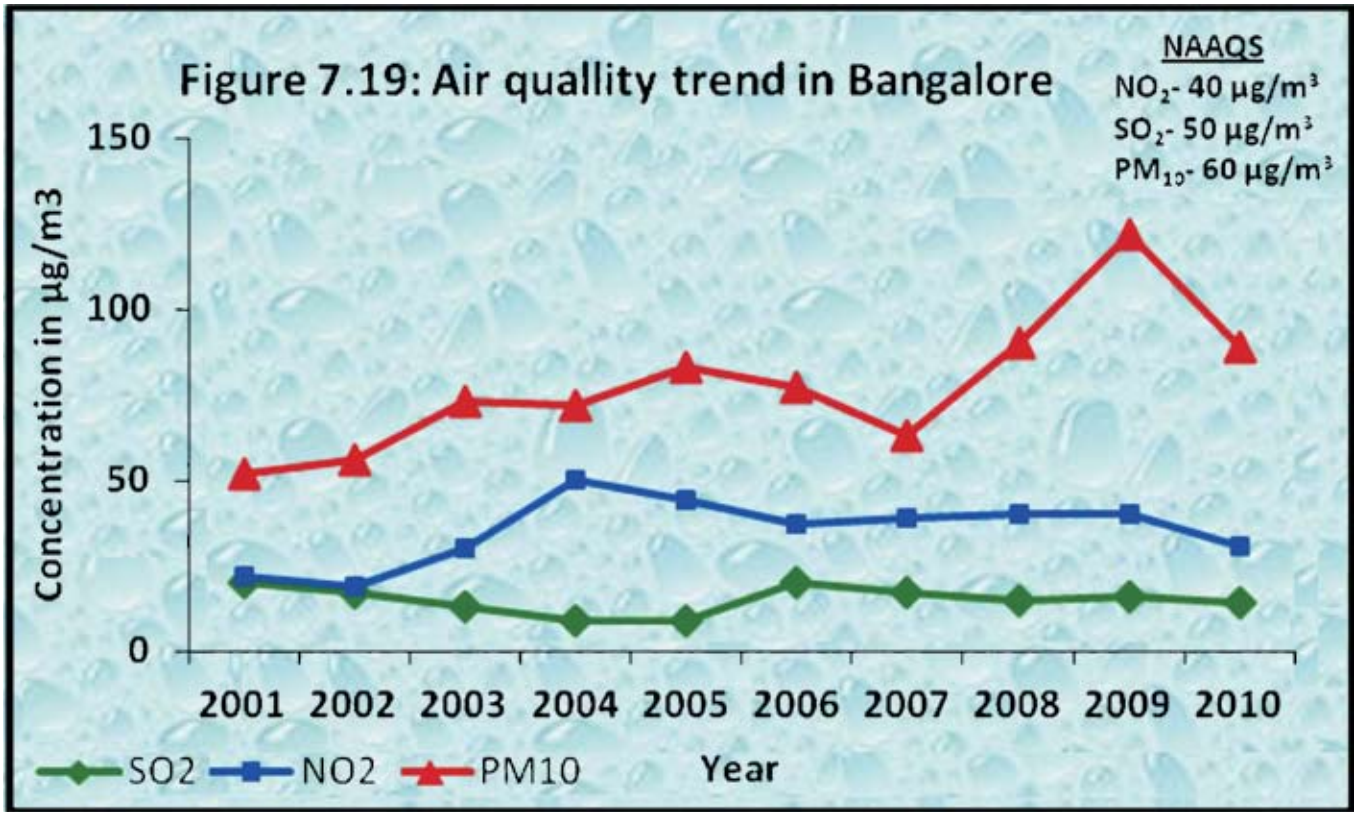
7.3.18 VISHAKHAPATNAM

State	Andhra Pradesh
Location	17°43' N and 83°17' E
Area	Vishakhapatnam urban area comprises Vishakhapatnam Municipal Corporation covering 111 km^2 and Gajuvaka Municipality with an area of 97 km^2
Population	13,29,472
Climate	Tropical savanna climate with little variation in temperature through the year. High humidity throughout the year with aggressive summer and pleasant winter Temperature: temperature generally varies from 28 to 38°C in summer and 18 to 30°C in winter mean temperature ranges from 23.5 to 30°C Rainfall: mean annual rainfall of the area is 982 mm
Geography	Situated among the hills of the Eastern Ghats and faces the Bay of Bengal to the east. Forms a part of Eastern Ghat tectonic complex of Archaean age which include khondalites, charnockite and migmatite groups
Industries	Shipyard, steel, refinery, fertlisers, heavy plates and vessels, dredging
Air quality stations	8 (4 residential, 3 industrial, 1 sensitive)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows a fluctuating trend, NO_2 and SO_2 shows a stable trend and are within NAAQS (Figure 7.18).



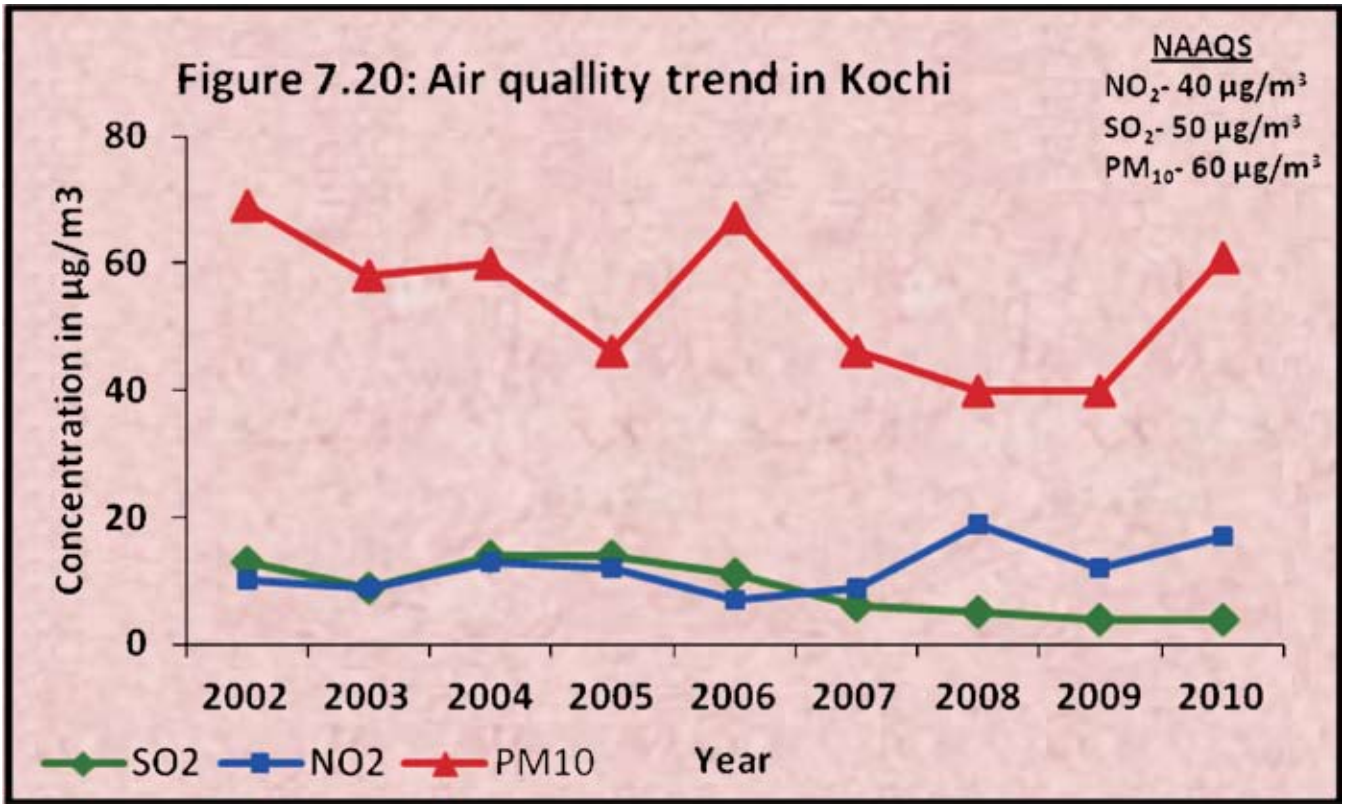
6.3.19 BANGALORE

State	Karnataka
Location	12°34'48" N and 77°22'48" E. Altitude of 920 m above MSL
Area	1000 km^2
Population	56,86,844
Climate	Tropical savanna climate with distinct wet and dry seasons. Due to its high elevation, Bangalore usually enjoys a more moderate climate throughout the year. The summer heat is moderated by fairly frequent thunderstorms. Temperature: 28 to 36°C during hottest months (April/May) to 16 to 25°C during winter months (December/January). Rainfall: average rainfall is 686 mm
Geography	Located on the Deccan Plateau in the south-eastern part of Karnataka. Soils consist of red laterite and red, fine loamy to clayey soils
Industries	Silicon valley of India. Major industries are aircraft, earthmoving equipments, watches, garments, silk, machine tools, handicrafts, computer software, computer hardware, electronics, telecommunication, instrumentation and information technology, steel and coffee.
Air quality stations	9 (5 residential, 4 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows an increasing trend with an abrupt increase after 2007. SO_2 and NO_2 is more or less stable after 2006 and are within NAAQS (Figure 7.19).



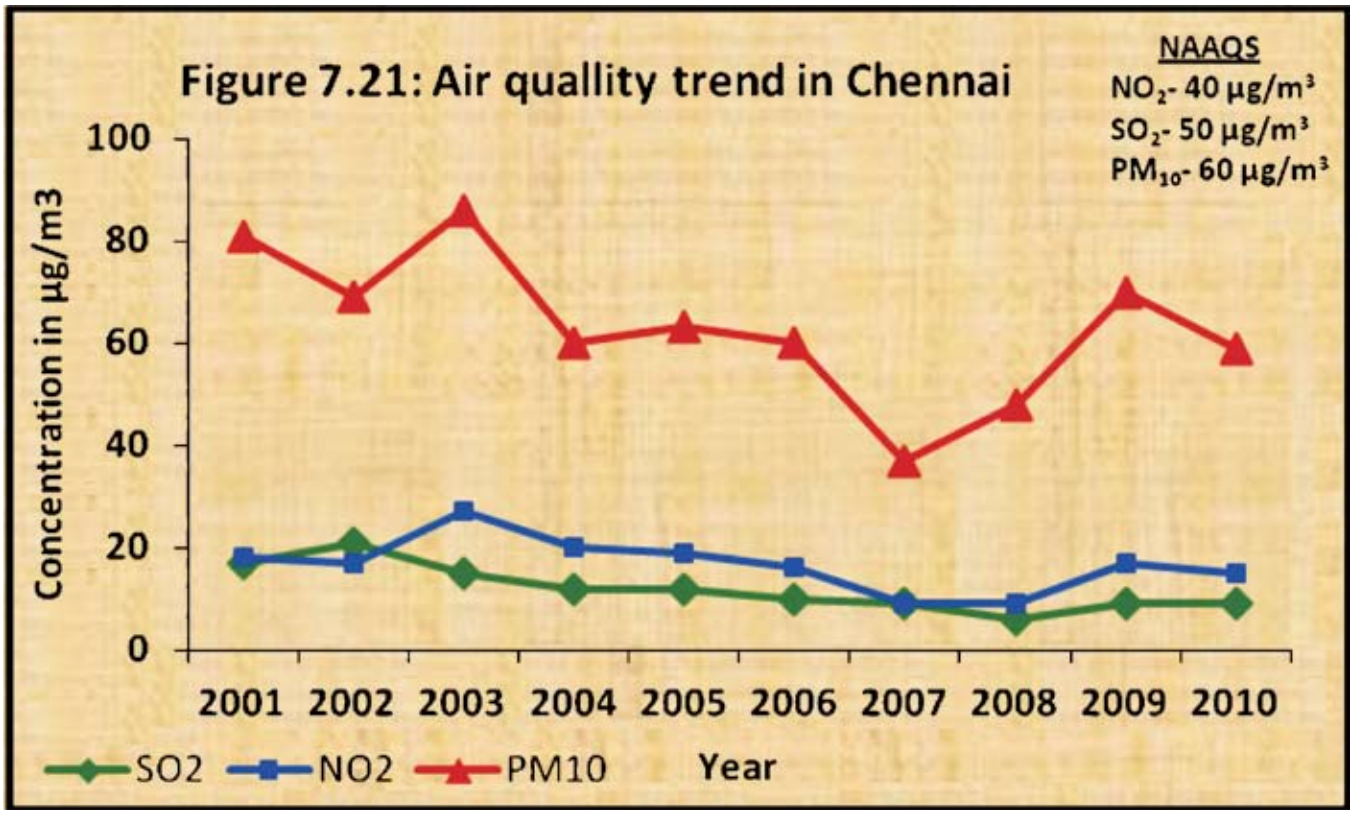
6.3.20 KOCHI

State	Kerala
Location	9°58'N to 9.967°N and 76°13'E to 76.217°E
Area	2408 km^2
Population	1,355,972
Climate	Tropical monsoon climate. From June through September, the south-west monsoon brings in heavy rains as Kochi lies on the windward side of the Western Ghats. From October to December, Kochi receives rain from the northeast monsoon, as it lies on the leeward side. Temperature: maximum of 40 °C while in winter it is around 25°C Rainfall: annual rainfall is about 310 cm
Geography	To the west lies the Arabian Sea, and to the east are estuaries drained by perennial rivers originating in the Western Ghats. Much of Kochi lies at sea level, with a coastline of 48 km. Soil consists of sediments such as alluvium, teri's, brown sands, etc. Hydromorphic saline soils are also found in the areas surrounding the backwaters. Predominant rock types found here are Archaean-basic dykes, Charnockites and Gneisses.
Industries	Cashew and other food products, Cochin Spices, Coir products, Chemicals and Agro products, Chemicals, Handloom, Handicrafts, Rubber, Electric, Electronic appliances, Transformers, Telephone cables, Ceramics, Tiles, Drugs, Chemicals, Paints, Newsprint, Refinery and wood craft industries.
Air quality stations	7 (4 residential, 3 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows an increasing trend with an abrupt increase after 2007. SO_2 and NO_2 is more or less stable after 2006 and are within NAAQS (Figure 7.20).



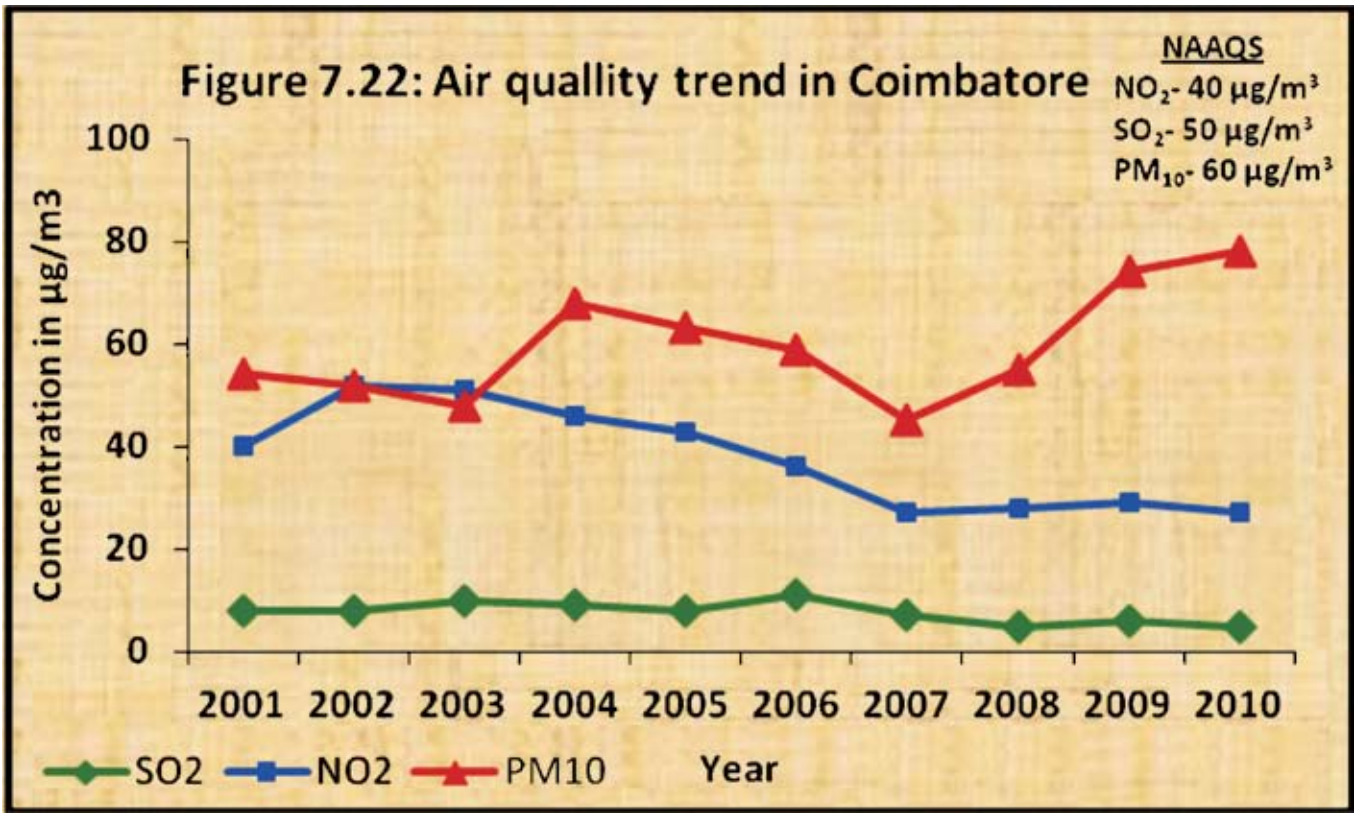
6.3.21 CHENNAI

State	Tamilnadu
Location	13°04' N and 80°17'E. Average elevation is around 6.7 metres
Area	173 km^2
Population	64,24,624
Climate	Tropical wet and dry climate. The weather is hot and humid for most of the year. The city gets most of its seasonal rainfall from the north-east monsoon winds, from mid-October to mid-December. Cyclones in the Bay of Bengal sometimes hit the city. T Temperature: 24.3^0 C (min) to 32.9 ^{0}C (max) Rainfall: annual rainfall in the region is the range from 1286 to 1233 mm
Geography	Situated on the eastern coastal plains. Drained by Cooum River (or *Koovam*) through the centre, Adyar River to the south and Kortalaiyar on the northern fringes. Soil is mostly clay, shale and sandstone.
Industries	Chemicals, oil refinery, oil storage tanks motors, cycles, rubber factory, surgical instruments factory, refinery, food factories, beverage factories, wood, paper and paper products, machinery tool industries, transport equipments, electrical machinery industries
Air quality stations	6 (2 residential, 4 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows an increasing trend with an abrupt increase after 2007. SO2 and NO2 is more or less stable after 2006 and are within NAAQS (Figure 7.21).



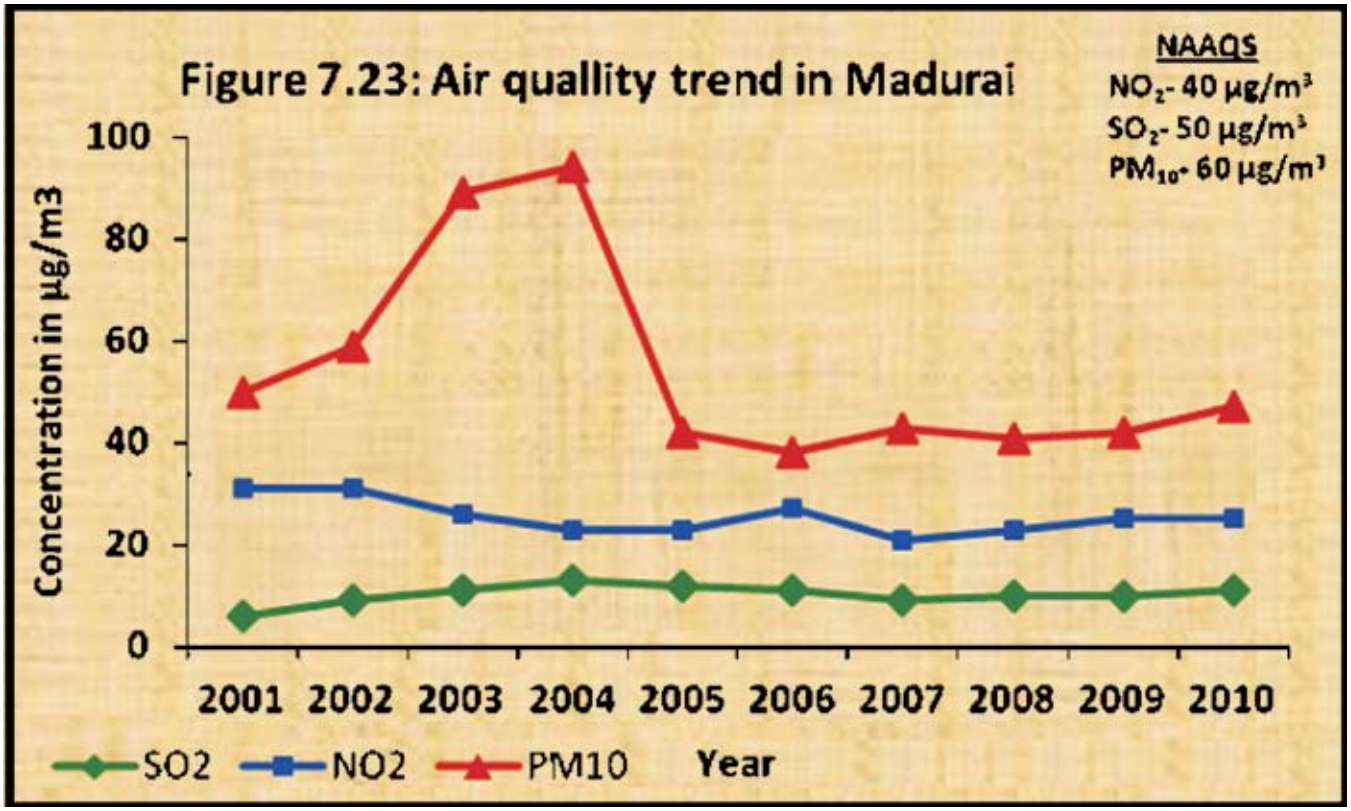
6.3.22 COIMBATORE

State	Tamilnadu
Location	11°00' N and 77°00' E, Elevation of about 398 meters
Area	140 km^2
Population	14,46,034
Climate	Tropical wet and dry climate. Regular monsoon starts from October lasting till early November brought about by the retreating North-eastern monsoon. Temperature: The mean maximum and minimum temperatures during summer and winter varies between 35°C to 18°C. Rainfall: annual rainfall of the district is 647 mm
Geography	The soil is predominantly black, which is suitable for cotton cultivation, but it also has some red loamy soil. Falls under the Class III/IV Seismic Zone
Industries	Textile mills, engineering industries, automobile components, washing machines, wet grinders, general engineering industries, food processing units and readymade garments.Large number of small-scale industries also florish
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows fluctuating trend with an abrupt increase after 2007. NO2 shows a decline over the years and SO2 is stable and within NAAQS (Figure 7.22).



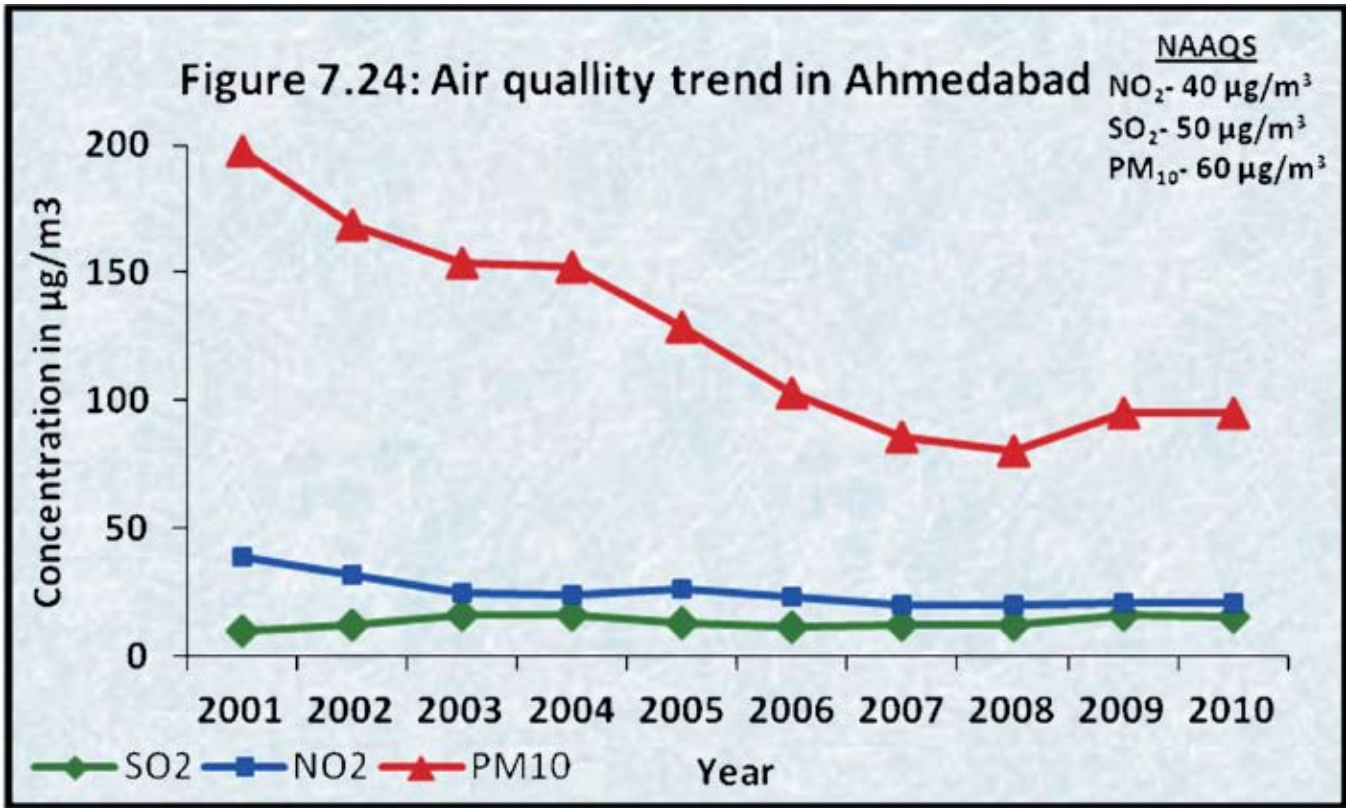
6.3.23 MADURAI

State	Tamilnadu
Location	9°58' N and 78°10' E, elevation of 101 meters above mean sea level
Area	140 km^2
Population	11, 94,665
Climate	Hot and humid, Madurai has the typical climate of the rest of the Deccan plateau. Normally, Sub tropical climate prevails over the city without any sharp variation. four distinct seasons, viz., and South West monsoon, North East Monsoon, Winter Season and Hot Summer Season Temperature: Temperatures during summer reach a maximum of 40 and a minimum of 26.3 °C, though temperatures over 43 °C are not uncommon. Winter temperatures range between 29.6 and 18 °C. Rainfall: average annual rainfall of the city is 867 mm
Geography	Situated on the banks of the River Vaigai
Industries	Textile mills, engineering industries, mechanical industries, electrical and electronic appliances, steel rolling mills and small scale industries like Food products, readymade garments, wooden industries, printing, moulding industries predominate in the area.
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows fluctuating trend. NO2 shows a decline over the years and SO2 is stable and within NAAQS (Figure 7.23).



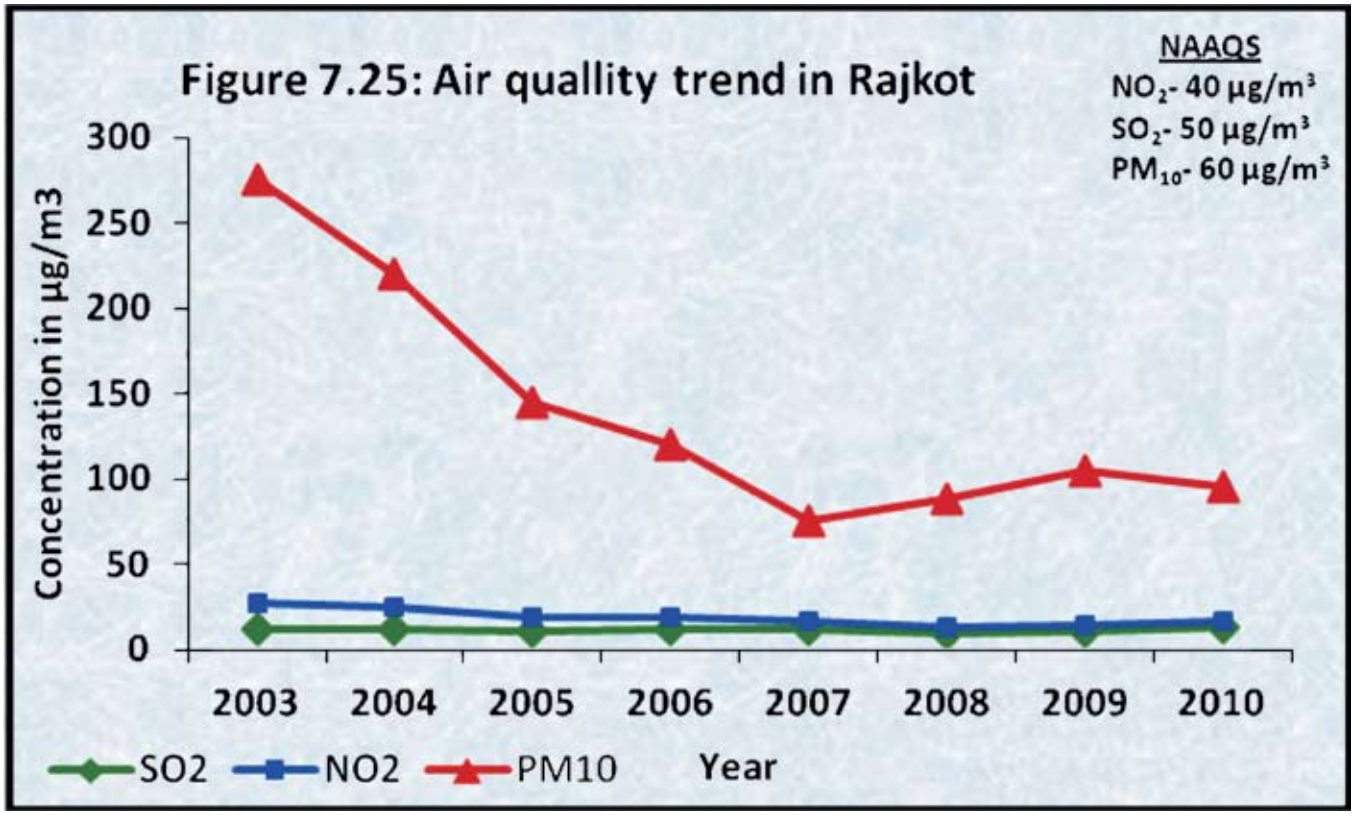
6.3.24 AHMEDABAD

State	Gujarat
Location	23°02' N and 72°35' E, elevation of 53 metres
Area	300 km^2
Population	35,20,085
Climate	Semi-arid climate. There are three main seasons: summer, monsoon and winter. Aside from the monsoon season, the climate is dry. The southwest monsoon brings a humid climate from mid-June to mid-September. Temperature: May is the hottest month with mean daily maximum temperature of 41.3°C and occasionally rises up to over 46°C. January is the coldest month with the mean daily temperature of 29°C. Rainfall: average annual rainfall for this period was 732 mm
Geography	The city sits on the banks of the River Sabarmati, in north-central Gujarat. falls under seismic zone-III. Area forms part of the Cambay sedimentary basin, and is underlain by post-Miocene alluvium, both aeolian and fluvial, composed of sand, silt, gravel and clay.
Industries	Textile mill, chemicals and pharmaceuticals industry.
Air quality stations	6 (4 residential, 2 industrial)
Air quality trend	Analysis of nine year air quality data of PM_{10} shows a declining trend with a slight increase during 2009. Both SO2 and NO2 are more or less stable (Figure 7.24).



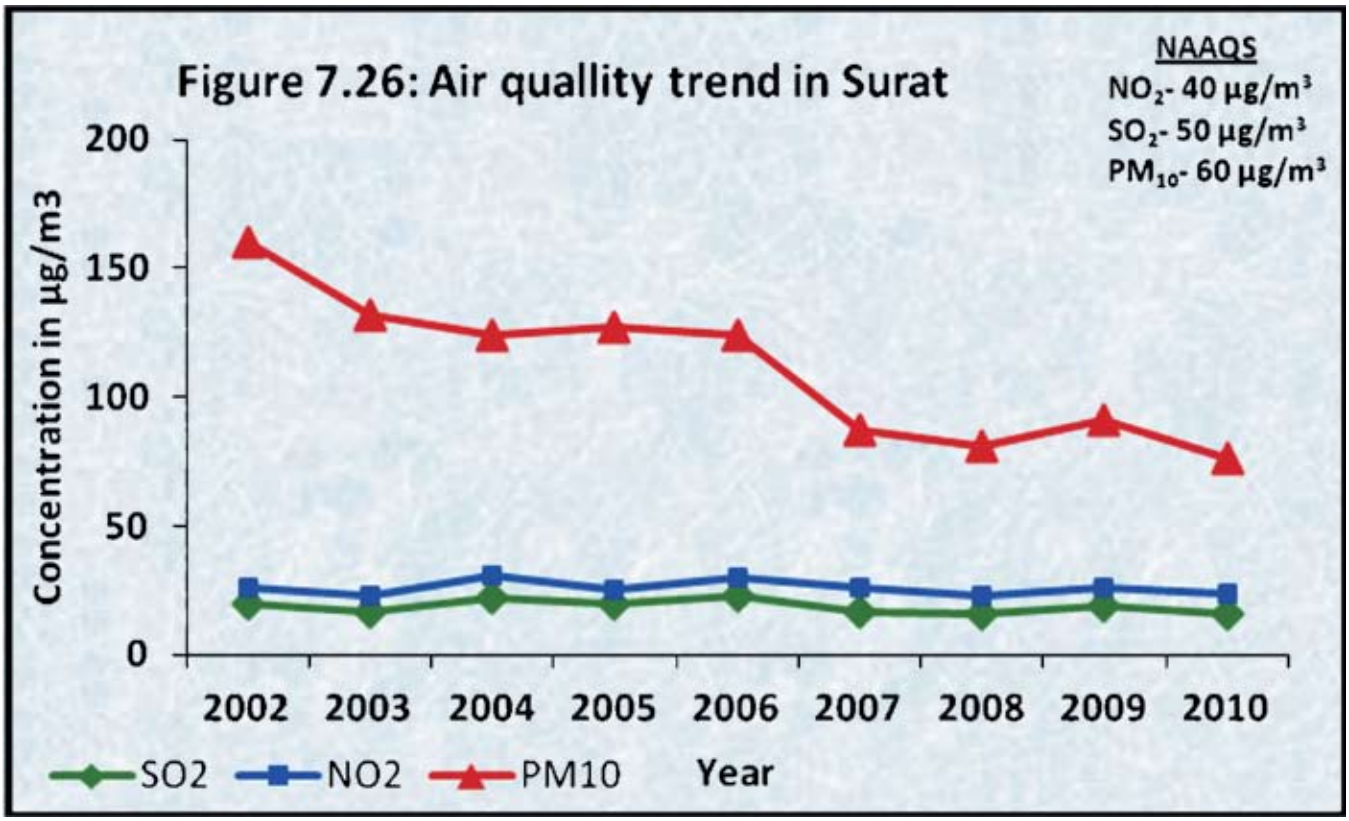
6.3.25 RAJKOT

State	Gujarat
Location	22°18' N and 70°47' E, elevation of 134 m (439 feet).
Area	104.86 km^2
Population	10,02,160
Climate	Semiarid climate with hot dry summers from mid-March to mid-June and the wet monsoon season from mid-June to October. The cyclones generally occur in the Arabian Sea during the months after the rainy season. Temperature: average maximum and minimum temperatures recorded over the last 40 years are 43.5°C and 24.2°C respectively Rainfall: average annual rainfall is observed about 500 mm in the area
Geography	Dharangadhra sand stones (Upper Jurassic to Lower Cretaceous), Deccan Trap (Upper Cretaceous to Lower Eocene), Fluviomarine alluvium and Milliolite limestone (Quaternary to Upper Tertiary). However, major part of the area is constituted of Basaltic lava flows.
Industries	Bearings, diesel engines, kitchen knives and other cutting appliances, watch parts (cases & bracelets), automotive parts, forging industry, casting industry, machine tools, share market and software development, textile mill There are eight industrial areas/estates functioning in the city. The total number of small scale industries registered is about 12000.
Air quality stations	2 (1 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for SO2 and NO2. As for PM_{10} upto 2007 a declining trend is seen whereas a slight increasing trend is seen after 2007 (Figure 7.25).



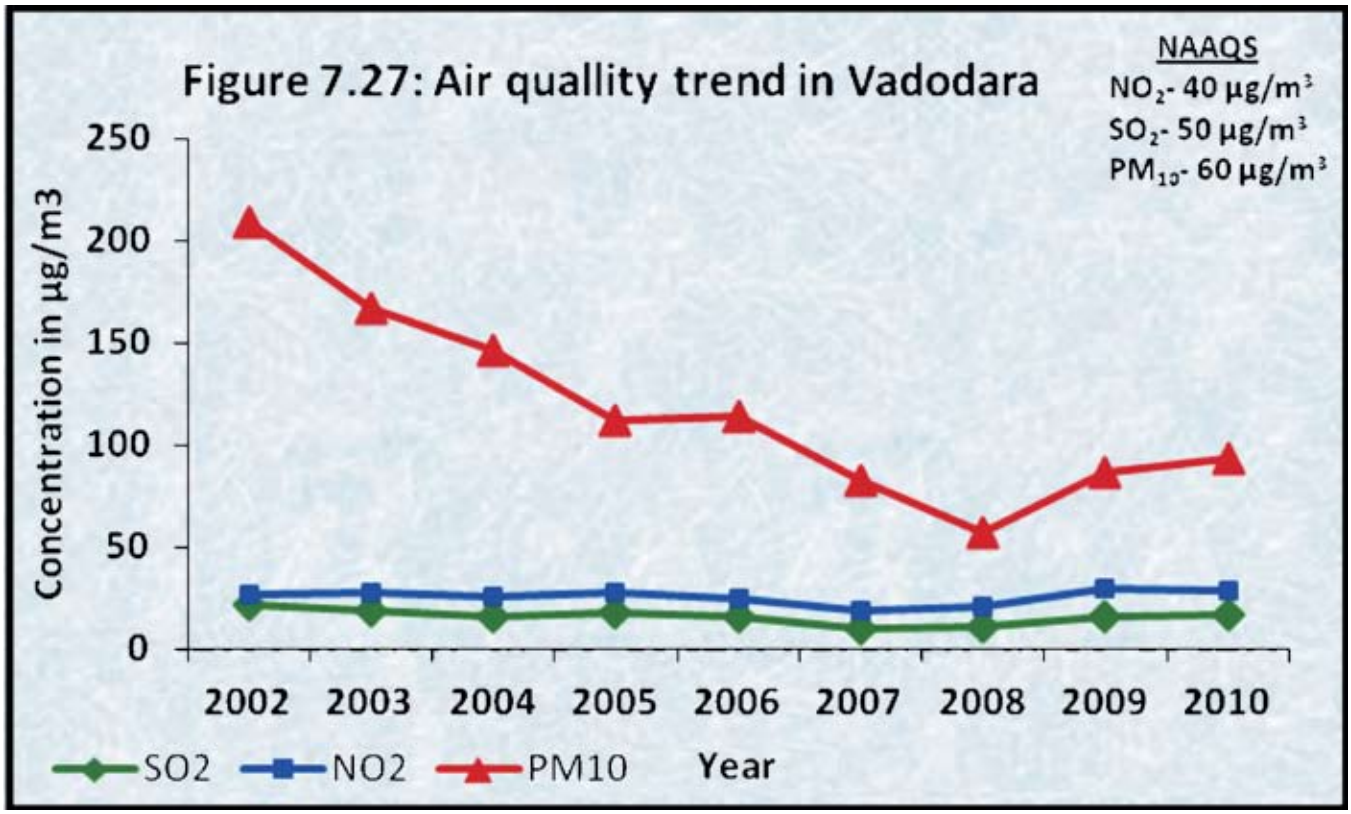
6.3.26 SURAT

State	Gujarat
Location	21°10' N and 72°50' E, average elevation of 13 meters
Area	112.27 km^2
Population	28,11,466.
Climate	Tropical monsoon climate, moderated strongly by the Arabian Sea. The summer begins in early March and lasts till June. April and May are the hottest months, the average temperature being 30 °C. Monsoon begins in late June. Very often heavy monsoon rain brings floods in the Tapi basin area. Temperature: temperature of the city varies from 12°C to 31°C, while it varies from 24°C to 42°C Rainfall: 931 mm
Geography	Situated on the left bank of the Tapti River, 14 miles from its mouth soil of the area is of black cotton type upto 1.5 m followed by yellow soil and silt upto 10 m. Below 10 m depth, soft rocks are available. There is no signature of hardrock in the area.
Industries	Production of synthetic fibers and man-made fabrics, diamond-polishing industry, , steel. The total number of industries registered is about 45000.
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for SO2 and NO2. As for PM_{10} upto 2007 a declining trend is seen whereas a slight increasing trend is seen after 2007 (Figure 7.26).



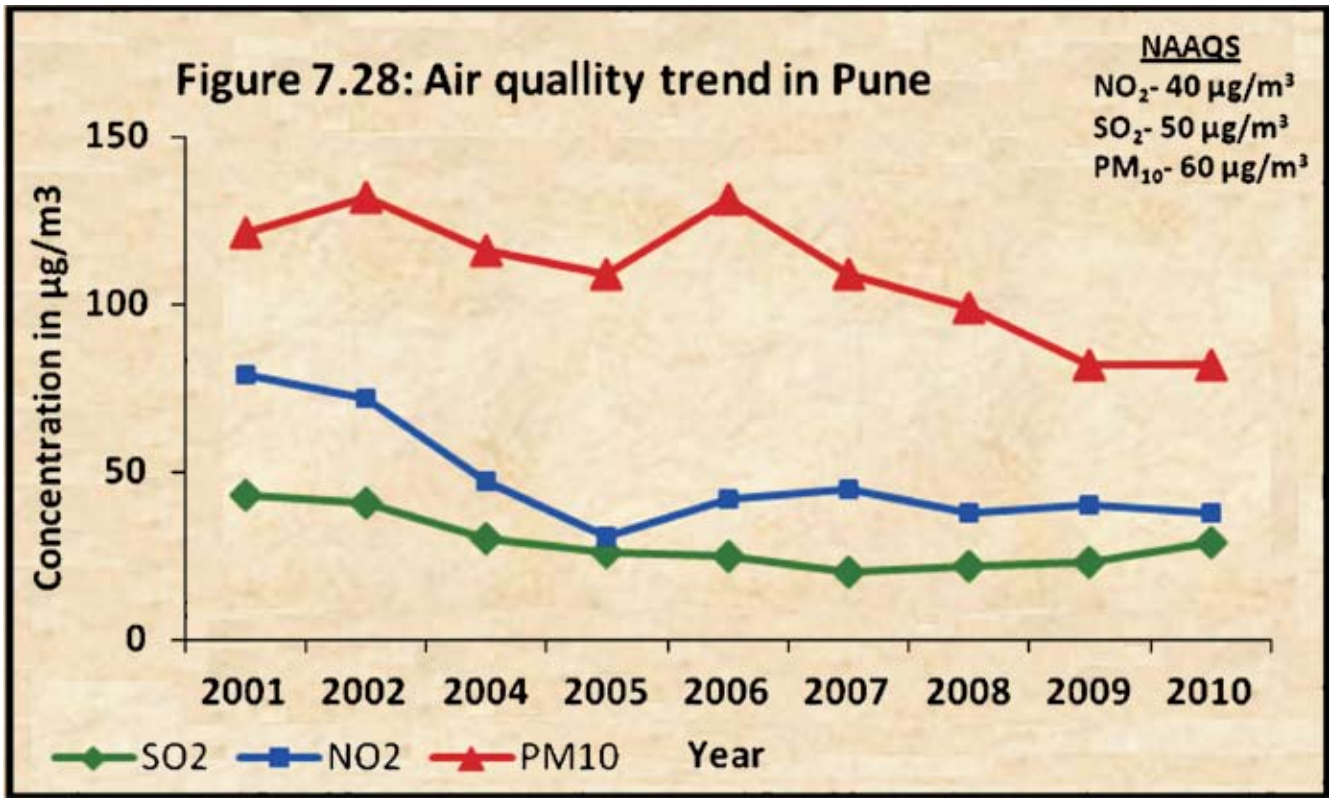
6.3.27 VADODARA

State	Gujarat
Location	22°18' N and 73°16' E, elevation of 39 metres (123 feet)
Area	140 km^2
Population	14,92,398
Climate	Tropical savanna climate. There are three main seasons: Summer, Monsoon and Winter. Aside from the monsoon season, the climate is dry. Temperature: The temperature of the city varies from 8°C to 46°C Rainfall: 900 mm
Geography	Basement rocks, exposed in northern and eastern parts, had been controlled by the Precambrian orogenies (Arvalli and Delhi cycles), and the older crystalline rocks ideally shows folds, faults and magmatism related to the two orogenies. The city sits on the banks of the River Vishwamitri, in central Gujarat, Mahi & Narmada Rivers. Falls under seismic zone-III, in a scale of I to V (in order of increasing proneness to earthquakes).
Industries	Petrochemicals, engineering, pharmaceuticals, plastics and Forex. The total number of industries registered is about 7500, out of which 6000 are functioning. There are about 2200 industries under GIDC in Makarpura.
Air quality stations	4 (3 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for SO_2 and NO_2. As for PM_{10} upto 2008 a declining trend is seen whereas a slight increasing trend is seen after 2008 (Figure 7.27).



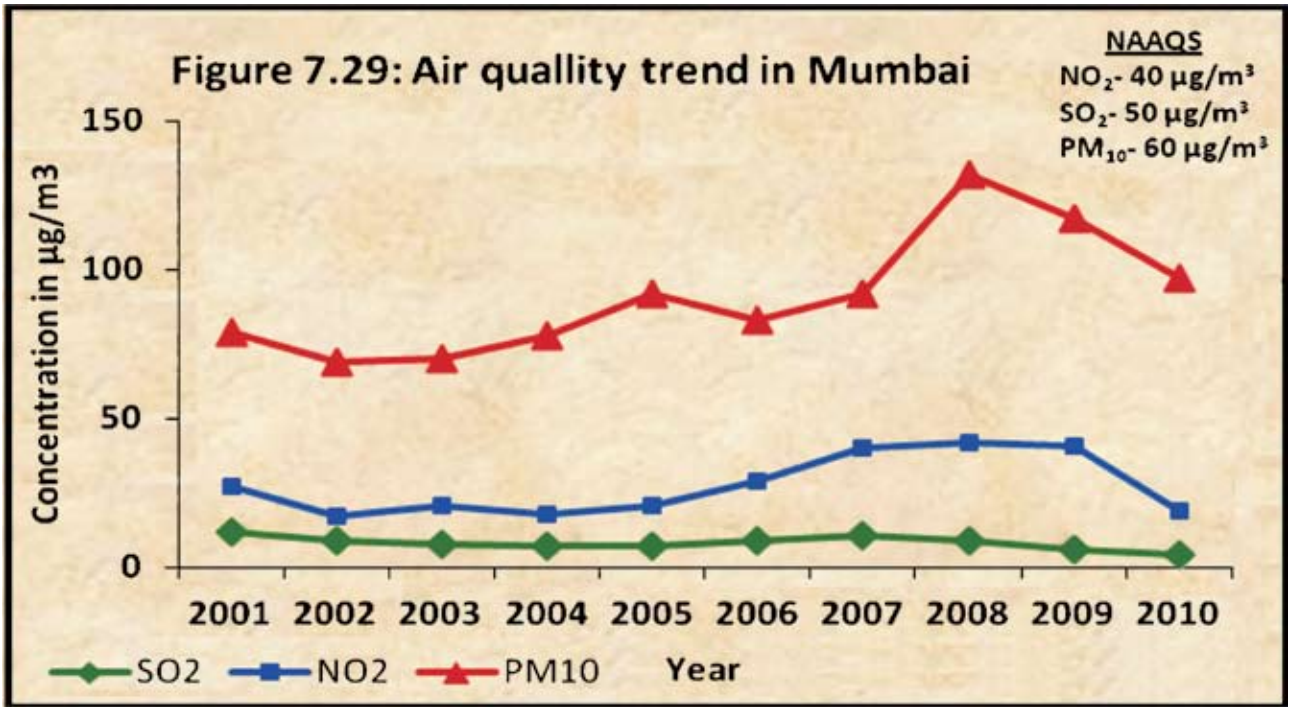
6.3.28 PUNE

State	Maharashtra
Location	18°18'36" N and 73°33' E, 560 m (1,840 ft) above sea level
Area	15,642 km^2
Population	37,55,525
Climate	Tropical wet and dry climate. Three distinct seasons: summer, monsoon and winter. The height above sea level and the leeward location with reference to the Western ghats have made the city climate moderate and salubrious. Temperature: mean summer maximum and the minimum temperatures are 37° and 23° C respectively. The same for the cold season are 30 and 12°C respectively relative humidity ranges from 36% in March to 81% in August Rainfall: average rainfall is about 70 cm in just four months from June to September
Geography	Lcated on the western margin of the Deccan plateau on the leeward side of the Sahyadri mountain range, which form a barrier from the Arabian sea. At the confluence of the Mula and Mutha rivers. The Pavana and Indrayani rivers, tributaries of the Bhima river, traverse the northwestern outskirts of metropolitan Pune. Underlain by basaltic lava flows (Pahoehoe and AA) of upper cretaceous econe age associated with basic intrusives. The soil texture contains alluvial deposites of sand, gravels, fine silts and clays along the bank of major rivers.
Industries	One of the world's three largest two-wheeler manufacturers. Engineering, electronic and electrical industries culture.
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data shows a more or less stable trend for SO2 and NO2. As for PM_{10} a declining trend is seen. (Figure 7.28).



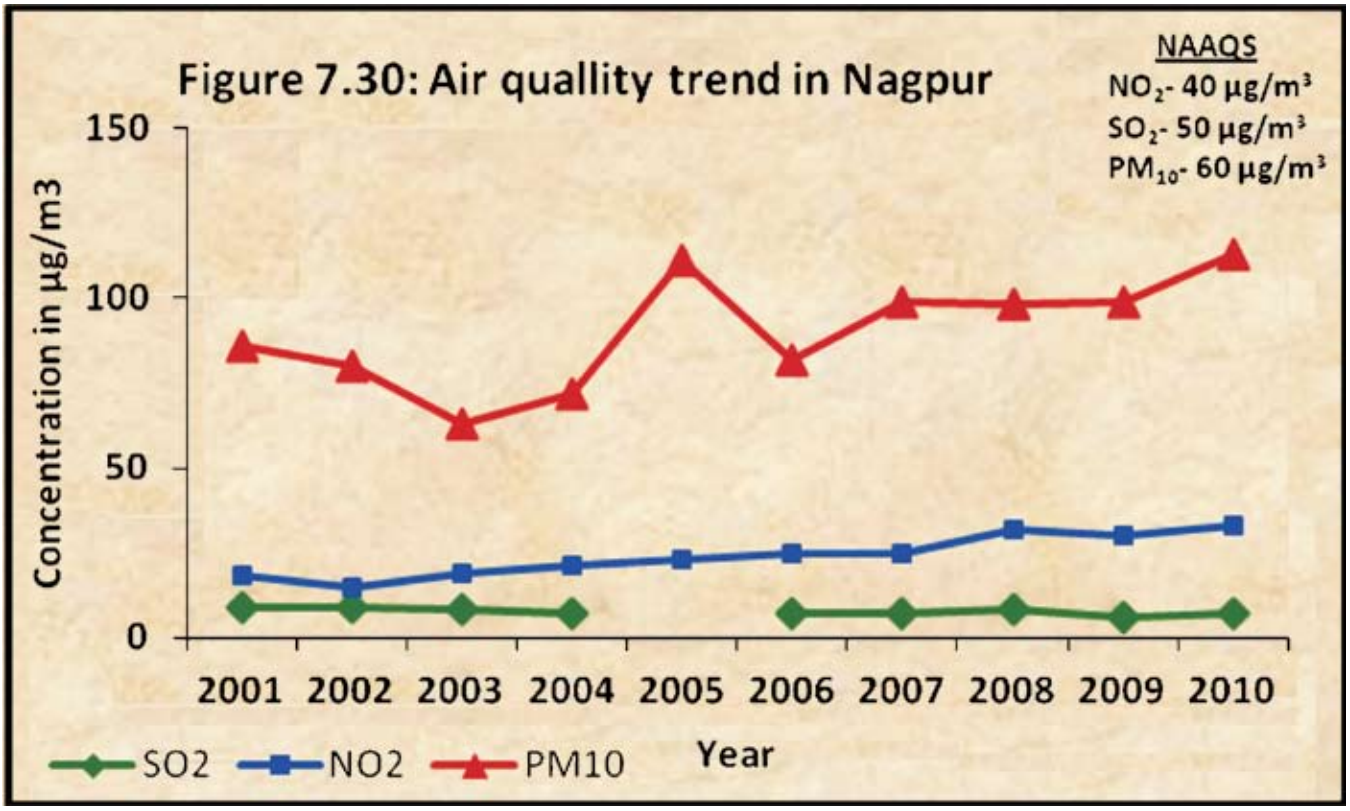
6.3.29 MUMBAI – commercial capital

State	Maharashtra
Location	18°55' N and 72°54' E, elevation of 14 m (46 ft)
Area	603.4 km^2 (233 sq mi)[
Population	1,40,00,000 lacs
Climate	Tropical climate, specifically a tropical wet and dry climate with seven months of dryness and peak of rains in July. The cold season from December to February is followed by the summer season from March to June. The period from June to about the end of September constitutes the south-west monsoon season, and October and November form the post-monsoon season. Temperature: average maximum temperature is 31.2 °C (88.2 °F), while the average minimum temperature is 23.7 °C (74.7 °F) Rainfall: average total annual rainfall is 2,146.6 millimetres (84.51 in) for the Island City, and 2,457 millimetres (96.73 in) for the suburbs
Geography	Mumbai lies at the mouth of the Ulhas River on the western coast of India, in the coastal region known as the Konkan. Three small rivers, the Dahisar River, Poinsar (or Poisar) and Ohiwara (or Oshiwara) originate within the park, while the polluted Mithi River originates from Tulsi Lake and gathers water overflowing from Vihar and Powai Lakes. The coastline of the city is indented with numerous creeks and bays, stretching from Thane creek on the eastern to Madh Marve on the western front. The eastern coast of Salsette Island is covered with large mangrove swamps, rich in biodiversity, while the western coast is mostly sandy and rocky. Soil cover in the city region is predominantly sandy due to its proximity to the sea. In the suburbs, the soil cover is largely alluvial and loamy. The underlying rock of the region is composed of black Deccan basalt flows, and their acidic and basic variants It is a seismically active zone
Industries	port and shipping
Air quality stations	(residential, industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows an increasing trend till 2008 and slight decrease in2009. NO2 salso showed an increasing trend b ut SO2 showed a decreasing trend. (Figure 7.29).



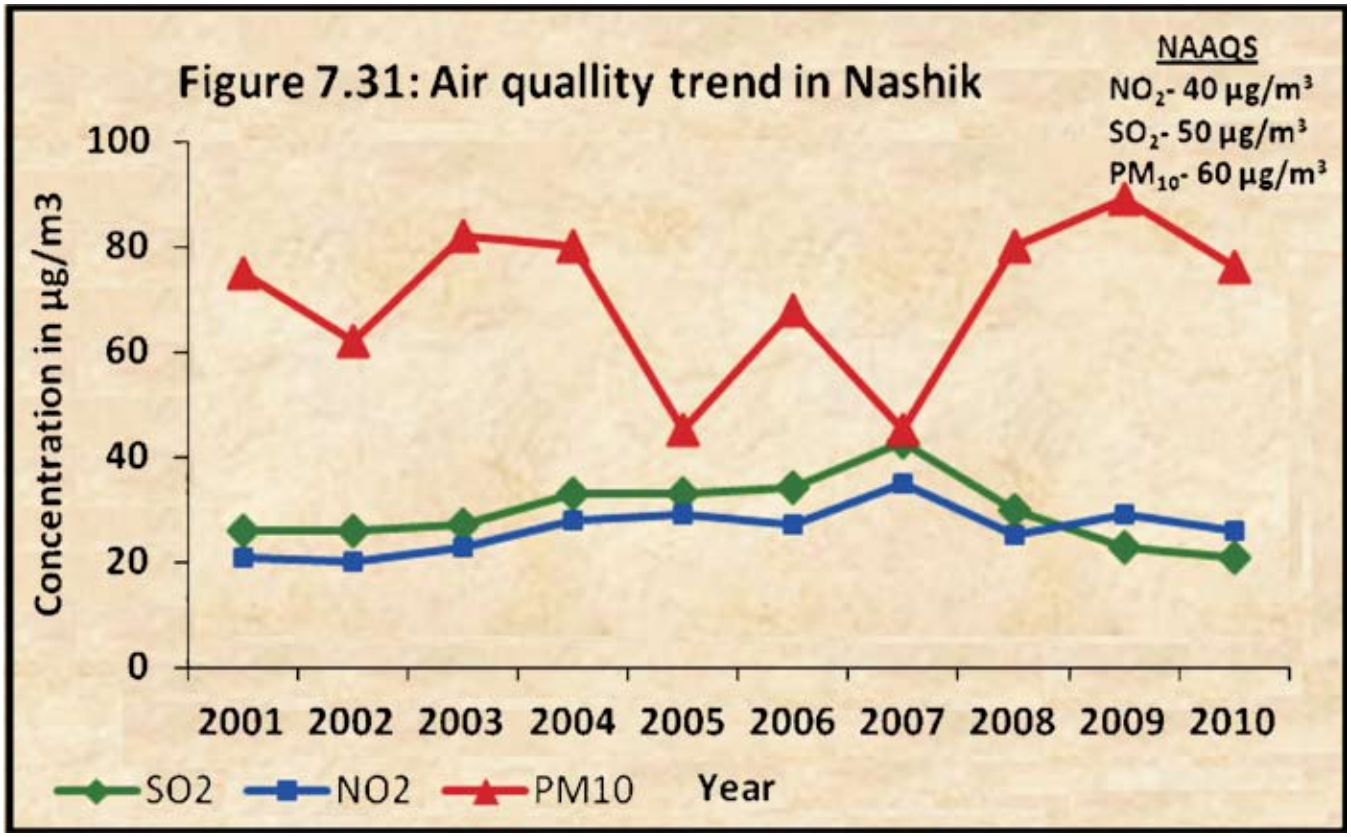
6.3.30 NAGPUR

State	Maharashtra
Location	21°5'24" N and 79°5'24"E, mean altitude of 310 meters above sea level
Area	218 km^2
Population	21,22,965
Climate	Tropical wet and dry climate with dry conditions prevailing for most of the year. Summers are extremely hot lasting from March to June, with maximum temperatures occurring in May. Winter lasts from November to January Temperature: mean daily temperature at 12.1°C and daily maximum temperature being 28.7 °C. Rainfall average annual rainfall being 1178.7 mm
Geography	Nagpur lies on the Deccan plateau of the Indian Peninsula The underlying rock strata is covered with alluvial deposits resulting from the flood plain of the Kanhan River. In some places these give rise to granular sandy soil. In low lying areas which are poorly drained, the soil is alluvial clay with poor permeability characteristics. In the eastern part of city crystalline metamorphic rocks such as gneiss, schist and granites are found, while in the northern part yellowish sand stones and clays of the lower Gondwana formations are found.[
Industries	Engineering Works, Saw mills, Rolling mills, Ayurvedic medicines. Different types of small scale and cottage units.
Air quality stations	6 (4 residential, 2 industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows an increasing trend till 2008 and slight decrease in2009. NO2 salso showed an increasing trend b ut SO2 showed a decreasing trend. (Figure 7.30).



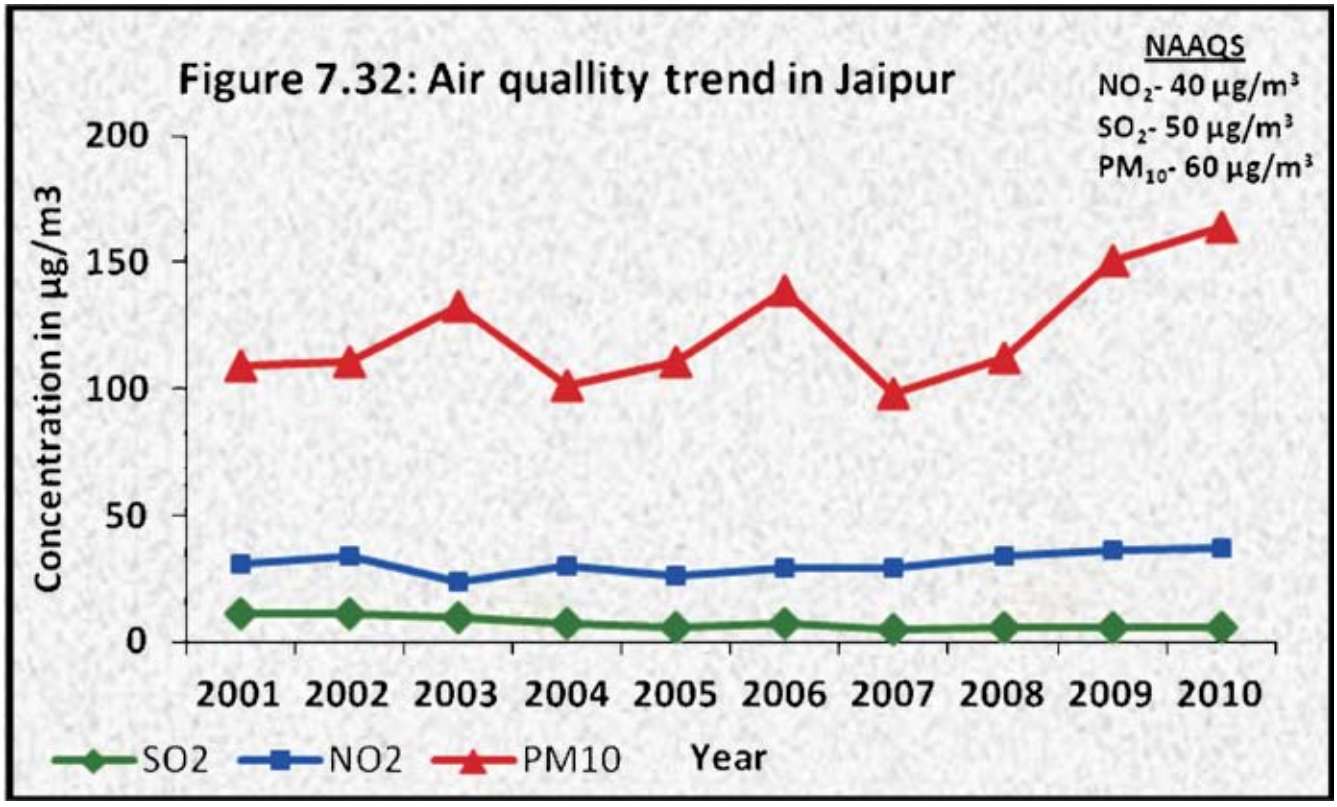
6.3.31 NASHIK

State	Maharashtra
Location	20°1'12" N and 73°30' E, 600m (1 968 ft) from the mean sea level
Area	259.13 km^2
Population	11,52,048
Climate	Semi-arid climate. The period from June to September is the (South West) Monsoon Season. Mild, dry winter from November to February, with warm days and cool nights, although occasional cold waves can dip temperatures. Temperature: summer and winter temperatures ranged 22 to 43°C and 20 to 3° C respectively Rainfall: average annual rainfall is about 700 mm Relative humidity is maximum 62% and minimum 43.65%.
Geography	The river Godavari originates from Trimbakeshwar) flows through various parts of the city. Lies on western edge of the Deccan Plateau which is a volcanic formation. The soil here is primarily black which is favorable for agriculture. Occupied by Deccan basaltic rocks.
Industries	Aircraft manufacturing plant, automobile, pharmaceuticals, electricals, steel , nation's currency printer
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows an increasing trend till 2008 and slight decrease in2009. NO2 salso showed an increasing trend b ut SO2 showed a decreasing trend. (Figure 7.31).



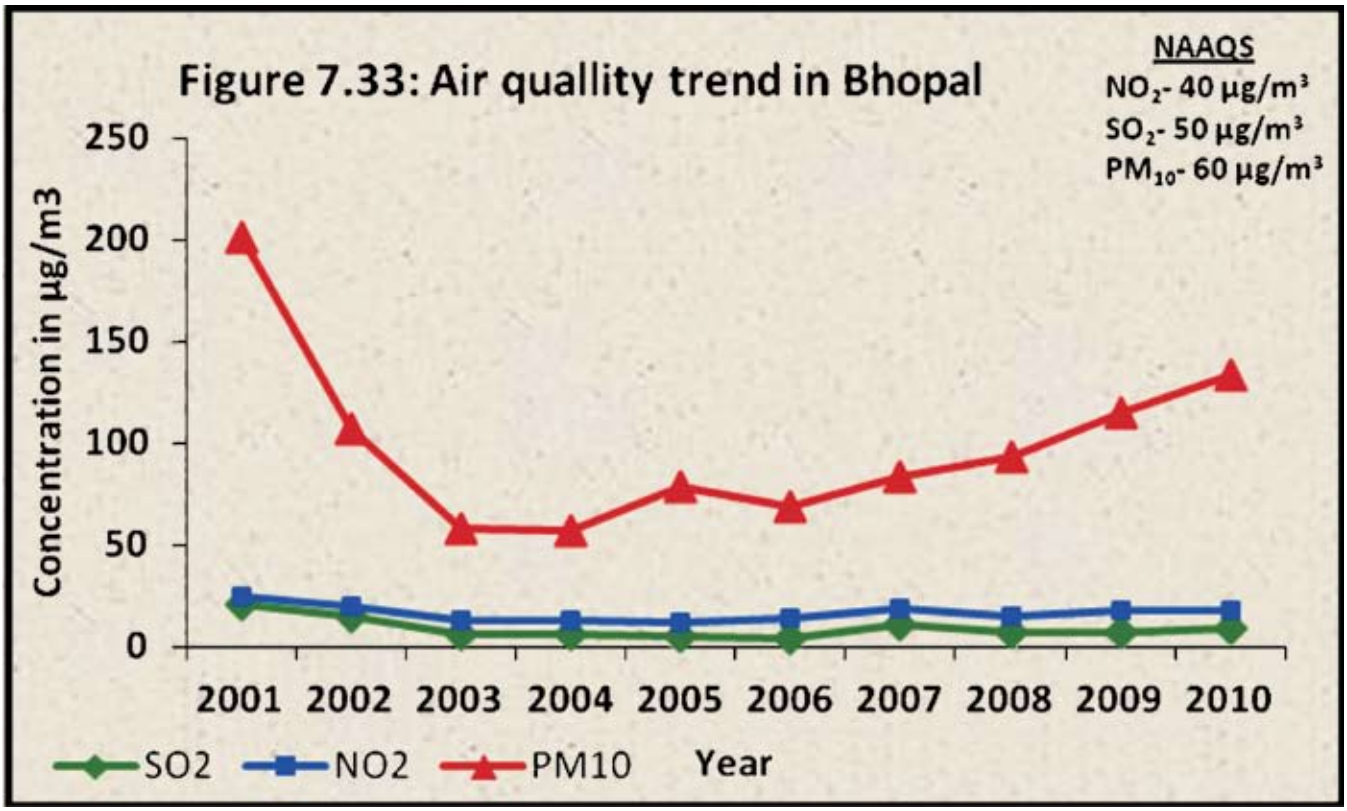
6.3.32 JAIPUR

State	Rajasthan
Location	26°33' N and 75°31'12"E , average elevation of 431 metres (1417 ft)
Area	230 km^2
Population	23,24,319
Climate	Semi-arid climate Temperatures remain relatively high throughout the year. During the monsoon there are frequent, heavy rains and thunderstorms. Winter months of November to February are mild and pleasant, There are however occasional cold waves that lead to temperatures near freezing is dry and healthy and is subjected to extremes of cold and heat at various places. Temperature: minimum and maximum temperatures are 3°C and 45°C respectively while the mean temperature is 24°C. Rainfall annual rainfall in the district is 548 mm
Geography	Ooldest groups of rock in the district are schist, gneisses, migmatite and quartzite of Pre-Aravalli, which are considered to be nearly 2,500 million year old. These rocks are covered under a mantle of sand and alluvium, of recent to sub recent age. The major rivers passing through the Jaipur district are Banas and Banganga. Ground water resources to the extent of about 28.65 million cubic meter are available in the district.
Industries	Marbel units, Readymade garments, Rolling mills, Chemical units, Printing units, Powerloom units, Gems and Jewelry unit, Casting units, Vanaspati oil mills, Precious and semi precious stone cutting units, Leather units and Electronics industries. The total number of registered small scale and artizen units in the city is 16799.
Air quality stations	6 (4 residential, 2 industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows an increasing trend till 2008 and slight decrease in2009. NO2 also showed an increasing trend but SO2 showed a decreasing trend. (Figure 7.32).



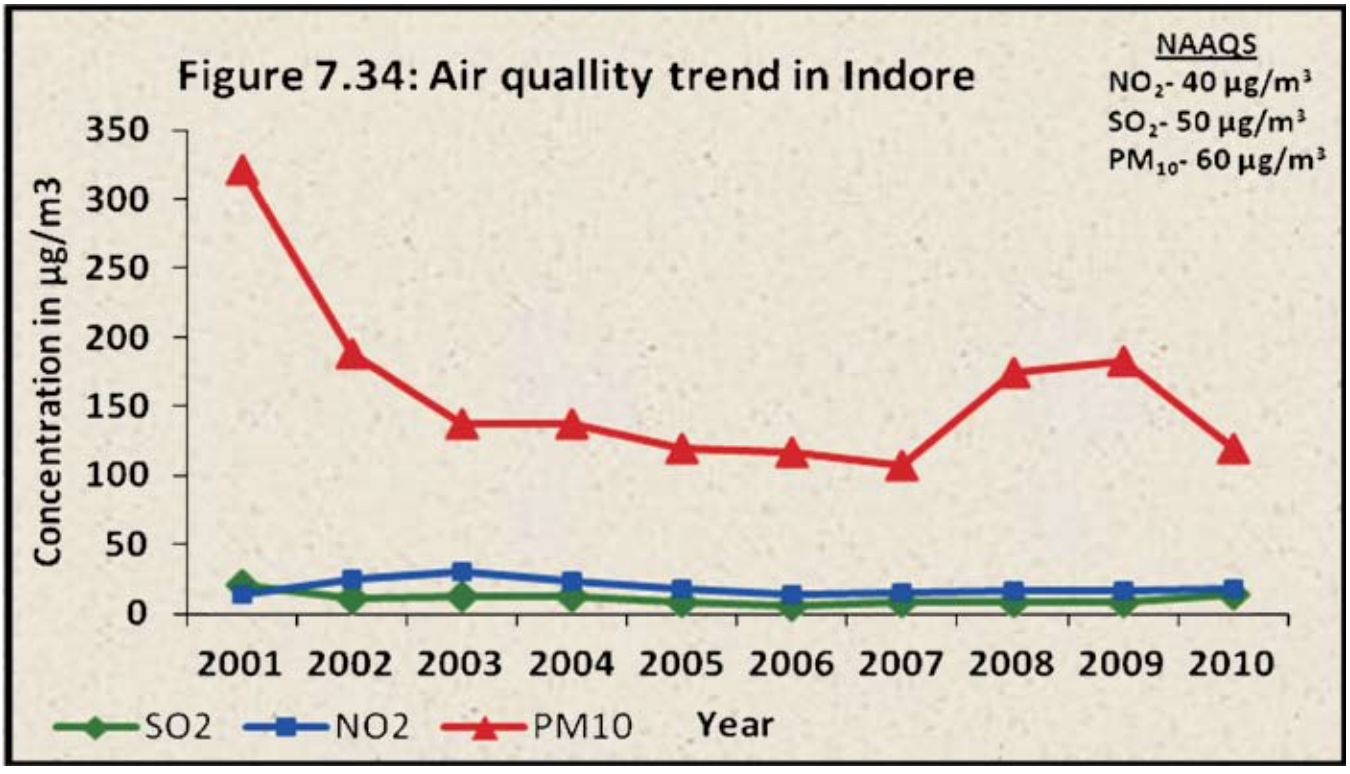
6.3.33 BHOPAL

State	Madhya Pradesh
Location	23°9'36" N and 77°21'36"E, average elevation of 499 metres (1637 ft)
Area	286 km^2
Population	14,54,830
Climate	Humid subtropical climate, with mild, dry winters, a hot summer and a humid monsoon season, starting in late June and ends in late September with frequent thunderstorms and flooding.. The winter peaks in January when temperatures may drop close to freezing on some nights. Temperature: Summers start in late March and go on till mid-June, the average temperature being around 30 °C (86 °F) Winters in Bhopal are mild, sunny and dry, with average temperatures around 18 °C (64 °F) Rainfall The normal annual rainfall of Bhopal city is about 1260 mm
Geography	Located in upper limit of the Vindhya mountain ranges, on the Malwa plateau. The area is occupied alluvial formations
Industries	Engineering Works, Bewerage, Bottling, Paints, Anciallary to BHEL, Electrical, Mechanical Engineering, Heavy fabrication factories, Glass fibre industries, Wooden, Saw mills, Food products, Automobiles and Agricultural equipments. The total number of registered units (small scale and cottage) in the city is 11960
Air quality stations	4 (3 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM_{10} shows an increasing trend till 2008 and slight decrease in2009. NO_2 salso showed an increasing trend b ut SO_2 showed a decreasing trend. (Figure 7.33).



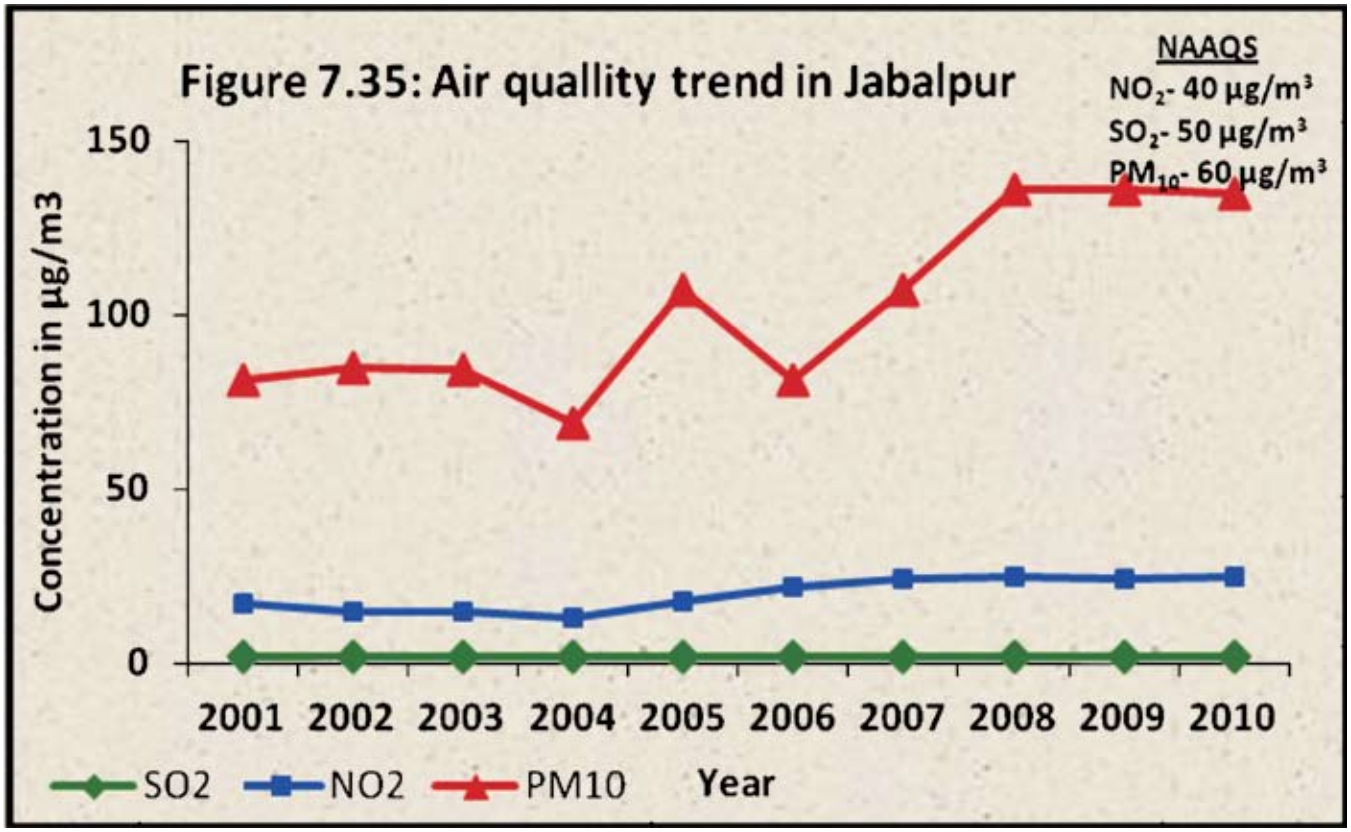
6.3.34 INDORE

State	Madhya Pradesh
Location	22°26'24" N and 75°30'E, elevation of 550 metre above sea level
Area	130 km^2
Population	16,39,044
Climate	Tropical wet and dry climate and a humid subtropical climate. Three distinct seasons are observed: summer, monsoon and winter. Summers start in mid-March and can be extremely hot in April and May. Due to Indore's location on the southern edge of the Malwa Plateau, a cool breeze in the evenings makes summer nights quite pleasant. Temperature: Average Summer temperatures may go as high as 42-44.c (100.4 °F) but humidity is very low. The monsoon season starts in late June, with temperatures averaging around 26 °C (79 °F), with sustained, torrential rainfall and high humidity. Winters start in mid-November and are dry, mild and sunny. Temperatures average about 4–15 °C (39–59 °F), but can fall close to freezing on some nights. Rainfall: Average rainfall of Indore district is about 980 mm
Geography	Located in the southern edge of the Malwa plateau, on the Saraswati and Khan rivers, which are tributaries of the Shipra River. Isolated patches of alluvium also occur along the Kshipra and Khar rivers and the Katkiya nallla
Industries	Food product, Tobacco product, Cotton textile, Wool milk, synthetic powder, Jute product, Housary garments, Wood products, Paper and paper product, Leather and leather product, Rubber and Plastic products, Chemical and chemical product, Metal product, Basic metal industries, Machinery parts, Electric machinery product, Repairing and servicing, Steel furniture, Printing, Paints & Varnish, Pulses mills, Cold storage and Fertilizers, Electronics & Computer parts, Readymade garments, etc. The total number of registered units (small scale and cottage) in the city is 10247 (upto March 2002).
Air quality stations	3 (2 residential, 1 industrial)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows a decreasing trend till 2007 and increasing thereafter till 2009. NO2 and SO2 showed a stable trend. (Figure 7.34).



6.3.35 JABALPUR

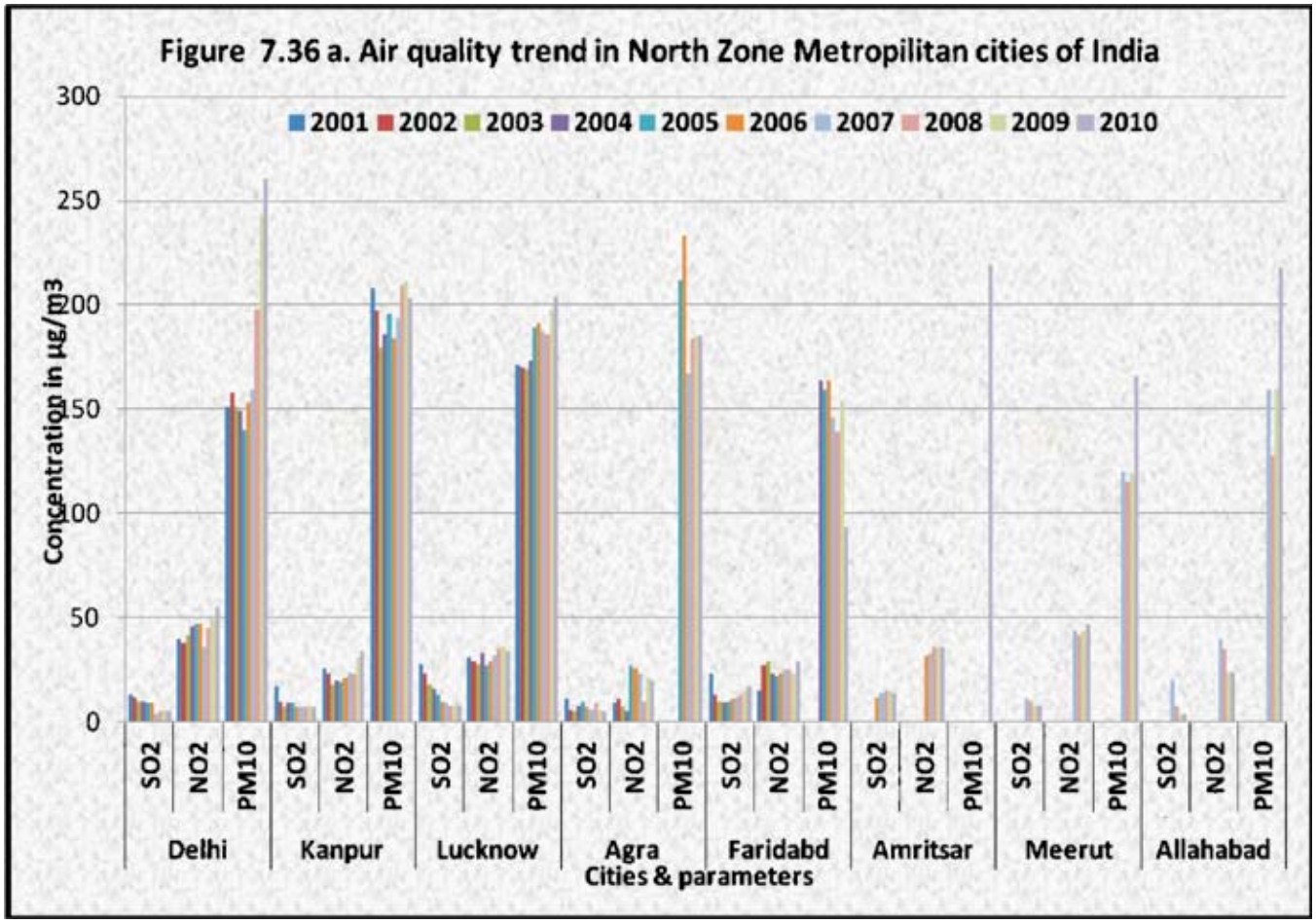
State	Madhya Pradesh
Location	23°6' N and 79°35'24"E, average elevation of 411 metres (1348 feet).
Area	131 km^2
Population	11,17,200
Climate	Humid subtropical climate. Summers start in late March and last up to June. May is the hottest month followed by the monsoon season, which lasts until early October. Winters start in early November and last until early March. Temperature: average minimum temperature of 18.3 °C and an average maximum of 32.1 °C. Rainfall annual rainfall of 1130 mm with June to September being the principal rainy period
Geography	rocks of Archaen era, Bijawars, Vindhyan, Gondwanas, Lametas and Deccan traps. Schists, gneiss and granite are prevalent in the Archaeans
Industries	Steel fabrication factories, food products, polythene, RCC hume pipes, plastic base factories, sodium silicate, telecom, air products, etc. The total number of registered small scale and cottage units in the city is 320.
Air quality stations	1 (1 residential)
Air quality trend	Analysis of nine year air quality data with respect to PM10 shows a fluctuating trend where the pollutant increases during 2005 and 2008 and slightly decreases duting 2009 but remaining above NAAQS. NO2 and SO2 showed a more or less stable trend. (Figure 7.35).



7.4 Air quality trend in different zones of India with respect to metropolitan cities

The trend in air quality in different zones viz. north, east, south, west and central zones are depicted in Figure 6.41 a, b, c, d and e respectively

Figure 7.36 Air quality trend in the different zones (north, east, south, west, central) in India



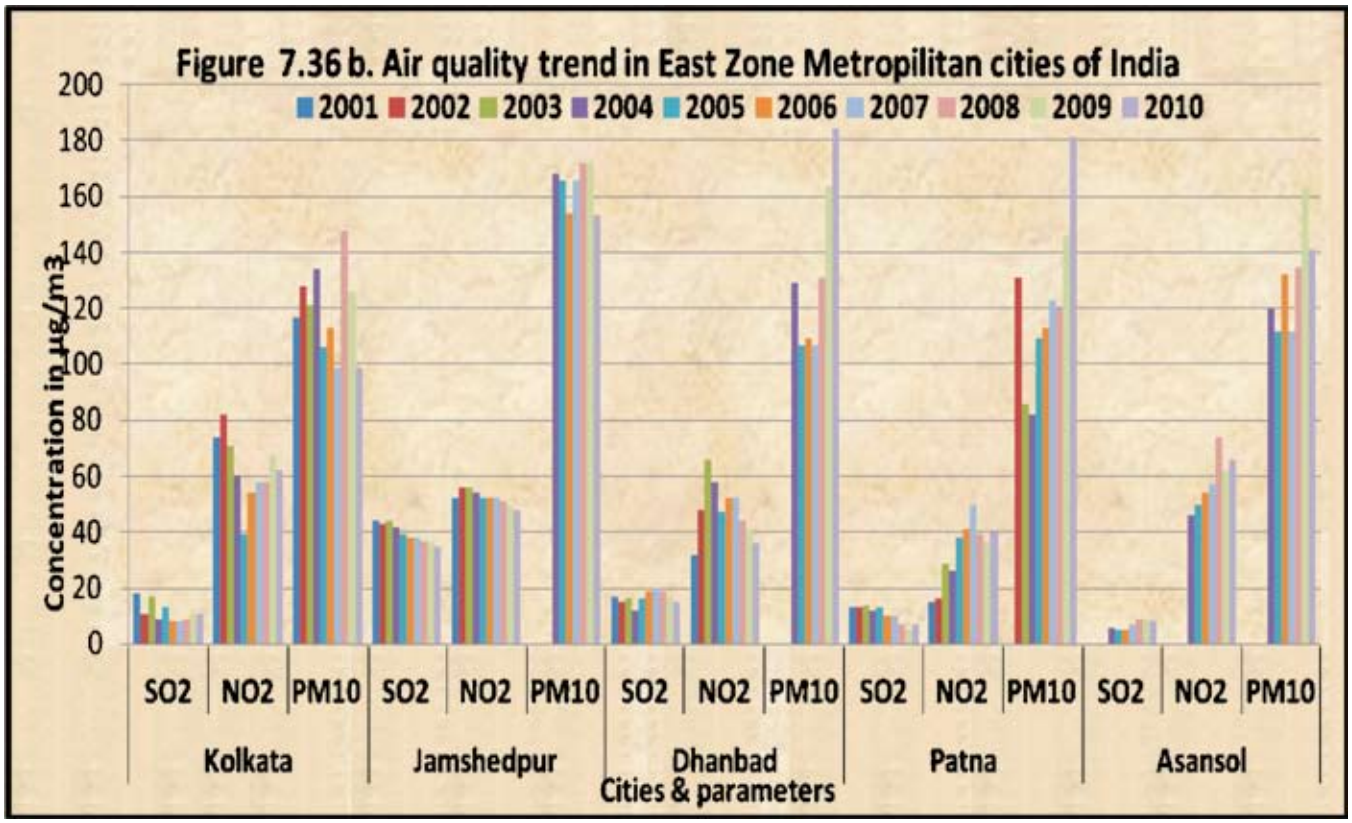


Figure 7.36 b. Air quality trend in East Zone Metropilitan cities of India
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Concentration in µg/m3
0 20 40 60 80 100 120 140 160 180 200
SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10
Kolkata Jamshedpur Dhanbad Patna Asansol
Cities & parameters

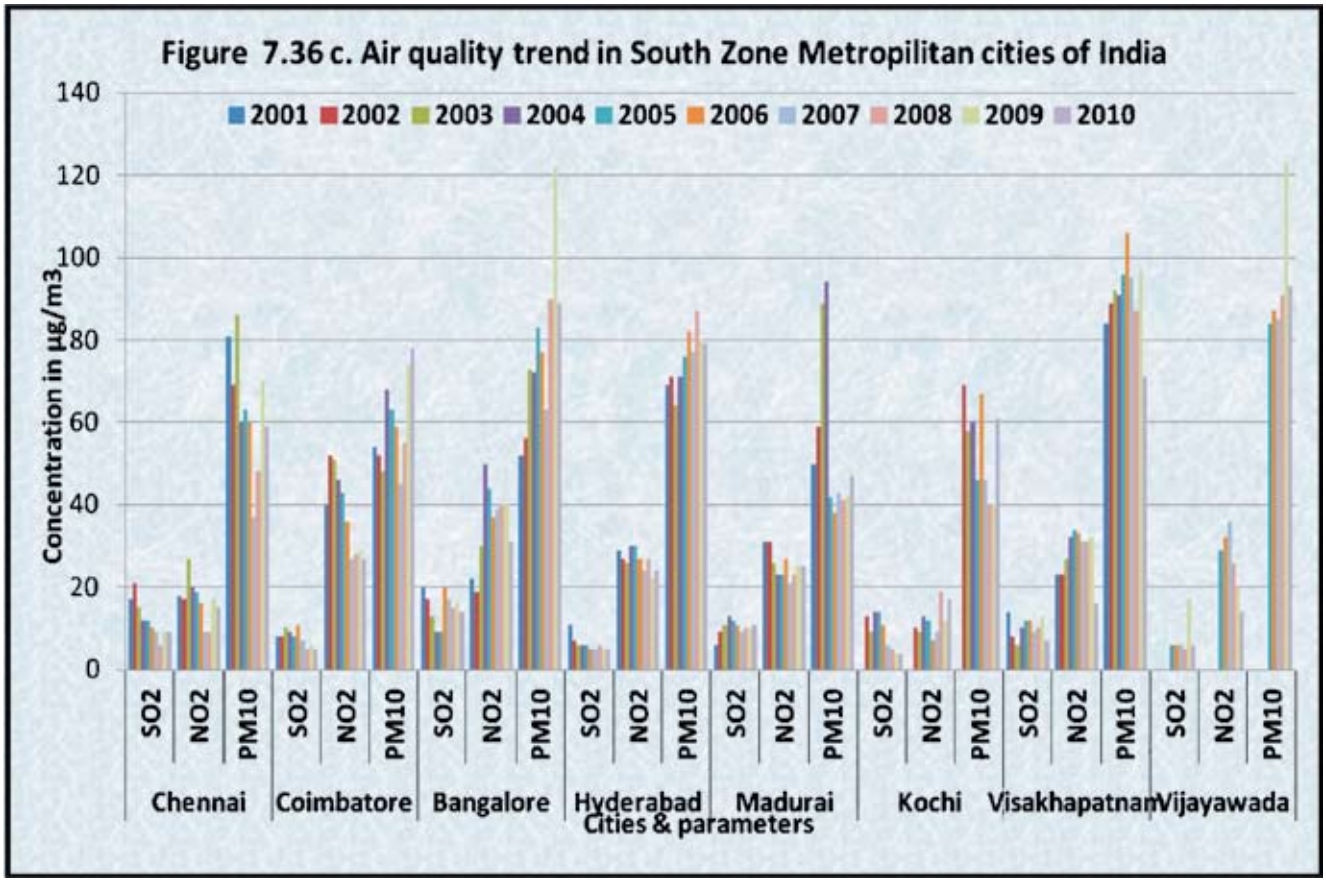


Figure 7.36 c. Air quality trend in South Zone Metropilitan cities of India
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Concentration in µg/m3
0 20 40 60 80 100 120 140
SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10 SO2 NO2 PM10
Chennai Coimbatore Bangalore Hyderabad Madurai Kochi Visakhapatnam Vijayawada
Cities & parameters

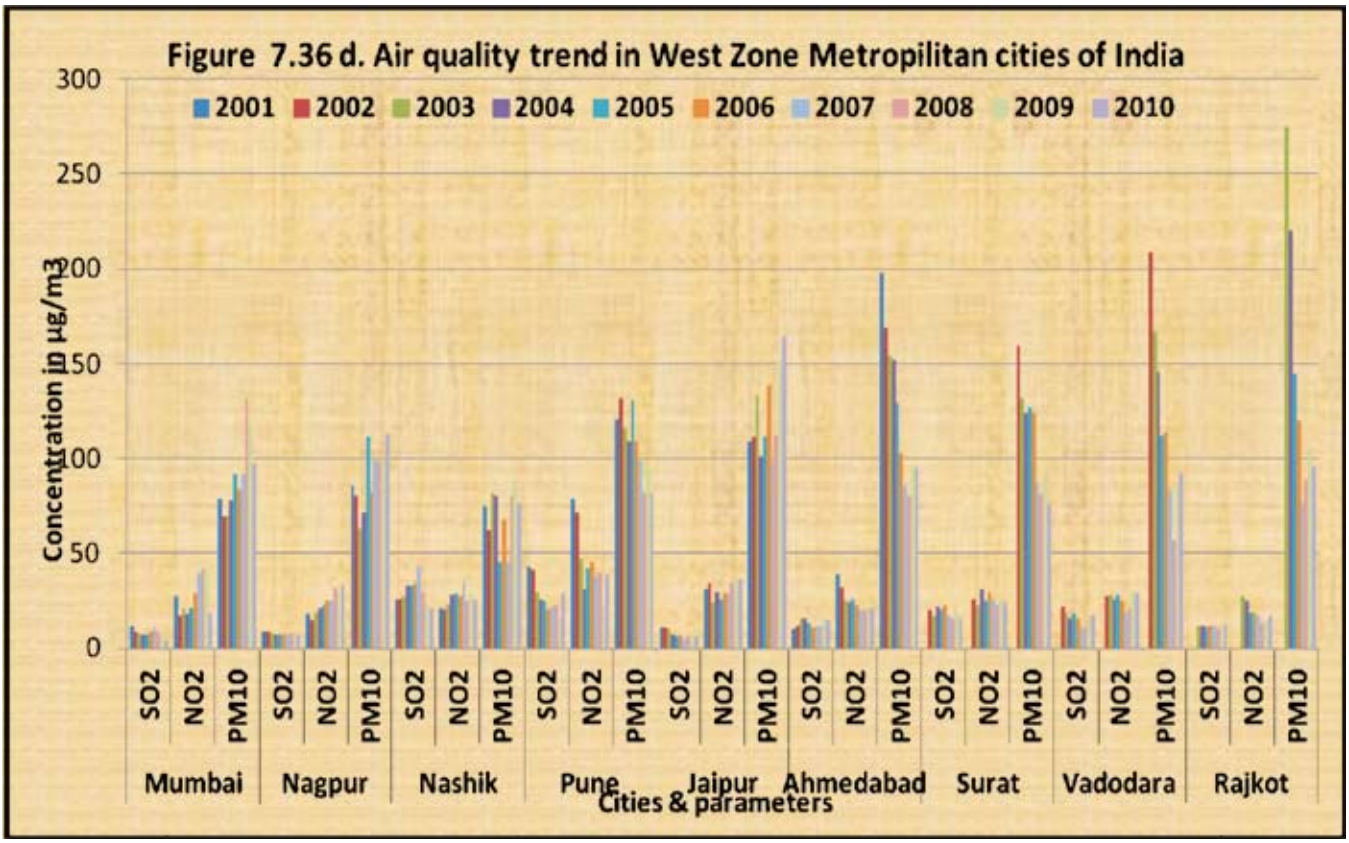


Figure 7.36 d. Air quality trend in West Zone Metropilitan cities of India
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Concentration in µg/m3
300
250
200
150
100
50
0
SO2 NO2 PM10
Mumbai
Nagpur
Nashik
Pune
Jaipur
Ahmedabad
Surat
Vadodara
Rajkot
Cities & parameters

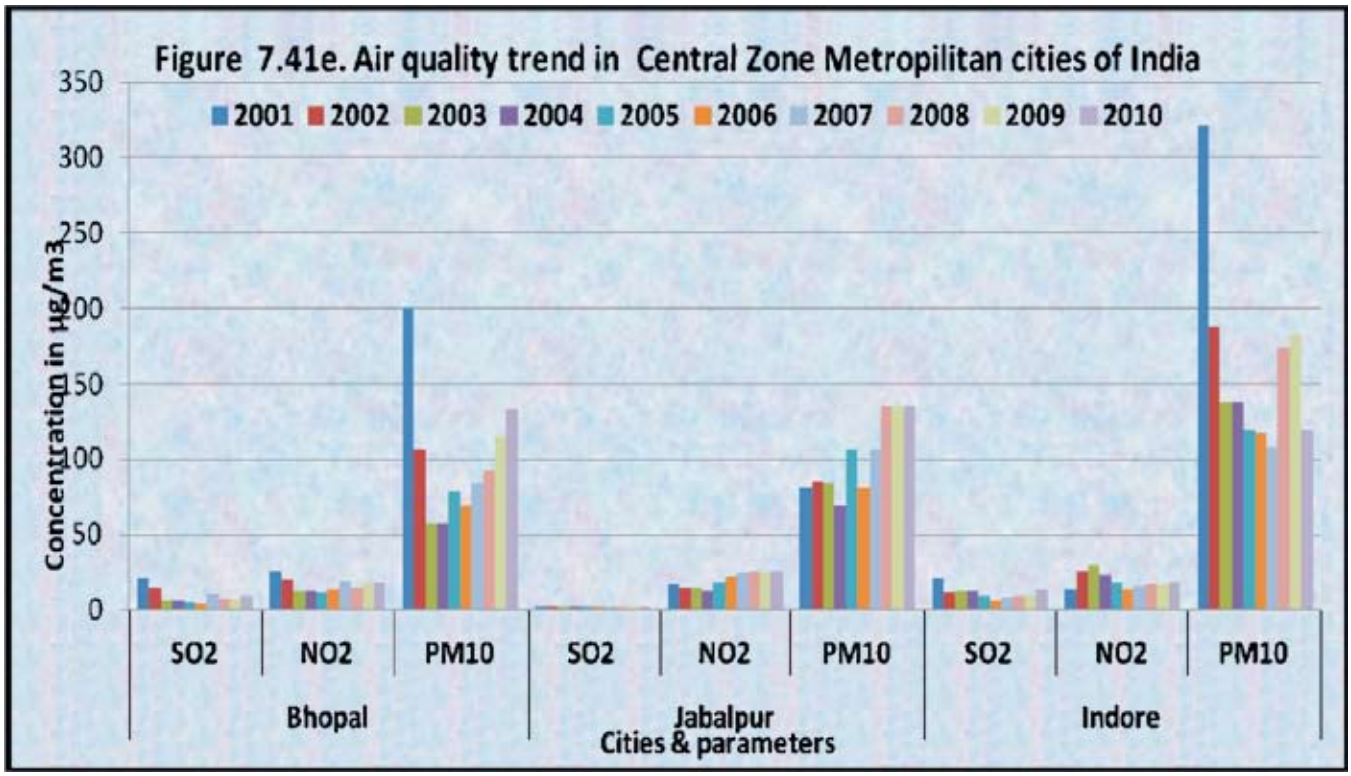


Figure 7.41e. Air quality trend in Central Zone Metropilitan cities of India
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Concentration in µg/m3
350
300
250
200
150
100
50
0
SO2 NO2 PM10
Bhopal
Jabalpur
Indore
Cities & parameters

In addition to criteria pollution like SO_2, NO_2 and PM_{10} Central Pollution Control board carried out four additional parameters such as Ammonia (NH_3), Carbon Monoxide (CO), Ozone (O_3) and Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$). NH_3 has been measured in six metro cities viz Delhi, Mumbai, Chennai, Kolkata, Nagpur and Hyderabad with the help of National Environmental Engineering Research Institute (NEERI) under NAMP.

8.1 Ammonia Levels

Annual average concentration of ammonia has been compared with the NAAQS. The air quality has been categorized into four broad categories based on an Exceedence Factor (the ratio of annual mean concentration of a pollutant with that of a respective standard). The four categories are low, moderate, high and critical as explained in earlier chapters. Low levels were observed in Nagpur, Kolkata and residential areas of Mumbai. Moderate levels were observed in Hyderabad, Delhi, Chennai and industrial areas of Mumbai. There was no exceedence of air quality standards (annual average and 24 hourly averages) at all the monitored locations except Parel in Mumbai. The air quality is given in Table 8.1. Annual average concentration of ammonia at 18 monitoring stations in 6 cities are given in Table 8.2

Table 8.1 : Ambient Air Quality wrt Ammonia in India during 2010

Pollution level	**Annual Mean Concentration Range ($\mu g/m^3$)**
Low (L)	0-50
Moderate (M)	51-100
High (H)	101-150
Critical (C)	> 150

STATE, UT / CITY	**Ammonia**	
AREA CLASS	**Industrial Areas**	**Residential Areas**
Andhra Pradesh		
Hyderabad	M	M
Delhi		
Delhi	M	M
Maharashtra		
Mumbai	M	L
Nagpur	L	L
Tamil Nadu		
Chennai	M	M
West Bengal		
Kolkata	L	L

Table 8.2: Summary of Ammonia Levels (Annual Average Concentration in $\mu g/m^3$) during 2010.

S.No.	State / UT	City	Location	Type of Area	No. of mon. days (n)	Min	Max	NH_3 Annual Average ($\mu g/m^3$)	10 percentile	50 percentile	90 percentile	Std. Dev.	% exceedence (24 hrly avg.)	Air Quality
1	Andhra Pradesh	Hyderabad	Nacharam	I	96	28	103	51	35	48	66	15	0	M
			Tarnaka	R	96	22	119	56	38	55	76	17	0	M
			ABIDS Circle	R	96	27	124	67	45	62	97	20	0	M
2	Delhi	Delhi	Mayapuri Ind. Area	I	96	32	136	84	59	87	108	20	0	M
			Sarojini Nagar	R	96	30	120	77	52	75	106	20	0	M
			Town Hall	R	96	44	137	89	66	84	121	22	0	M
3	Maharashtra	Mumbai	Parel	I	98	5	459	54	6	38	118	62	1	M
			Worli	R	103	5	317	47	7	33	93	53	0	L
			Kalbadevi	R	84	5	285	48	7	35	102	45	0	L
		Nagpur	Hingna Road	I	82	5	125	28	8	23	55	23	0	L
			Maskasath	R	99	5	107	39	13	32	75	25	0	L
			NEERI Lab., Nehru Marg	R	99	5	204	27	8	22	51	24	0	L
4	Tamil Nadu	Chennai	Thiruvottiyur Municipal Office	I	95	8	175	70	15	59	142	48	0	M
			Madras Medical College	R	94	6	166	65	18	45	138	46	0	M
			NEERI CSIR Campus	R	95	7	172	59	14	44	130	45	0	M
5	West Bengal	Kolkata	Cossipore	I	96	5	18	8	5	7	13	3	0	L
			Lal Bazaar	R	96	5	26	8	5	8	13	4	0	L
			Kasba	R	96	5	17	7	5	6	12	3	0	L

Note:- R – Residential and other areas, I – Industrial area, Std dev. – Standard deviation, n – number of days monitored for 16 and more hours a day L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedence factor (calculated for n ≥ 50 days), % exceedence (24 hrly avg.) – Percentage violation wrt NAAQS (24 hourly average).

8.2 Carbon Monoxide

a) CO levels at BSZ Marg (ITO)

Carbon monoxide is monitored at Bahadur Shah Zafar (BSZ) Marg, New Delhi using Non-Dispersive Infrared Spectrometry (NDIR) method. Monthly average and annual average concentration of CO is given in Table 8.3. The annual average concentration of CO was 2072 $\mu g/m^3$ during 2010 and monthly average concentration varied from 1246 $\mu g/m^3$ to 3624 $\mu g/m^3$. High levels of CO might be attributed to increase in vehicular population especially passenger cars in Delhi.

Table 8.3: Concentration of Carbon Monoxide (CO) at BSZ Marg, New Delhi during 2010

Months of 2010	CO Concentration ($\mu g/m^3$)
January	3624
February	3201
March	2660
April	2189
May	1740
June	1246
July	1421
August	1396
September	1253
October	1913
November	2784
December	1360
Annual Average	2072

NA – Data not adequate

b) CO levels at Siri Fort

Carbon monoxide is monitored at Siri Fort, New Delhi using Non-Dispersive Infrared Spectrometry (NDIR) method. Monthly average and annual average concentration of CO is given in Table 8.4. The annual average concentration of CO was 2727 $\mu g/m^3$ during 2010 and the monthly average concentration varied from 1184 $\mu g/m^3$ to 4238 $\mu g/m^3$. High levels of CO might be attr ibuted to increase in vehicular population especially passenger cars in Delhi.

Table 8.4: Concentration of Carbon Monoxide (CO) at Siri Fort, New Delhi during 2010

Months of 2010	CO Concentration ($\mu g/m^3$)
January	2357
February	1827
March	1518
April	1184
May	NA
June	NA
July	NA
August	NA
September	NA
October	2965
November	4238
December	3384
Average	2727

NA – Data not available

c) CO levels at Delhi College of Engineering (DCE), Bhawana

Carbon monoxide is monitored at Delhi College of Engineering (DCE), Bhawana, Delhi using Non-Dispersive Infrared Spectrometry (NDIR) method. Monthly average and annual average concentration of CO is given in Table 8.5. The annual average concentration of CO was 1014 $\mu g/m^3$ during 2010. The monthly average concentration varied from 426 $\mu g/m^3$ to 1930 $\mu g/m^3$. High levels of CO might be attributed to increase in vehicular population especially passenger cars in Delhi.

Table 8.5: Concentration of Carbon Monoxide (CO) at DCE, Bhawana, Delhi during 2010

Months of 2010	CO Concentration ($\mu g/m^3$)
January	1023
February	1166
March	1313
April	789
May	853
June	582
July	426
August	630
September	763
October	1132
November	1930
December	1391
Average	1014

NA – Data not available/not adequate

8.3 Ozone

a) Ozone level at BSZ Marg (ITO)

Ozone was measured at BSZ Marg (ITO) using continuous analysers. Monthly average and annual average concentration of Ozone are given in Table 8.6. The annual average concentration of Ozone was 33 $\mu g/m^3$ during 2010. The monthly average concentration of ozone varied from 15 $\mu g/m^3$ to 54 $\mu g/m^3$.

Table 8.6: Concentration of Ozone at BSZ Marg (ITO), New Delhi during 2010

Months of 2010	Ozone Concentration ($\mu g/m^3$)
January	15
February	25
March	36
April	30
May	31
June	33
July	41
August	54
September	36
October	42
November	26
December	24
Average	33

NA – Data not available/not adequate

Higher ozone concentrations are observed, in general, in Summer months as it is formed by photochemical reactions of NOx and VOCs. Ozone concentrations tend to peak in early to mid afternoon in areas where there is strong photochemical activity.

b) Ozone levels at Siri Fort

Ozone was measured at Siri Fort using continuous analysers. Monthly average and annual average concentration of Ozone are given in Table 8.7. The annual average concentration of Ozone was 34 $\mu g/m^3$ during 2010. The monthly average concentration of ozone varied from 24 $\mu g/m^3$ to 51 $\mu g/m^3$. The values indicate that ozone levels are within NAAQS.

Table 8.7: Concentration of Ozone at Siri Fort, New Delhi during 2010

Months of 2010	Ozone Concentration ($\mu g/m^3$)
January	51
February	37
March	31
April	26
May	NA
June	NA
July	NA
August	NA
September	NA
October	30
November	28
December	24
Average	34

NA – Data not available/not adequate

Higher ozone concentrations are observed, in general, in Summer months as it is formed by photochemical reactions of NOx and VOCs. Ozone concentrations tend to peak in early to mid afternoon in areas where there is strong photochemical activity. The values indicate that ozone levels are within NAAQS.

c) Ozone levels Delhi College of Engineering (DCE), Bhawana

Ozone was measured at Delhi College of Engineering (DCE) using continuous analysers. Monthly average and annual average concentration of Ozone are given in Table 8.8. The annual average concentration of Ozone was 72 $\mu g/m^3$ during 2010. The monthly average concentration of ozone varied from 36 $\mu g/m^3$ to 141 $\mu g/m^3$.

Table 8.8: Concentration of Ozone at DCE, Bhawana, Delhi during 2010

Months of 2010	Ozone Concentration ($\mu g/m^3$)
January	36
February	70
March	88
April	141
May	91
June	47
July	46
August	43
September	63
October	126
November	60
December	57
	72

NA – Data not available/not adequate

Higher ozone concentrations are observed, in general, in Summer months as it is formed by photochemical reactions of NOx and VOCs. Ozone concentrations tend to peak in early to mid afternoon in areas where there is strong photochemical activity. The values indicate that ozone levels are within NAAQS.

8.4 Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$)

a) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Pritampura, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Pritampura, New Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.9. The annual average concentration of $PM_{2.5}$ was 72 $\mu g/m^3$ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 30 $\mu g/m^3$ to 143 $\mu g/m^3$. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition.

Table 8.9: Concentration of $PM_{2.5}$ at Pritampura, New Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration ($\mu g/m^3$)
January	143
February	30
March	61
April	68
May	57
June	49
July	40
August	58
September	36
October	112
November	117
December	132
Average	72

NA – Data not available/not adequate

c) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Sirifort, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Sirifort, New Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.10. The annual average concentration of $PM_{2.5}$ was 103 $\mu g/m^3$ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 43 $\mu g/m^3$ to 235 $\mu g/m^3$. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition.

Table 8.10: Concentration of $PM_{2.5}$ at Sirifort, New Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration ($\mu g/m^3$)
January	155
February	182
March	187
April	107
May	235
June	131
July	63
August	43
September	61
October	88
November	77
December	53
Average	103

NA – Data not available/not adequate

d) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Janakpuri, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Janakpuri, New Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.11. The annual average concentration of $PM_{2.5}$ was 107 μg/m³ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 38 μg/m³ to 197 μg/m³. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition

Table 8.11: Concentration of $PM_{2.5}$ at Janakpuri, New Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration (μg/m³)
January	197
February	148
March	163
April	38
May	70
June	157
July	41
August	100
September	59
October	100
November	127
December	167
Average	107

NA – Data not available/not adequate

e) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Nizamuddin, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Nizamuddin, New Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.12. The annual average concentration of $PM_{2.5}$ was 79 μg/m³ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 22 μg/m³ to 261 μg/m³. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition.

Table 8.12: Concentration of $PM_{2.5}$ at Nizamuddin, New Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration (μg/m³)
January	261
February	NA
March	NA
April	65
May	59
June	162
July	30
August	22
September	33
October	91
November	80
December	103
Average	79

NA – Data not available/not adequate

e) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Shahzada Bagh, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Shahzada Bagh, New Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.13. The annual average concentration of $PM_{2.5}$ was 85 μg/m³ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 43 μg/m³ to 148 μg/m³. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition.

Table 8.13: Concentration of $PM_{2.5}$ at Shahzada Bagh, New Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration (μg/m³)
January	148
February	78
March	106
April	64
May	61
June	79
July	43
August	67
September	50
October	102
November	130
December	94
Average	85

NA – Data not available/not adequate

f) Particulate matter with size less than or equal to 2.5 μm ($PM_{2.5}$) at Shahdara, Delhi

Particulate matter with size less than or equal to 2.5 micrometer ($PM_{2.5}$) was measured at Shahdara, Delhi using continuous analysers. Monthly average and annual average concentration of $PM_{2.5}$ are given in Table 8.14. The annual average concentration of $PM_{2.5}$ was 85 μg/m³ during 2010. The monthly average concentration of $PM_{2.5}$ varied from 35 μg/m³ to 171 μg/m³. Higher $PM_{2.5}$ levels were observed in winter months as mixing height is lower in winter months resulting is less volume of troposphere for mixing and hence higher concentrations. Lower concentrations were observed in monsoon months as particulate matters are washed out due to wet deposition.

Table 8.14: Concentration of $PM_{2.5}$ at Shahdara, Delhi during 2010

Months of 2010	$PM_{2.5}$ Concentration (μg/m³)
January	171
February	106
March	119
April	68
May	54
June	44
July	44
August	60
September	35
October	100
November	137
December	88
Average	85

NA – Data not available/not adequate

8.5 Conclusion

It is observed Ammonia (NH_3) is within NAAQS in six metro cities. With respect to Ozone (O_3) the values at Delhi are within NAAQS, however in case of $PM_{2.5}$ and Carbon monoxide (CO) with respect to Delhi the value observed is mostly above the NAAQS. These observations indicate the vehicular pollution is the major cause of exceedence of CO and $PM_{2.5}$ in Delhi.

Various measures have been taken to control air pollution from vehicles, industries and other sources. The steps taken to control air pollution from vehicles and industries are as follows:

9.1 Measures taken to Reduce Vehicular Pollution

Automobile Pollution Control initiatives gained this year marks enforcement of a variety of control measures ranging from notification of advanced Euro-IV equivalent emission norms and commensurate fuel for new vehicles to stricter exhaust emission limits for in-use vehicles, augmentation of infrastructures for alternative fuels and mass transits and other urban planning and management options. This year marks the continuation of the implementation of the road map as recommended by the Auto Fuel Policy of India. The vehicular pollution control framework in the country has now shifted its focus towards integrated control and management options and has extended its domain to cover all major metro cities and now it is no more restricted only to capital of India. Important measures pertaining to vehicular pollution control initiated during this financial year are as follows:

Mass Emission Standards

Mass emission standards are the primary technical policy for controlling emissions from vehicles. The Motor Vehicle Act, 1988, and the Central Motor Vehicles Rules (CMVR), 1989, are the principal instruments for regulation of motor vehicular traffic /emissions throughout the country. The implementation of various provisions of this Act rests with the state governments. The Ministry of Road Transport and Highways (MRTH) acts as a nodal agency for the formulation and implementation of various provisions of the Motor Vehicle Act and CMVR.

- Mass Emission Standards (Bharat Stage IV) have been notified for all categories of new vehicles (except two and three wheelers) in 11 mega cities, to be implemented on or after the 1st April, 2010.
- Mass Emission Standards (Bharat Stage III) have been notified for two and three wheelers all over the country, to be implemented on or after the 1st April, 2010.
- Mass Emission Standards (Bharat (Trem) Stage III) have been notified for every diesel driven agricultural tractors, to be implemented on or after the 1st April, 2010 for the category < 37KW and on or after the 1st April, 2011 for the category >37 KW.
- Mass Emission Standards (Bharat Stage III) have been notified for two and three wheelers, to be implemented on or after the 1st April, 2010.

Fuel Quality Specifications

- Auto-Fuels commensurate to Euro III (whole country) and Euro IV (for 11 cities) specifications is proposed to be made available in the respective cities from 01.04.2010.
- The Research Octane Number (RON) for premium petrol available in 11 mega cities has been boosted to 95 with lead content being reduced to 0.005 g/l and benzene content of maximum 1%. From 01.04.2010, the content of sulphur in gasoline is proposed to be reduced to 0.005% (50 mg/kg) from existing 0.015% (150 mg/kg). However, all over the country, content of sulphur in gasoline is proposed to be 0.015% (150 mg/kg) from 01.04.2010.
- For diesel the Cetane Number has been enhanced to 51 with Sulphur content proposed to be reduced further to 0.005 % (50 mg/kg) in the 11 mega cities by 01.04.2010. The amount of sulphur in diesel is proposed to be 0.035% (350 mg/kg) all over the country
- Important fuel specification of Diesel and Gasoline as available in metro cities from 01.04.2010 are as follows:

Important Fuel Specifications of Diesel and Gasoline

Specifications	Requirements
DIESEL	
Cetane Number (CN), min	51
Total Sulphur, max	0.005 % (50 mg/kg)
Distillation , 95% vol. recovery at 0^0C, max	360 ^{0}C
Polycyclic Aromatic Hydrocarbon (PAH), max	11 % mass
GASOLINE	
Research Octane number (RON), min	95
Reid Vapour pressure (RVP), max	60 kpa
Benzene content, max	1% Volume
Lead content (as Pb),max	0.005 g/l
Sulphur, total, max	0.005 % (50 mg/kg)
Aromatics content, max	35 % volume
Oxygen content, max	2.7 % volume

In-Use Vehicles

- The tourist transport operators shall not engage or use any vehicle for the purpose of journey, the origin and destination of which falls within the National Capital Region (NCR), unless such vehicle conforms to the mass emission standards (Bharat Stage III), notified vide GSR 58(E) dated January 30, 2009.
- MRTH has constituted a task force to introduce auditing system in PUC centers all over the country, to look into various aspects related to procedure, implementation and suggest effective institutional mechanism for the same, in which CPCB is one of the members.

Alternate Fuels - Initiatives

There has been lot of developments in this front when various organizations including the Planning Commission, Oil Companies, Auto Sectors, CPCB and other research agencies initiated various demonstration and feasibility studies with alternative fuels like LPG and bio-diesel (B20) in the country. Some of the developments are depicted below:

- Bio-fuels mainly Ethanol and Biodiesel (in B20 form) are the prospective options for India. Pilot studies on ethanol and biodiesel have been completed and many are on-going.
- Efficacy of B20 biodiesel from Jatropa feedstock has been established and experiences gained through some pilot studies. Introduction of biodiesel starting with lower blends like B5, B10, etc. is a possibility now.
- In Kolkata all three wheelers have been ordered to switch over to LPG mode from September, 2005 vide notification No. 2421-WT/3M-73/2005 dated May 24, 2005.
- Besides Delhi & Mumbai, the supply of CNG as automotive fuel has been extended to the cities of Ankleshwar, Vadodra & Surat in Gujarat and Kanpur, Bareli, Agra & Lucknow in Uttar Pradesh. The total CNG vehicles in the country touching over 3.54 Lakh, as per the industry estimates.
- Work is on to introduce bio-diesel in the form of B20 as an automotive fuel in India. Several research studies and field trials have been initiated by Organizations like –IITs, IOC, Mercedes, Railways, etc. Already "Jatropha Carcus" has been identified and earmarked to be the prominent source of biodiesel in the country.
- Efforts for developing and popularizing electric vehicles also gained momentum during this year. Already "Reva Motors" have commercialized a small electric/battery car. Many three-wheeler manufacturers are also contemplating electric driven OEM for Indian markets.

Other Measures

- Various traffic management options have been adopted by many cities. Governments to deal with the increasing vehicle population and to ensure smooth traffic flow. Synchronized traffic lightings with timers, bus-only lanes, parking area demarcation, etc. are few steps initiated in many metro cities of India.

- Bus Rapid Transit System (BRTS) aims at segregation of traffic in various lanes according to type of vehicles. Through BRTS it is expected that the hindrance caused to speed of fast moving vehicles by speed of slow moving vehicles will overcome and mass transit vehicles i.e. buses will move in optimal way. In Delhi BRTS is has been implemented at some of the stretches during 2008 and it is proposed to expand in other stretches of the city in a phased manner.

- Road-infrastructure development, management and by-passing of inter- state vehicles, parking restrictions, etc. are other measures being adopted in the cities. Cities like Delhi, Mumbai, Kolkata, Pune etc. have constructed many flyovers and multi-lane roads to ease traffic congestion.

- The Delhi metro line has been extended to various stretches of Delhi for catering more people thereby promoting use of mass public transport system. Other cities are also exploring to start metros and other mass transport systems.

- Interstate trucks which are not destined to Delhi are not allowed to ply within the city limits.

9.2. Measures Taken for Controlling Air Pollution from Industries

The measures taken for controlling air pollution from industries are as follows:

Emission standards have been notified under the Environment (Protection) Act, 1986 to check pollution.

Industries have been directed to install necessary pollution control equipment in a time bound manner and legal action has been initiated against the defaulting units.

24 critically polluted areas have been identified. Action Plan have been formulated for restoration of environmental quality in these areas.

Environmental guidelines have evolved for siting of industries.

Environmental clearance is made compulsory for 29 categories of development projects involving public hearing/ NGO participation as an important component of Environmental Impact Assessment process.

Environmental audit in the form of environmental statement has been made mandatory for all polluting industries.

Preparation of zoning Atlas for siting of industries based on environmental considerations in various districts of the country has been taken up.

Power plants (coal based) located beyond 1000 kms from the pit-head are required to use low ash content coal (not exceeding 34%) with effect from 1.6.2002. Power plants located in the sensitive areas are also required to use low ash coal irrespective of their distance from the pit head.

9.3. Action Plan for the control of air pollution in sixteen cities identified by the Hon'ble Supreme Court of India

With the objective of controlling these rapidly burgeoning air pollution problems in our country, the Hon'ble Supreme Court of India, in the matter of CWP No. 13029 of 1995, passed the orders on 05.04.2001, regarding formulation and implementation of action plans for control of pollution in selected cities. The Hon'ble Court stressed the need for such initiatives relating to vehicular pollution in Delhi and directed that action plan for pollution control in the cities/ towns, which do not meet the ambient air quality standards, should be prepared.

On August 14, 2003, the Hon'ble Supreme Court passed the following direction: "CPCB's report shows that the Respirable Particulate Matter (in short "RSPM") levels in Ahmedabad, Kanpur, Sholapur, Lucknow, Bangalore, Chennai, Hyderabad, Mumbai and Kolkata are alarming."

"Issue notices to the States of Maharashtra, Andhra Pradesh, Gujarat, Uttar Pradesh, Karnataka and Tamil Nadu. In the Meantime, we direct that the Union of India and the respective States shall draw a plan for lowering the rate of RSPM level in the aforesaid cities. After the plan is drawn, the same would be placed before EPCA. This may be done within a period of two months. We are excluding Mumbai and Kolkata where the respective High Courts are stated to be monitoring the RSPM levels in those cities. EPCA after examining the matter shall submit a report to this Court within a period of four weeks thereafter."

Further Central Pollution Control Board has also identified various non- attainment cities all over the country on the basis of national ambient air quality data under NAMP. Central Pollution has been coordinating with the concerned state governments of the sixteen critically polluted cities identified by the Hon'ble Supreme Court of India as well as non-attainment cities identified by itself for the preparation of action plan for the control of air pollution in all these cities. Further CPCB is also reviewing and monitoring the implementation of the action plans prepared for these critically polluted as well as non- attainment cities. So far State Governments of the all the sixteen critically polluted cities as identified by the Hon'ble Supreme Court of India have submitted their action plan for controlling air Pollution from all the major sources including industrial, vehicular & domestic sources. The major actions those have been proposed for almost all the cities are:

Industrial Pollution

- Shifting of Industries from non- confirming zones.
- Switching over to clean technologies.
- Using clean fuels.
- Installation of Pollution control Devices.
- Development of green belt, etc.

Vehicular Pollution

- Implementation of the emission norms as well as fuel quality in accordance with the road map proposed by the Auto Fuel Policy.
- Switching over to clean alternate fuels like CNG, LPG & Bio-fuels.
- Augmentation in Public Transport system
- Better traffic management
- Implementation of fiscal measures, etc

Domestic Pollution

- Ban on open burning of garbage, biomass, etc.
- Augmentation on supply of LPG as cooking fuel , etc.

Central Pollution Control Board along with EPCA has been regularly reviewing action plan submitted by State Pollution Control Boards, further it is also monitoring the timely implementation of the action plan.

SUMMARY OF AMBIENT AIR QUALITY DURING 2010

1. Summary of air quality scenario in different locations

- Analysis of annual average concentration of ambient air quality reveal that 295 locations exceeded the standard of 60 $\mu g/m^3$ (annual) in residential / industrial / rural / other area and 17 locations exceeded the standard of 60 $\mu g/m^3$ (annual) in ecologically sensitive areas with respect to PM_{10}

- With respect to $NO_{2,}$ 67 locations exceeded the standard of 40 $\mu g/m^3$ (annual) in residential / industrial / rural / other area and 4 locations exceeded the standard of 30 $\mu g/m^3$ (annual) in ecologically sensitive areas

2. Summary of air quality scenario in different cities

- Analysis of annual average concentration of ambient air quality in residential / industrial / rural / other area reveals that 130 cities exceeded the standard of 60 $\mu g/m^3$ (annual) with respect to PM_{10}. Patna, Raipur, Delhi Ahmedabad, Ranchi, Bhopal, Mumbai, Amritsar, Jaipur, Lucknow, and Kolkata are critical.

- With respect to $NO_{2,}$ 19 cities exceeded the standard of 40 $\mu g/m^3$

- Cities like Badlapur and Ulhasnagar (Maharashtra), Asansol, Durgapur, Barrackpur, Howrah, Kolkata Raniganj and Sankrail (West Bengal) are critical with respect to both NO_2 and PM_{10}

3. Summary of air quality scenario in different states

- Analysis of annual average concentration of ambient air reveled Jharkhand had maximum SO_2, West Bengal highest NO_2 and Delhi highest PM_{10} concentration (annual average of residential / industrial / rural / other area and ecologically sensitive area)

4. Summary of air quality scenario in different metropolitan cities

- Analysis of annual average concentration of ambient air quality in residential / industrial / rural / other and ecologically sensitive area of metropolitan cities revealed that out of 35 cities, 33 cities exceeded the NAAQS of 60 $\mu g/m^3$ for $PM_{10.}$

- With respect to NO_2 5 cities exceeded the standard of 40 $\mu g/m^3$ (annual).

- No metropolitan city exceeded the standard limit of 50 $\mu g/m^3$ (annual) for SO_2 during 2010

5. Percent exceedence of ambient air quality standard

- With respect to residential/industrial/rural area, considering annual average 11% and 82% location for NO_2 and PM_{10} exceeded NAAQS respectively

- Taking 24-hourly average data into consideration, 5%, 15% and 88% location for SO_2, NO_2 and PM_{10} exceed NAAQS respectively for residential / industrial / rural / other area.

- With respect to ecologically sensitive area, considering annual average concentration, 17% and 65% locations for NO_2 and PM_{10} exceeded NAAQS respectively

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Air Pollutants, their sources and effects

Annexure 1

Pollutant	Possible Sources		Effects	
	Natural	Anthropogenic	Human / flora / fauna	Environment & Property
Sulphur dioxide (SO_2) **SO_2** is the chemical compound produced by volcanoes and in various industrial processes and are also a precursor to particulates in the atmosphere.	• Volcanos (67%)	• combustion of fossil fuel (coal, heavy fuel oil in thermal power plants, office, factories) • paper Industry • extravtion & distribution of fossil fuels • smelting of metals (sulfide ores to produce copper, lead and zinc) • Petroleum refining • combustion process in diesel, petrol, natural gas driven vehicles	• respiratory illness • visibility impairment • aggravate existing heart and lung diseases	• acid rain • aesthetic damage
Oxides of Nitrogen (NOx) Oxides of nitrogen are a generic term for a group of highly reactive gases that contain nitrogen and oxygen in varying amounts. NOx are emitted as nitrogen oxide (NO) which is rapidly oxidized to more toxic nitrogen dioxide (NO2) Nitrogen dioxide (NO_2) is a reddish-brown toxic gas with a characteristic sharp, biting odor and is a prominent air pollutant.	• Lightning • Forest fires • Bacterial activity of soil	• High temperature combustion (internal combustion engines, fossil fuel-fired power stations, industrial) • Burning of Bio-mass and Fossil Fuels	• irritates the nose and throat • increase susceptibility to respiratory infections	• Precursor of ozone formed in the troposphere • Form atmospheric fine particulate matter burden as a result of oxidation to form nitrate aerosol
Respirable Suspended Particulate Matter (PM_{10}, size ≤ 10μm, coarse fraction PM_{10} - $PM_{2.5}$). called thoracic fraction) Particulate matter (PM) is a complex mixture of suspended solid and liquid particle in semi equilibrium with surrounding gases. The major constituents of RSPM are organic and elemental carbon, metals/elements like silicon, magnesium, iron, ions like sulphates, nitrates, ammonium etc. PM10 can settle in the bronchi and lungs and cause health problems	• Coarse particles are produced by the mechanical break-up of larger solid particles. • Wind blown dust such as road dust, fly ash, soot, agricultural processes • physical processes of crushing, grinding and abrasion of surfaces. photochemically • produced particles, such as those found in urban haze • Pollen grains, mould spores, and plant and insect parts • Non-combustible materials released when burning fossil fuels.	• Road traffic emissions particularly from diesel vehicles • Industrial combustion plants some public power generation • Commercial and residential combustion • Non-combustion processes (e.g. quarrying) • agricultural activities	• cardio-pulmonary problems • asthma, bronchitis, and pneumonia in older people	Visibility reduction

Pollutant	Possible Sources		Effects	
	Natural	Anthropogenic	Human / flora / fauna	Environment & Property
Particulate Matter 2.5 ($PM_{2.5}$, size ≤ 2.5μm, **fine** fraction size up to 2.5 μm, respirable fraction) Airborne particles smaller than 2.5 μm called fine particles. Composed mainly of carbonaceous materials (organic and elemental), inorganic compounds (sulfate, nitrate, and ammonium), and trace metal compounds (iron, aluminium, nickel, copper, zinc, and lead). pose the greatest problems, $PM_{2.5}$, tend to penetrate into the gas exchange regions of the lung, and very small particles (< 100 nanometers) may pass through the lungs to affect other organs. The smallest particles, however, less than 100 nm (nanoparticles) can get into the bloodstream and affect the cardiovascular system	• Fine particles are largely formed from gases. • Ultrafine particles are formed by nucleation, which is the initial stage in which gas becomes a particle. These particles can grow up to a size of 1μm either through condensation, when additional gas condensates or coagulation	• Vehicular emission • Industrial combustion plants some public power generation • Commercial and residential combustion	• oxidative stress • respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing • decreased lung function • aggravated asthma • chronic bronchitis • irregular heartbeat cardio-pulmonary disordera • premature death in people with heart or lung disease	• aesthetic damage • visibility reduction
Ozone(O_3) Ozone is a pale blue gas, soluble in water and non-polar solvents with specific sharp odor somewhat resembling chlorine bleach. Ozone is a secondary pollutants formed in the atmosphere by reaction between oxides of nitrogen and volatile organic compounds (VOCs) in the presence of sunlight. Peak O_3 levels occur typically during the warmer times of the year.	• ozone is present in the atmosphere in the stratosphere, in a region also known as the ozone layer between about 10 km and 50 km above the surface	• formed by the reaction of sunlight on air containing hydrocarbons and nitrogen oxides emitted by car engines, industrial operations, chemical solvents to form ozone • electronic equipment such as photocopiers	• lung function deficits • respiratory illness • premature death, asthma, bronchitis, heart attack, and other cardiopulmonary problems. • ground-level ozone and pollution which interferes with photosynthesis and stunts overall growth of some plant species	• Ozone cracking in car tires, gaskets, O-rings is caqused by attack of ozone on any polymer possessing olefinic or double bonds within its chain structure, • ozone present in the upper troposphere acts as a greenhouse gas, absorbing some of the infrared energy emitted by the earth.
Lead Lead is a bright silvery soft, dense, ductile, highly malleable, bluish-white metal that has poor electrical conductivity heavy metal and is highly resistant to corrosion.	• food (lead is absorbed by plants)	• Waste incineration • Metal processing • Paint Industry • lead solder in food cans, breast milk, drinking water, Cosmetics, ceramic pottery, burning of firewood or kerosene, indigenous remedies, tobacco and tobacco products, contaminated drinking water, toys, industrial effluents, lead acid batteries, ammunition, paints and varnishes, water pipes • automobile exhaust,	• Pb is rapidly absorbed into the bloodstream and is believed to have adverse effects on the central nervous system, the cardiovascular system, kidneys, and the immune system • causes blood disorders like anemia increase in blood presssure. • potent neurotoxin that accumulates both in soft tissues and the bones. • causes nephropathy, and colic-like abdominal pains. • weakness in fingers, wrists, or ankles. • Miscarriage and reduction of fertility in males, delayed puberty in girls • permanently reduce the cognitive capacity of children	

Pollutant	Possible Sources		Effects	
	Natural	Anthropogenic	Human / flora / fauna	Environment & Property
Carbon monoxide (CO) . also called **carbonous oxide**, is a colorless, odorless and tasteless gas which is slightly lighter than air. It is highly toxic to humans and animals in higher quantities. Mainly formed by incomplete combustion of carbon containing fuels.	• produced during normal animal metabolism (by the action of heme oxygenase 1 and 2 on the heme from hemoglobin breakdown and produces carboxyhemoglobin in normal persons) in low quantities and has some normal biological functions (signalling molecule) • volcanic activity • forest and bushfires	• Exhaust of internal combustion engines, especially of vehicles with petrol engines • Burning of carbon fuels • organic combustion in waste incineration • power station processes • Iron smelting • burning of crop residues	• CO enters the bloodstream through lungs and combines with hemoglobin forms carboxyhemoglobin.This condition is known as anoxemia, which inhibits blood's oxygen carrying capacity to organs and tissues. • Persons with heart disease are sensitive to CO poisoning and may experience chest pain if they breathe the gas while exercising. • adverse effects on the fetus of a pregnant woman • Infants, elderly persons, and individuals with respiratory diseases are also particularly sensitive. • anti-inflammatories, vasodilators and encouragers of neovascular growth	
Ammonia (NH3) A compound of nitrogen and hydrogen, a colourless gas with a characteristic pungent odour. Contributes significantly to the nutritional needs of terrestrial organisms by serving as a precursor to food and fertilizers, and either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals.	• putrefaction of nitrogenous animal and vegetable matter • Ammonia and ammonium salts are also found in small quantities in rainwater, fertile soil and in seawater • during volcanic erruption • The kidneys secrete NH_3 to neutralize excess acid	• Farms • Fertilizers Industry • Industrial sites that store ammonia or use it as a refrigerant can release high levels if the chemical leaks or is spilled	• irritating to skin, eyes, throat, and lungs and cause coughing • burns • Lung damage and death may occur after exposure to very high concentrations of ammonia	Odour
Benzene (C6H6) Benzene is a colorless, sweet smelling liquid. Benzene is generated whenever carbon-rich materials undergo incomplete combustion. Benzene is generated whenever carbon-rich materials undergo incomplete combustion.	• volcanoes • forest fires	• Combustion of fuel (automotive fuel, wood and stationary fossil fuel, other aromatics • evaporation (fuel storage containers, during refueling • Industrial emission • Coke oven • Perchlorethlyene is emitted from some dry cleaning facilities • tobacco smoke, wood smoke • glues, paints, furniture wax, and detergents	• Hematotoxic, neurotoxic, leukemogenic, carcinogenic effects • Chronic exposure to benzene may causechromosomal damage, immune suppression, aplastic anemia, myelodysplastic syndrome, leukemia, non-Hodgkins's lymphoma, and cancer of the lung and nasopharynx • Effect the Reproductive system, developing fetus and fertility in men, low birth weights, delayed bone formation, and bone marrow damage	

Pollutant	Possible Sources		Effects	
	Natural	Anthropogenic	Human / flora / fauna	Environment & Property
Polyaromatic hydrocarbons (BaP) (particulate phase only) is a five-ring polycyclic aromatic hydrocarbon whose metabolites are mutagenic and highly carcinogenic	• coal tar (after a forest fire), • eruption of volcanoes	• Incomplete combustion of fuels (processing of coal and crude oil) • Combustion of natural gas • Road transport • Industrial plant • Tobacco smoke • coal tar • automobile exhaust fumes (especially diesel engines), in all smoke resulting from the combustion of organic material • charbroiled food, burnt toast, cooked meat products, in burnt foods such as coffee	• Mutagenic and highly carcinogenic (skin, lung, and bladder cancer in humans and in animals) • skin rash or eye irritation Bronchitis	
Arsenic (As) is a solid layered, a ruffled analogue of graphite, metallic gray in color and is a semiconductor. It is a potent poison IARC) recognizes arsenic and group I carcinogen (IARC)	• volcanic ash, weathering of the arsenic-containing mineral and ores as well as groundwater. • food, water, soil and air	• Smelting of metals, • Combustion of fuels (especially of low-grade brown coal) • Use of pesticides. • wood preservation, glass production, nonferrous metal alloys, electronic semiconductor manufacturing. • coke oven emissions associated with the smelter industry	• epigenetic changes • multi-system organ failure • As poisoning	
Nickil (Ni) a silvery-white lustrous corrosion-resistant metal with a slight golden tinge	• urease (an enzyme which assists in the hydrolysis of urea) contains nickel	• Combustion of fossil fuels • Nickel plating • Metallurgical processes	• Nickel sulfide fume and dust is believed to be carcinogenic • allergy, dermatitis. Sensitivity to nickel may also be present in patients with pompholyx.	explosive in air

Methods of Measurement of twelve notified parameters in Ambient Air

(NAAQS notified in November 2009)

a) Sulphur Dioxide (SO_2) in Ambient Air

Sulphur dioxide content in the ambient air is measured by the modified West and Gaeke method. Sulphur dioxide in ambient air is absorbed in a solution of 0.04M sodium tetrachloromercurate at an average flow rate of 1 liter per minute (LPM), resulting in the formation of dischlorosulphitomercurate complex. The main interference is due to the oxides of nitrogen, ozone and trace metals. Interference from oxides of nitrogen can be prevented by adding sulphamic acid, which acts as a reducing agent and converts some of the oxygenated nitrogen species to nitrogen gas. Interference from ozone can be eliminated by aging the sample prior to analysis. Interference from trace metals can be prevented by adding EDTA (disodium salt) to the unexposed absorbing solution. For analysis, the exposed sample is treated with sulphamic acid, formaldehyde and acid bleached pararosaniline containing hydrochloric acid. Pararosaniline, formaldehyde and bisulfite anion react to form violet red coloured pararosaniline methyl sulphonic acid. The intensity of the colour is measured on a spectrophotometrer at 560 nm wavelength. The detection range of the SO_2 concentration is 4 – 1050 $\mu g/m^3$.

Concentration of sulphur dioxide in the range of 25-1050 $\mu g/m^3$ can be measured under the conditions given one can measure concentration below 25 $\mu g/m^3$ by sampling larger volumes of air, but only if, the absorber efficiency of the particular system is first determined and found to be satisfactory. Higher concentration can be analyzed by using smaller gas samples of a suitable aliquot of the collected sampler. Beer's law is followed through the working range from 0.03 to 1.0 absorbance unit. This corresponds to 0.8-27 μg of sulfite ion in 25 ml of final solution calculated as sulphur dioxide. The lower limit of detection of sulphur dioxide in 10 ml absorbing reagent is 0.75 μg based on twice the standard deviation, which represent a concentration of 25 $\mu g/m^3$ in an air sample of 30 litres.

b) Nitrogen dioxide (NO_2) in Ambient Air

In the method the NO_2 from ambient air is absorbed in a solution of sodium hydroxide and sodium arsenite. Sulphur dioxide is the major interfering compound. The interference of sulphur dioxide is eliminated by converting it to sulphuric acid by addition of hydrogen peroxide. The absorbed nitrogen dioxide is then reacted with sulphanilamide in the presence of phosphoric acid at a pH of less than 2 and then coupling it with N-(1Nepthyl) ethylenediamine dihydrochloride. The absorbance of the highly coloured azo dye is measured on spectrophotometer at a wavelength of 540 nm. The detection range of the NO_2 concentration is 9 – 750 $\mu g/m^3$. The concentration of nitrite ion (NO^-_2) produced during sampling is determined colorimetrically by reacting the nitrite ion with phosphoric acid, sulfanilamide, and N-(1-naphthyl)-ethylenediamine di-hydrochloride (NEDA) and measuring the absorbance of the highly colored azo-dye at 540 nm.

a) The nominal range of the method is 9 to 750 μg NO_2/m^3 (0.005 to 0.4 ppm)[3]. The range of the analysis is 0.04 to 2.0 μg NO^-_2/ml, following Beer's Law throughout this range (0 to 1.0 absorbance units). Under the specified conditions of 50 ml of absorbing reagent, a sampling rate of 200 cm^3 /min for 24 hours, and a sampling efficiency of 0.82, the range of the method is, therefore, 9 to 420 $\mu g/NO_2/m^3$ (0.005 to 0.22 ppm). Nitrogen dioxide concentrations in the range of 420 to 750 $\mu g/m^3$ (0.22 to 0.4 ppm) are accurately measured by 1:1 dilution of the collected sample.

b) Based on results from a collaborative study, the within laboratory standard deviation is 8 $\mu g/m^3$ (0.004 ppm) and the between laboratory standard deviation is 11 $\mu g/m^3$ (0.006 ppm) over the range of 50 to 300 μg NO_2/m^3 (0.027 to 1.16 ppm)[4].

c) Based on results from a collaborative study, the method has an average bias of -3% over the range of 50 to 300 μg NO_2/m^3 (0.027 to 0.16 ppm.

c) Respirable Suspended Particulate Matter (RSPM/ PM_{10}) in Ambient Air

PM_{10} are the particulate matter having aerodynamic diameter less than or equal to 10 μm size is a fraction of the particulate matter suspended in air and it represents the fraction that is considered to enter the respiratory system. Sources of PM_{10} include road dust, emission from petrol and diesel exhaust, construction and fireplaces. PM_{10} may also be formed from other pollutants (acid rain, NO_x, SO_x, organics) and from incomplete combustion of any fuel. Monitoring of RSPM is carried out for 24 hours with 8-hourly sampling. RSPM is measured gravimetrically with GFA/ EPM 2000 filter paper using respirable dust sampler. In a gravimetric method, air is drawn at a flow rate which is typically 1.1 m^3/min through a size-selective inlet wherein the particulate matter is fractionated in two aerodynamic diameter size ranges, 0-10 micro meter called RSPM of PM10 and above 10 micro meter called coarse fraction. The PM10 is collected on a 20.3 X 25.4 cm (8 X 10 in) filter. The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM_{10} is calculated by dividing the weight gain of the filter by the volume of air sampled.

d) Suspended Particulate Matter (SPM) in Ambient Air

(The parameter is eliminated from the revised standard November 2009)

SPM are particulate/aerosol having diameter less than 100μm that tend to remain suspended in the atmosphere for a long period of time. Sea salt, soil dust, volcanic particles and smoke from forest fires are the natural sources of total suspended particulates. Fossil fuel burning and industrial processes are the anthropogenic sources of suspended particulate matter. Monitoring of SPM is carried out for 24 hours with 8-hourly sampling. SPM is measured gravimetrically with GFA/EPM 2000 filter paper using high volume sampler.

For measurement of SPM, ambient air is drawn into a covered housing of HVS through a 20.3 x 25.4 cm (8 x 10") Whatman GF/A or EPM pre weighed glass fiber filter paper at a flow rate of 1.1 to 1.5 cubic meters per minute. The main housing should be rectangular (29 cm x 36 cm) and must be provided with a gable roof having 45° to the horizontal so that the filter is protected from precipitation and particles less than 100 μm size are only collected on the filter surface. Particles within the size range of 100 to 0.1 μm are ordinarily collected on glass fiber filter. The mass concentration of SPM in the ambient air, expressed in micrograms per cubic meter is calculated by measuring the mass of collected particulate and the volume of air drawn.

e) Particulate Matter (Particle Size < 2.5) –$PM_{2.5}$ in Ambient Air

The Particulate Matter in ambient air (aerodynamic size <2.5 or in atmosphere, is measured by an electrically powered air sampler draws ambient air at a constant volumetric flow rate of 16.7 LMP (1 m^3/h) maintained by a mass flow controller coupled to a microprocessor into specially designed inertial particle-size separator (cyclones or impactors) where $PM_{2.5}$ is separated and collected on a 47 mm poly-tetrafluoroethylene (PTFE) filter over a specified sampling period. Each filter is weighed before and after sample collection to determine the net mass of PM2.5 collected on filter paper. The mass concentration in the ambient air is computed as the total mass of collected $PM_{2.5}$ divided by the actual volume of air sampled, and is expressed in $\mu g/m^3$.

f) Ammonia (NH_3) in Ambient Air

The Ammonia (NH_3) content in atmosphere/in ambient air is measured by Indophenol method (Method 401, Air Sampling and Analysis, 3rd Edition). Ammonia in the atmosphere/in ambient air is collected by bubbling a measured volume of air through a dilute solution of sulphuric acid to form ammonium sulphate. In a procedure, place 10 ml of absorbing solution in an impinger and sample for one hour at the flow rate of 1 to 2 L/min. After sampling measure the volume of sample and transfer to a sample storage bottle. Finally this can be further transfer to the sample bottle to a 25 ml glass stopper graduated cylinder. Maintain all the solutions and sample at 25° C. Add 2 ml buffer. Add 5 ml of working phenol solution, mix, and fill to about 22 ml. Add 2.5 ml of working hypochlorite solution and rapidly mix. Dilute to 25 ml, mix and store in the dark for 30 minutes to develop colour. The ammonium sulphate

formed in the sample is analyzed calorimetrically by reaction with phenol and alkaline sodium hypochlorite to produce indophenol. The reaction is accelerated by the addition of sodium nitroprusside as catalyst. Measure the absorbance of the solution at 630 nm on a spectrophotometer using 1 cm cells. Prepare a reagent blank and field blank and measure the absorbance as done in the analysis of samples.

g) Toxic or Heavy Metals –Arsenic, Lead and Nickel (As, Pb & Ni) in Ambient Air

The monitoring of Arsenic, Lead and Nickel contents in aerosol of ambient air/atmosphere is measured in particulate matter (PM_{10} fraction of the particulate matter) having aerodynamic diameter less than or equal to 10 μm and it is fraction of the particulate matter suspended in air and it represents the fraction that is considered to enter the respiratory system. Sources of PM_{10} include road dust, emission from petrol and diesel exhaust, construction and fireplaces. PM_{10} may also be formed from other pollutants (acid rain, NO_x, SO_x, organics) and from incomplete combustion of any fuel. Monitoring of RSPM/PM10 is carried out for 24 hours with 8-hourly sampling. RSPM is measured gravimetrically with EPM 2000 filter paper using respirable dust sampler.

The PM10 is collected on a 20.3 X 25.4 cm (8 X 10 in) filter. The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM_{10} is calculated by dividing the weight gain of the filter by the volume of air sampled. After sampling filters are kept in the envelope marked with necessary identification information and kept in the cool place /refrigerator in the lab (20-25 ^{0}C). After collecting samples, transport the filters to the laboratory, taking care to minimize contamination and loss of the sample. The filters should be transported or shipped in a shipping envelope. Store these envelopes at approximately 30°C until taken out for analysis. The maximum sample holding times is usually 180 days. Analyze the samples within 180 days. The collected sample on glass fiber filters may be extracted by either hot acid procedure or by microwave extraction (Method IO-3.1). Extracted samples are used for the analysis using flame AAS procedure or furnace AAS procedure (Method IO-3.2). Arsenic is analyzed by Flame–VGA. For Lead (Pb) and Nickel (Ni), the wavelength required for analysis is 217nm and 232nm respectively. Where as in case of Arsenic (As), the VGA should attach with Flame and the wavelength required for analysis is 193.7nm.

As a general rule, samples that can be analyzed by flame or furnace may be more conveniently run with flame since flame atomic absorption is faster, simpler and has fewer interference problems. Tube life depends on sample matrix and atomization temperature. A conservative estimate of tube life is about 50 firings. Read the metal value in μg/L from the calibration curve or directly from the read-out of the instrument.

h) Benzo(a)Pyrene [B(a)p] in Ambient Air

The Benzo(a)Preen (Bap) content in atmosphere/in ambient air, is measured by the monitoring of aerosol (Particulate Matter) of ambient air/atmosphere. Benzo (a) Pyrene is one of the most important constituent of PAH compounds and also one of the most potent carcinogens. This can be measured in both particulate phase and vapor phase. In the vapor phase the concentration of B(a)p is significantly less than the particulate phase. Therefore more care to be taken for the measurement of Benzo (a) Pyrene in the particulate phase.

The particulate phase of Benzo(a)pyrene is measured in particulate matter (PM_{10} fraction of the particulate matter) having aerodynamic diameter less than or equal to 10 μm size of the particulate matter suspended in air and it represents the fraction that is considered to enter the respiratory system. Sources of PM_{10} include road dust, emission from petrol and diesel exhaust, construction and fireplaces. PM_{10} may also be formed from other pollutants (acid rain, NO_x, SO_x, organics) and from incomplete combustion of any fuel. Monitoring of RSPM/PM10 is carried out for 24 hours with 8-hourly sampling. RSPM is measured gravimetrically with EPM 2000 filter paper using respirable dust sampler. The PM10 is collected on a 20.3 X 25.4 cm (8 X 10 in) filter. The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM_{10} is calculated by dividing the weight gain of the filter by the volume of air sampled. Filter papers (half of all thee filters papers collected in a day) are finely cut into strips using the scissor and the same is transferred into 250 ml beaker. Add

~50 ml of Toluene (pesticide /GC/HPLC grade). These samples are extracted with toluene using ultra sonic bath for about 30 minutes & repeated twice (50ml x 2 times) for complete extraction. Alternatively sample can be extracted using soxhlet extraction apparatus for about 8 hrs with Toluene twice. Extracted samples were Filtered using glass funnel with Whatman filter paper no.41 containing 2 gm of Anhydrous Sodium sulphate to get dryness (free from the moisture). After filtration, the filtrate taken in the round bottom flask and kept in the rotary evaporator for concentrating the filtrate up to 2ml volume of final Extract. The final volume of 2ml concentrated sample is passed through a silica gel column chromatography /Solid phase extraction (SPHE) column for cleaning the sample impurities. Add 5 ml of cyclohexane at least 3 times for complete elution from the column. Collect the sample in the 25 ml beaker. The Cleaned up extract/filtrate (approximately 17 ml) is concentrated using rotary evaporator and it is then evaporated to nearly dryness with Nitrogen. After dryness, the sample is re-dissolved in 1ml of toluene and the same is transferred into 4 or 5 ml amber vials for final analysis on Gas Chromatography (GC).

i) Measurement of Benzene in ambient air by photo ionization detector

a) Monitoring of benzene in ambient air by BTEX analyzer:

It is based on chromatographic separation in the gaseous phase coupled with photo ionization detector (PID) for detection. The ambient air is drawn into the sampling tube containing an adsorbent for aromatics and volatile compounds. The adsorbed compounds are thermally desorbed and separated in the chromatographic column by programmed heating. The compounds are subsequently detected and quantified by PID. The result is displayed on the screen. Nitrogen is used as carrier gas. BTEX analyzers are commercially available from a number of manufacturers. These analyzers must be operated in accordance with the manufacturers' instructions and instrument-specific operating procedures.

b) Measurement of Benzene in ambient air: manual method

Manual method for measurement of ambient air benzene is based on adsorption of volatile organic compounds on adsorbing column. These compounds are then thermally desorbed or extracted and subsequently detected/determined by gas chromatography. Follow the operating instruction manual of the VOC sampler for sample collection and that of GC for detection.

j) Measurement of Ozone in ambient air

Ozone is a highly reactive, colorless gas. It must be measured at the sampling location, as samplmes cannot be taken back to a laboratory for analysis. Three measurement methods are prescribed in NAAQS- 2009.

- U V photometric
- Chemiluminescence
- Chemical method

The UV photometric method

This is based on the attenuation of ultraviolet (UV) radiation by ozone. Ozone exhibits a strong absorption band in the ultraviolet region at 254 nm. This feature is the basis of the photometric measurement method for ozone. Other species present in the atmosphere such as aromatic hydrocarbons also absorb at or near 254 nm, and so represent potential interferences to the method. The commercially-available instruments compensate for this possible interference by comparing the absorbance of the sample with the absorbance of air in which the ozone has been catalytically reduced to molecular oxygen (O2); consequently attenuation of the UV light due to non-ozone species is taken into account. A range of ambient ozone analyzers are commercially available. These UV methods must be operated in accordance with the manufacturers' instructions and instrument-specific operating procedures.

The Chemiluminescence method

The chemiluminescence method for O_3 is based on direct gas phase reaction of O_3 with olefin to produce electronically excited products, which decay with the emission of light. When ozone reacts with ethylene gas, an olefin, electronically excited formaldehyde is produced. As this excited species returns to the ground state, it gives off light in a band centered at 430 nanometers (nm) in proportion to the amount of ozone present. This chemiluminescence can be measured using a photomultiplier tube, and the concentration of ozone is calculated. Any other measurement method or instrument must be compared against the reference method, and must perform on a par with the reference method to be deemed equivalent. Humidity causes a positive bias in chemiluminescence methods. This can be compensated for the areas of high humidity, the interference has been problematic and the debate continues as to the instrument's complete reliability for such an important purpose. Because the reference method uses a potentially flammable gas as a reactant, and because there is an equivalent method for directly measuring ozone, chemiluminescence-based monitors are seldom used for routine air monitoring.

Chemical method

This method is based on libration of iodine when micro-amounts of ozone and the oxidants are absorbed in a 1% solution of potassium iodide buffered at pH 6.8 $\pm$ 0.2. The iodine is determined spectrophotometrically by measuring the absorption of triiodide ion at 352 nm. The stoichiometry is approximated by the following reaction:

$$O_3 + 3\ KI + H_2O \text{ --> } KI_3 + 2\ KOH + O_2$$

PROCEDURE

- Assemble a train consisting of a rotameter, U-tube with chromium trioxide paper (optional), midget impinger, needle valve or critical orifice (1) and pump. Connections upstream from the impinger should be ground glass or inert tubing but joined with polyvinyl tubing. Fluorosilicon or fluorocarbon grease should be used sparingly. Pipette exactly 10 ml of the absorbing solution into the midget impinger. Sample at a rate of 0.5 to 3 L/min for up to 30 min. The flow rate and the time of sampling should be adjusted to obtain a sufficiently large concentration of oxidant in the absorbing solution. Approximately 1 μl of ozone can be obtained in the absorbing solution at an atmospheric concentration of 0.01 ppm by sampling for 30 min at 3 L/min. Calculate the total column of the air sample. Also measure the air temperature and pressure. Do not expose the absorbing reagent to direct sunlight.
- Measurement of Color – If there is evaporation of the absorbing solution during sampling; add water to bring the liquid volume to back to 10 ml before making colour measurement
- Within 30 to 60 minutes after sample collection, read the absorbance in a cuvette or tube at 352 nm against a reference cuvette or tube containing water.
- Blank Correction - Measure the absorbance of the unexposed reagent and subtract the value from the absorbance of the sample.

Calibration and Standardization

- Calibrating solutions are made up to 10 ml to facilitate the calculations:
- Obtain a range of calibration points containing from 1 μl to 10 μl of ozone equivalent per 10.0 ml of solution. Prepare by individually adding 1.0, 2.0, 4.0, 6.0, 8.0 and 10.0 mL of the calibrating iodine solution to 10.0 ml volumetric flasks. Bring each to the calibration mark with absorbing reagent.
- **Read the absorbance of each of the prepared calibration solutions**
- Plot the absorbance of the obtained colors against the concentration of O_3 in μl/10 ml absorbing reagent. Draw a straight line through the origin giving the best fit, or fit by least squares. Do not extrapolate beyond the highest concentration.

CALCULATIONS

- Standard conditions are taken as 101.3 kPa and 25°C, at which the molar gas volume is 24.47 liters.
- Record the volume of sample collected in liters. Generally the correction of the sample volume to standard conditions is slight and may be omitted. However, for greater accuracy corrections may be calculated by means of the perfect gas laws.
- The total μl of O_3/10 ml of reagent are read from the calibration curve.
- The concentration of O_3 in the gas phase in μl/l or ppm is calculated by Total μl ozone per 10 ml divided by Volume of air sample, L and the concentration of O_3 in terms of $\mu g/m^3$ at 101.3 kPa and 25°C is obtained when desired from the value of μl/l by dividing ppm x 48.00 x 10^3 24.47 = 1962 x ppm.

K) Measurement of Carbon monoxide in ambient air by non-dispersive infrared (NDIR spectroscopy:

In NDIR based ambient CO analyzers, the spectrometer measures the absorption by CO at 4.7 μm. The detector signal is led to an amplifier control section and the analyzer output measured on a display/meter. NDIR based ambient CO analyzers are commercially available from a number of manufacturers. These analyzers must be operated in accordance with the manufacturers' instructions and instrument-specific operating procedures. Some analyzers use different cells for standard reference gas and sample gas; some others use gas filter correlation to compare the IR absorption spectrum between the measured gas and other gases present in the sample, in a single sample cell. The CO analyzer can be calibrated using certified standard cylinders of CO and following the instructions contained in the instrument's instruction manual.

MEASUREMENT OF METEOROLOGICAL PARAMETERS: The measurement of meteorological parameters in ambient air (relative humidity, temperature, wind speed, wind direction.

Ambient temperature and Relative Humidity: Install the temperature and hygrometer sensors in such a way that these are protected from direct sun rays, however, well ventilated hood provided by the manufacturer. A regular cleaning schedule as prescribed by the manufacturer should be maintained.

Wind Speed and wind direction: Wind direction is detected by wind vane. The head of the arrow indicates the direction from which the wind is blowing. The wind direction can either be recorded in degree (0-360) or on 16 point of compass (N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW). The wind speed is normally measured by cup anemometer. The unit of measurement may be km/h or m/s. `Some manufacturers supply wind vane and cup anemometer for mounting on single rotor/mast other may supply separate rotors/masts.

Selecting the Site of Operation: In general, anemometers are designed to record the wind conditions are over a given large areas. In order to obtain comparable values for the determination of surface wind, measurements should be made at a height of 10 meters over open level terrain. Open level terrain is defined as an area where the distance between the anemometer and an obstruction amounts to at least 10 times the height of the obstruction. If, this condition cannot be met, then the anemometer should be set up at such a height where the measured values are, to the greatest extent possible, not influenced by local obstructions (approximately 6-10 meters above the obstruction).The anemometer should be installed in the middle of flat roofs - not at the edge - in order to avoid a possible bias to one direction or the other. Installing the Cup Anemometer – Follow the instructions mentioned in the instruction manual. Align the wind vane to north direction accurately.

Note: For detailed procedure/methods, it can be referred to CPCB Website: www:cpcb.nic.in/

1. Volume –I: Guidelines for manual sampling and analyses (along with sample flow chart and data sheets);
2. Volume-II: Guidelines for continuous sampling and real time analyses
3. Volume-III: Reference methods for manual sampling and analyses (compilation)
4. Volume-IV: Reference methods for continuous sampling and real time analyses (compilation)

Note: Guidelines are laboratory and infrastructure specific thus may not be applicable uniformly and need to develop based on infrastructure and expertise.