

# **NATIONAL AMBIENT AIR QUALITY STATUS & TRENDS IN INDIA-2010**



**CENTRAL POLLUTION CONTROL BOARD  
MINISTRY OF ENVIRONMENT & FORESTS**

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मीरा महर्षि

अध्यक्ष

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## केन्द्रीय प्रदूषण नियंत्रण बोर्ड

(भारत सरकार का संगठन)

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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 : 12<sup>th</sup> March, 2012

  
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## ABBREVIATION

| Abbreviation                  | Meaning                                                                         |
|-------------------------------|---------------------------------------------------------------------------------|
| AD                            | Adequate data (locations where $\geq 50$ days of monitoring was done in a year) |
| As                            | Arsenic                                                                         |
| B(a)P                         | Benzo (a) Pyrene                                                                |
| C                             | Critical pollution category                                                     |
| C <sub>6</sub> H <sub>6</sub> | 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 <sub>2</sub> S              | 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 <sub>3</sub>               | Ammonia                                                                         |
| NH <sub>3</sub>               | Ammonia                                                                         |
| Ni                            | Nickel                                                                          |
| NM                            | No monitoring                                                                   |
| NO <sub>2</sub>               | Nitrogen Dioxide                                                                |
| O <sub>3</sub>                | Ozone                                                                           |
| PAHs                          | Polycyclic Aromatic Hydrocarbons                                                |
| Pb                            | Lead                                                                            |
| PCC                           | Pollution Control Committees                                                    |
| PM <sub>10</sub>              | Particulate matter of size $\leq 10\mu\text{m}$                                 |
| PM <sub>2.5</sub>             | Particulate matter of size $\leq 2.5\mu\text{m}$                                |
| QA/QC                         | Quality assurance and Quality control                                           |
| RSPM                          | Respiratory Suspended Particulate Matter                                        |
| SO <sub>2</sub>               | Sulphur dioxide                                                                 |
| SPCB                          | State Pollution Control Boards                                                  |
| SPM                           | Suspended Particulate Matter                                                    |

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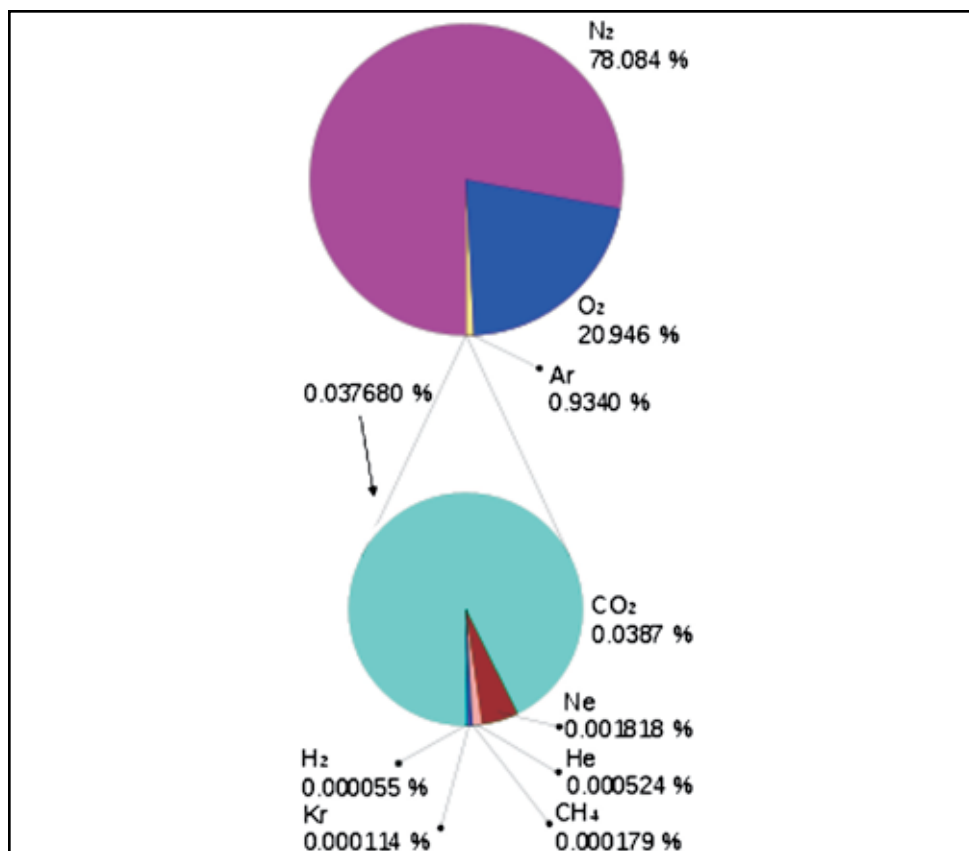
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| Figure 7.5  | Air quality trend of Agra                                                             |
| Figure 7.6  | Air quality trend of Allahabad                                                        |
| Figure 7.7  | Air quality trend of Kanpur                                                           |
| Figure 7.8  | Air quality trend of Lucknow                                                          |
| Figure 7.9  | Air quality trend of Meerut                                                           |
| Figure 7.10 | Air quality trend of Varanasi                                                         |
| Figure 7.11 | Air quality trend of Patna                                                            |
| Figure 7.12 | Air quality trend of Dhanbad                                                          |
| Figure 7.13 | Air quality trend of Jamshedpur                                                       |
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| Figure 7.15 | Air quality trend of Kolkata                                                          |
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| Figure 7.17 | Air quality trend of Vijayawada                                                       |
| Figure 7.18 | Air quality trend of Visakhapatnam                                                    |
| Figure 7.19 | Air quality trend of Bangalore                                                        |
| Figure 7.20 | Air quality trend of Kochi                                                            |
| Figure 7.21 | Air quality trend of Chennai                                                          |
| Figure 7.22 | Air quality trend of Coimbatore                                                       |
| Figure 7.23 | Air quality trend of Madurai                                                          |
| Figure 7.24 | Air quality trend of Ahmedabad                                                        |
| Figure 7.25 | Air quality trend of Rajkot                                                           |
| Figure 7.26 | Air quality trend of Surat                                                            |
| Figure 7.27 | Air quality trend of Vadodara                                                         |
| Figure 7.28 | Air quality trend of Pune                                                             |
| Figure 7.29 | Air quality trend of Mumbai                                                           |
| Figure 7.30 | Air quality trend of Nagpur                                                           |
| Figure 7.31 | Air quality trend of Nashik                                                           |
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| Plate No.        | Plate title                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CHAPTER I</b> | <b>INTRODUCTION</b>                                                                                                                                                                                  |
| Plate I.1        | Different monitoring modes a. Mobile van monitoring, b. cabin for monitoring, c. Continuous analysers and d. analysis facility under NAMP                                                            |
| Plate I.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 |



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 I.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 I.1: Composition of air**



### I.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 I.1).

**Table I.1: Revised National Ambient Air Quality Standards (NAAQS)****[NAAQS Notification dated 18<sup>th</sup> 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 <sub>2</sub> ), µg/m <sup>3</sup>                       | Annual*               | 50                                             | 20                                                           | 1. Improved West and Gaeke<br>2. Ultraviolet Fluorescence                                                   |
|        |                                                                             | 24 Hours**            | 80                                             | 80                                                           |                                                                                                             |
| 2      | Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>                      | Annual*               | 40                                             | 30                                                           | 1. Modified Jacob & Hochheiser (Na-Arsenite)<br>2. Chemiluminescence                                        |
|        |                                                                             | 24 Hours**            | 80                                             | 80                                                           |                                                                                                             |
| 3      | Particulate Matter (Size < 10µm) or PM <sub>10</sub> , µg/m <sup>3</sup>    | Annual*               | 60                                             | 60                                                           | 1. Gravimetric<br>2. TEOM<br>3. Beta attenuation                                                            |
|        |                                                                             | 24 Hours**            | 100                                            | 100                                                          |                                                                                                             |
| 4      | Particulate Matter (Size < 2.5 µm) or PM <sub>2.5</sub> , µg/m <sup>3</sup> | Annual*               | 40                                             | 40                                                           | 1. Gravimetric<br>2. TEOM<br>3. Beta attenuation                                                            |
|        |                                                                             | 24 Hours **           | 60                                             | 60                                                           |                                                                                                             |
| 5      | Ozone (O <sub>3</sub> ), µg/m <sup>3</sup>                                  | 8 hours**             | 100                                            | 100                                                          | 1. UV photometric<br>2. Chemiluminescence<br>3. Chemical Method                                             |
|        |                                                                             | 1 hours **            | 180                                            | 180                                                          |                                                                                                             |
| 6      | Lead (Pb), µg/m <sup>3</sup>                                                | Annual *              | 0.50                                           | 0.50                                                         | 1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper<br>2. ED-XRF using Teflon filter |
|        |                                                                             | 24 Hour**             | 1.0                                            | 1.0                                                          |                                                                                                             |
| 7      | Carbon Monoxide (CO), mg/m <sup>3</sup>                                     | 8 Hours **            | 02                                             | 02                                                           | Non dispersive Infra Red (NDIR) Spectroscopy                                                                |
|        |                                                                             | 1 Hour**              | 04                                             | 04                                                           |                                                                                                             |
| 8      | Ammonia (NH <sub>3</sub> ), µg/m <sup>3</sup>                               | Annual*               | 100                                            | 100                                                          | 1. Chemiluminescence<br>2. Indophenol blue method                                                           |
|        |                                                                             | 24 Hour**             | 400                                            | 400                                                          |                                                                                                             |
| 9      | Benzene (C <sub>6</sub> H <sub>6</sub> ), µg/m <sup>3</sup>                 | Annual *              | 05                                             | 05                                                           | 1. Gas chromatography based continuous analyzer<br>2. Adsorption and Desorption followed by GC analysis     |
| 10     | Benzo(a)Pyrene (BaP)-particulate phase only, ng/m <sup>3</sup>              | Annual*               | 01                                             | 01                                                           | Solvent extraction followed by HPLC/GC analysis                                                             |
| 11     | Arsenic (As), ng/m <sup>3</sup>                                             | Annual*               | 06                                             | 06                                                           | AAS/ICP method after sampling on EPM 2000 or equivalent filter paper                                        |
| 12     | Nickel (Ni), ng/m <sup>3</sup>                                              | 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 I.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 31<sup>st</sup> October 2011 the number of stations under operation has been further raised to 503 distributed in 209 cities, 26 states and 5 UTs.

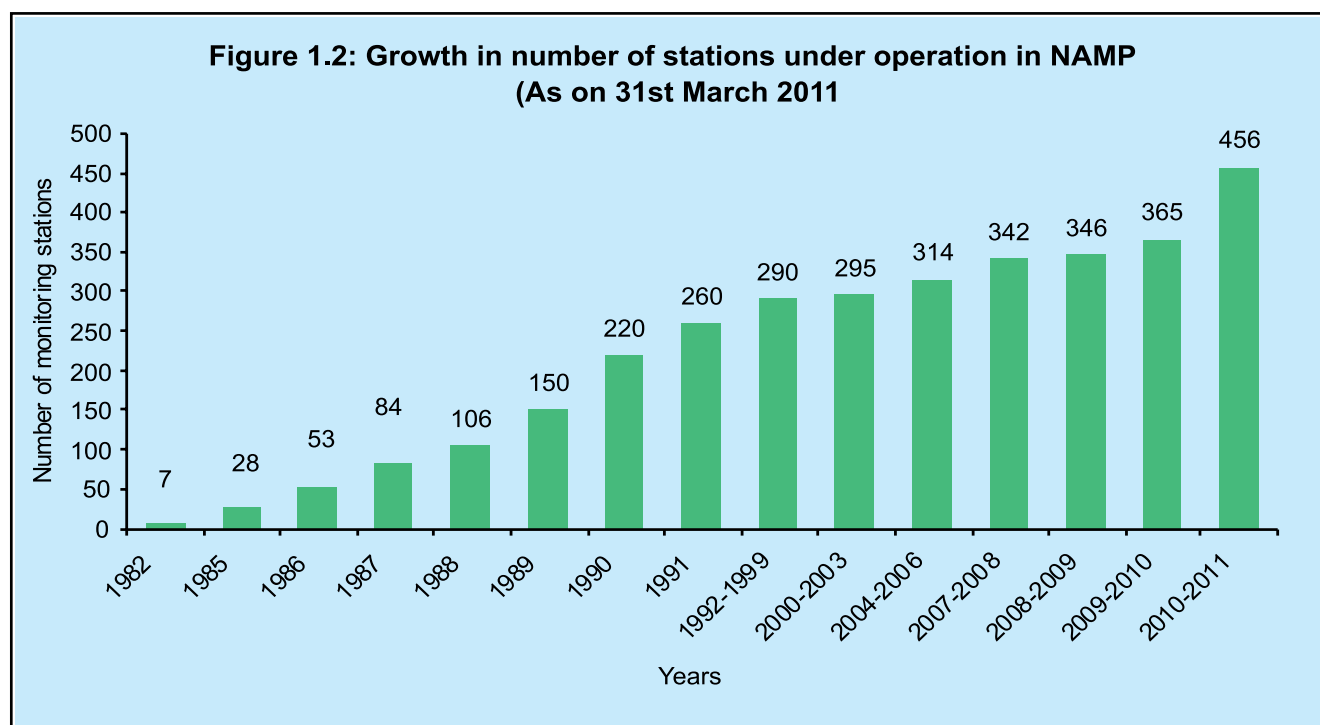


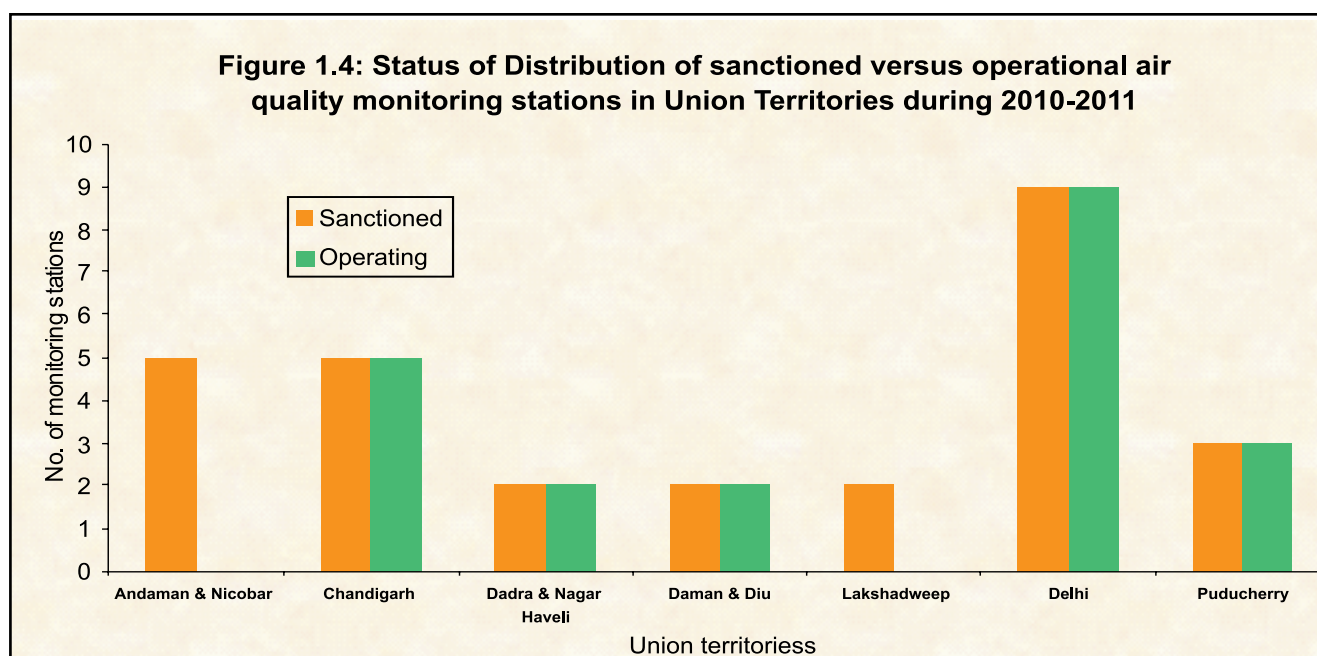
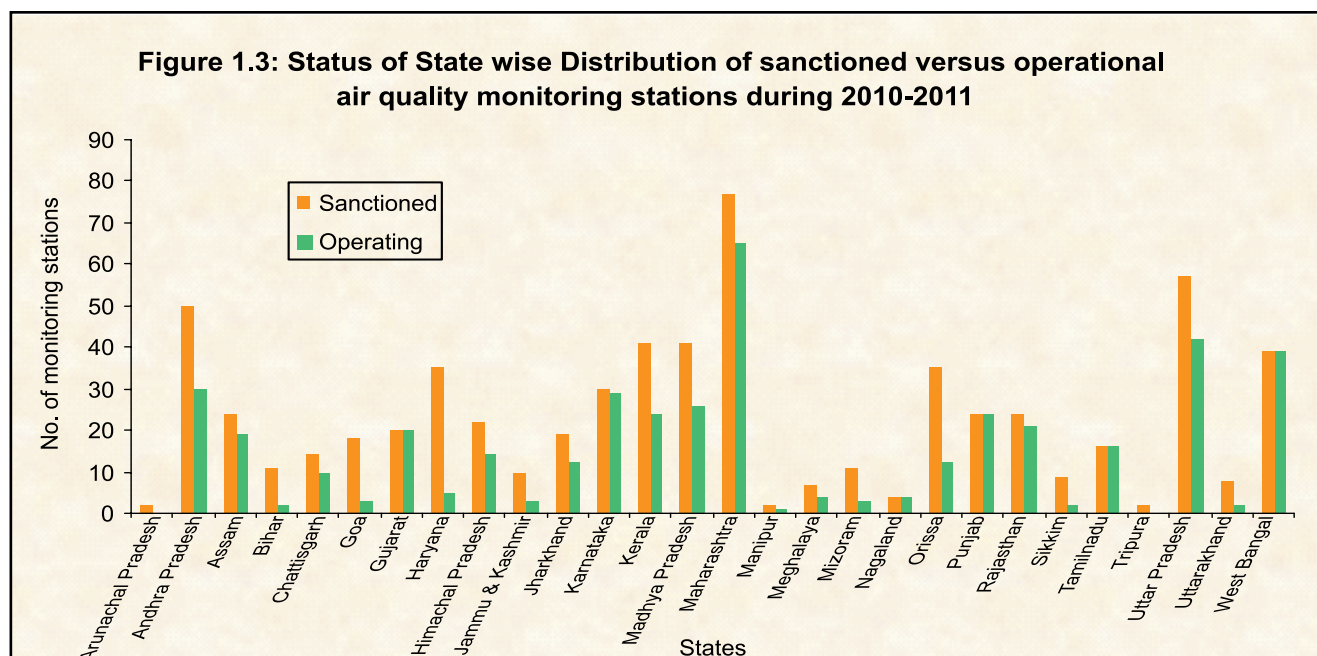
**Table I.2. Details of Air Quality Monitoring Stations under operation in India  
as on 31<sup>st</sup> March 2011**

| 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                            |
|        |                       | Jharua                                                   | 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                            |
|        |                       | Shimoga                                                  | 1                            |
|        |                       | Karwar                                                   | 1                            |
|        |                       | Ranebennur                                               | 1                            |
|        |                       | Bagalkote                                                | 1                            |
|        |                       | Kolar                                                    | 1                            |
|        |                       | Bidar                                                    | 1                            |
| 16     | Kerala (24)           | Kozhikode                                                | 2                            |
|        |                       | Kottayam                                                 | 2                            |
|        |                       | Cochin                                                   | 7                            |
|        |                       | Thiruvananthapuram                                       | 4                            |
|        |                       | Palakkad                                                 | 1                            |
|        |                       | Alappuzha                                                | 2                            |
|        |                       | Near District Office, KSPCB, Makkamkunnu, Pathanamthitta | 1                            |
|        |                       | Kollam                                                   | 2                            |
|        |                       | Sulthan, Bathery, Wayanad                                | 1                            |
|        |                       | Kakkanchery, Near KINFRA, Mallappuram                    | 1                            |
|        |                       | Kerala 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                            |
|        |                       | Bhubaneswar                                       | 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                            |
|              |                        | Bareilly             | 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                            |
| <b>Total</b> | <b>26 states, 5UTs</b> | <b>190 cities</b>    | <b>456 stations</b>          |



### 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  $10\ \mu m$ ), 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  $2.5\ \mu m$ ), 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 I.1).

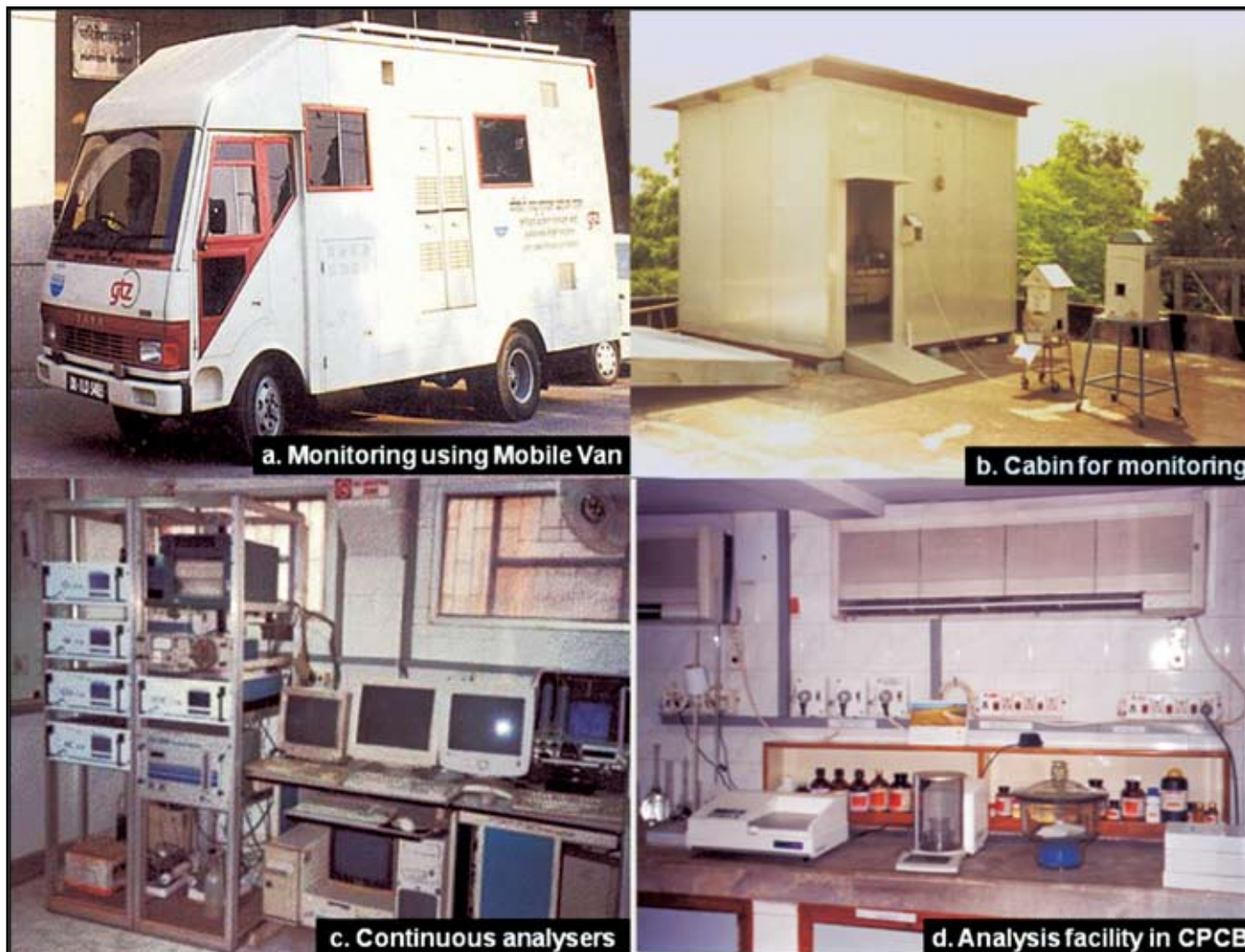


Plate I.1. Different monitoring modes a. Mobile van monitoring, b. cabin for monitoring, c. Continuous analysers and d. analysis facility under NAMP

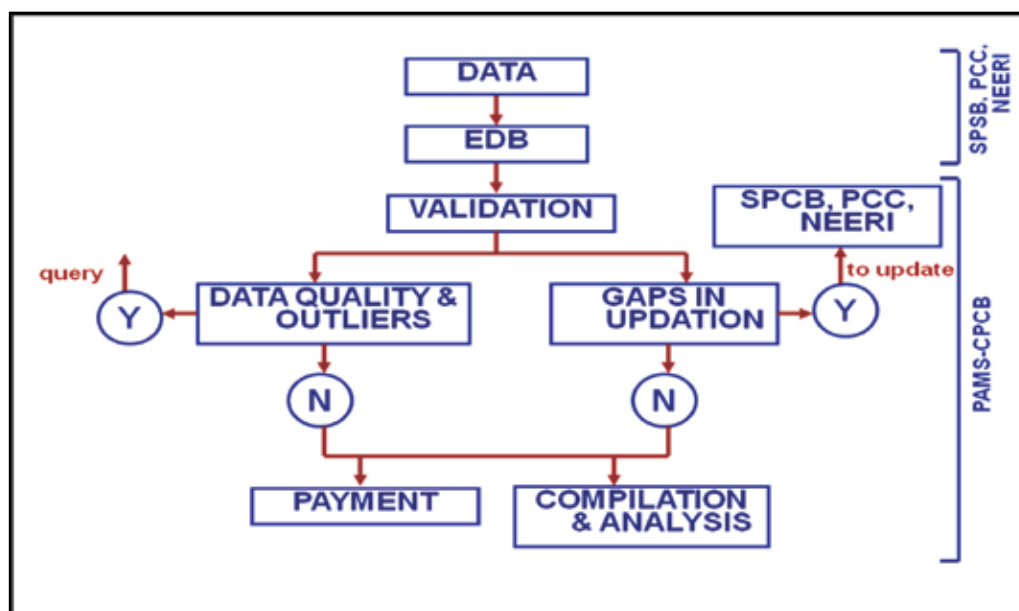
### 1.3.4. Data Analysis and Limitations

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:

- 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;
- In case no data is available in a particular month with respect to all the three parameters, the month has been excluded;
- 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
- 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 I.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 ( $\text{SO}_2$ ), nitrogen dioxide ( $\text{NO}_2$ ), particulate matter of size less than  $10\mu\text{g}$  ( $\text{PM}_{10}$ ) 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 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2010. Operating stations has been listed as numbers reported till 31<sup>st</sup> 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 I.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 Ramchandrapuram

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 ( $\mu\text{g}/\text{m}^3$ ) |                 |                  |                             |                 |                  |
|---------------------|--------------------------------------------------------------|-----------------|------------------|-----------------------------|-----------------|------------------|
|                     | Industrial, Residential, Rural & others areas                |                 |                  | Ecologically Sensitive Area |                 |                  |
|                     | SO <sub>2</sub>                                              | NO <sub>2</sub> | PM <sub>10</sub> | SO <sub>2</sub>             | NO <sub>2</sub> | PM <sub>10</sub> |
| <b>Low (L)</b>      | 0-25                                                         | 0-20            | 0-30             | 0-10                        | 0-15            | 0-30             |
| <b>Moderate (M)</b> | 26-50                                                        | 21-40           | 31-60            | 11-20                       | 16-30           | 31-60            |
| <b>High (H)</b>     | 51-75                                                        | 41-60           | 61-90            | 21-30                       | 31-45           | 61-90            |
| <b>Critical (C)</b> | $> 75$                                                       | $> 60$          | $> 90$           | $> 30$                      | $> 45$          | $> 90$           |

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<sub>2</sub>, 362 stations for NO<sub>2</sub> and 359 stations PM<sub>10</sub> for residential / commercial / industrial / rural area. The total number of stations considered for NO<sub>2</sub> and PM<sub>10</sub> were 402 and SO<sub>2</sub> was 401 as the data for Byrnihat, Meghalaya in case of SO<sub>2</sub> was outlier. Therefore, it was not considered. In case of Ecologically Sensitive Area adequate data was received from 25 stations for SO<sub>2</sub>, 24 stations for NO<sub>2</sub> and 26 stations for PM<sub>10</sub>. 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 <sub>2</sub>                                     | NO <sub>2</sub> | PM <sub>10</sub> | SO <sub>2</sub>             | NO <sub>2</sub> | PM <sub>10</sub> |
| Adequate data                    | 360                                                 | 362             | 359              | 25                          | 24              | 26               |
| Inadequate data                  | 38                                                  | 37              | 42               | 4                           | 5               | 5                |
| No data                          | 3                                                   | 3               | 1                | 2                           | 2               | 0                |
| <b>Total monitoring stations</b> | <b>401</b>                                          | <b>402</b>      | <b>402</b>       | <b>31</b>                   | <b>31</b>       | <b>31</b>        |

Key: Adequate data: locations where  $\geq 50$  days of monitoring was done in a year; Inadequate 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

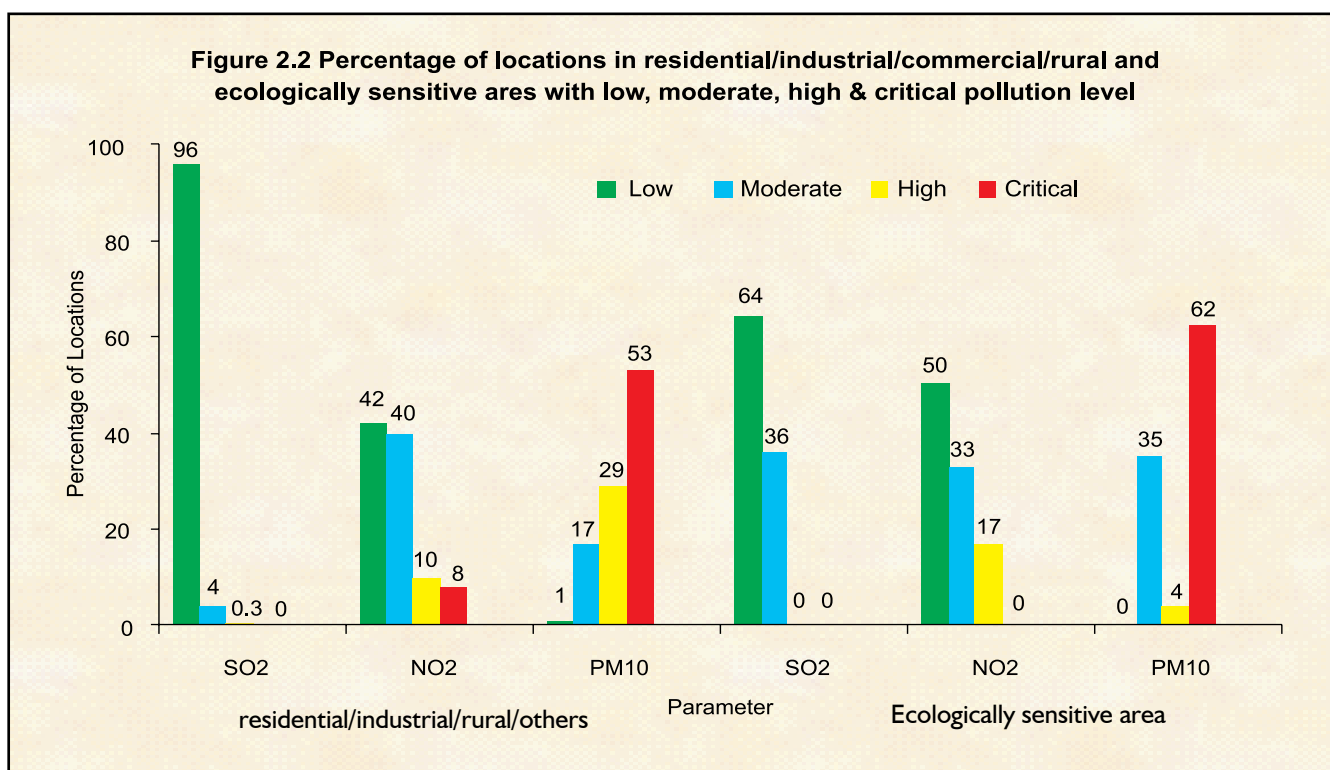
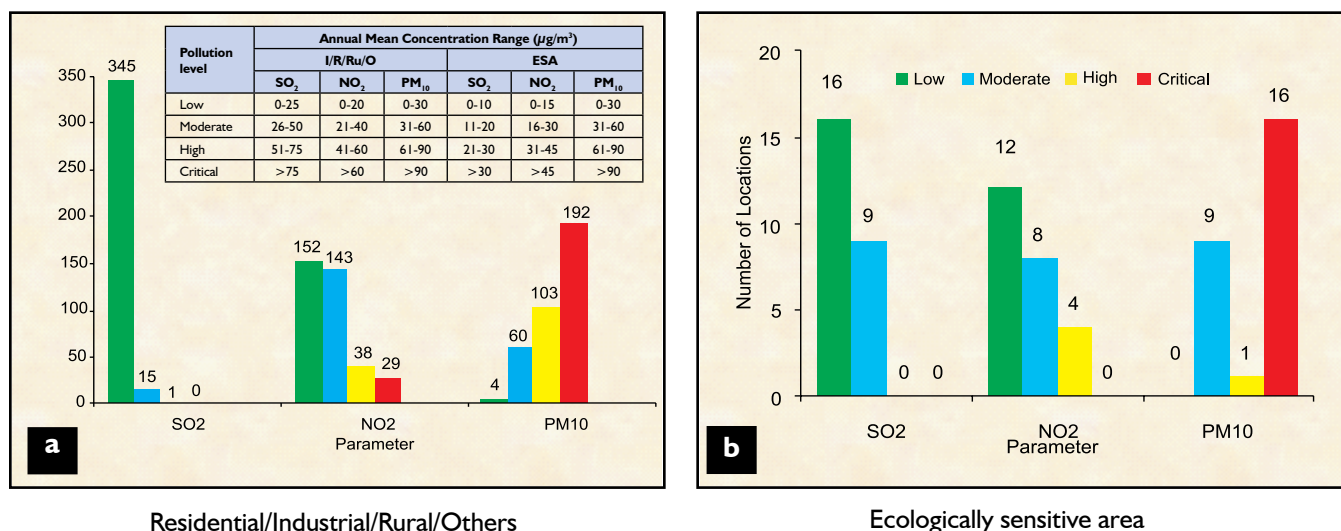
The analysis of three criteria pollutants (adequate data) with respect to National Ambient Air Quality Standards (NAAQS) during 2010 revealed that SO<sub>2</sub> showed low concentration in most of the locations (345 locations, 96%), moderate in 15 locations (4%) and high in 1 location. With respect to NO<sub>2</sub>, 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<sub>10</sub> only 4 locations (1%) showed low PM<sub>10</sub> 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<sub>2</sub> 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<sub>2</sub>, 12 locations (50%) were in low category, 8 in moderate (33%) and 4 in high (17%). In case of PM<sub>10</sub> no location showed low PM<sub>10</sub> 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 <sub>2</sub>                                     | NO <sub>2</sub> | PM <sub>10</sub> | SO <sub>2</sub>             | NO <sub>2</sub> | PM <sub>10</sub> |
| 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                |
| <b>Total locations (LMHC)</b>      | <b>361</b>                                          | <b>362</b>      | <b>359</b>       | <b>25</b>                   | <b>24</b>       | <b>26</b>        |
| <b>Grand total (L/M/H/C/IA/NM)</b> | <b>401</b>                                          | <b>402</b>      | <b>402</b>       | <b>31</b>                   | <b>31</b>       | <b>31</b>        |

**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 areas**



### 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<sub>2</sub>) and 168 (NO<sub>2</sub> and PM<sub>10</sub>) 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 under low category and 10 under moderate category I (Lote in Maharashtra) under high category with respect to Sulphur dioxide (SO<sub>2</sub>). NO<sub>2</sub> 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 <sub>2</sub>                                           | NO <sub>2</sub> | PM <sub>10</sub> | SO <sub>2</sub>            | NO <sub>2</sub> | PM <sub>10</sub> |
| 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 2.1 Figures within parenthesis represent percentage

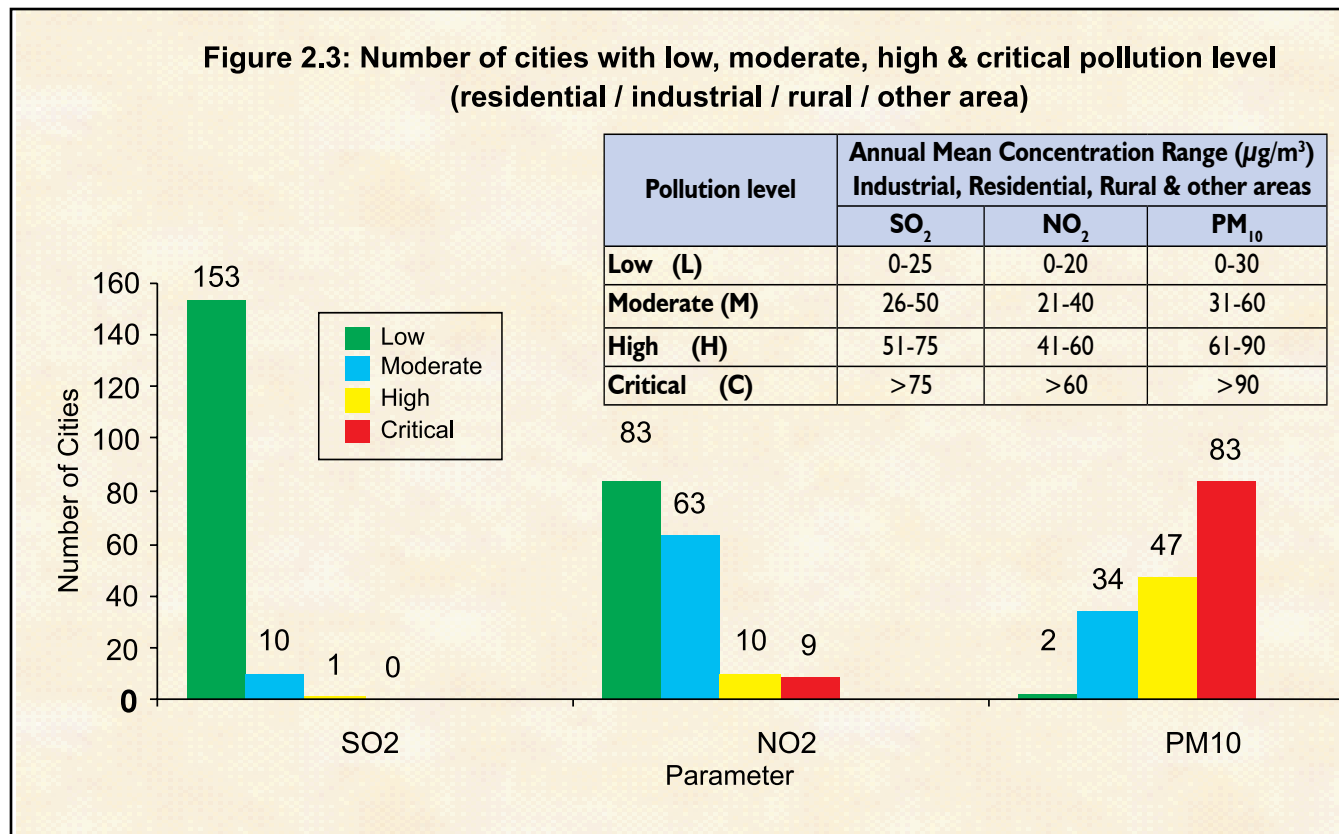
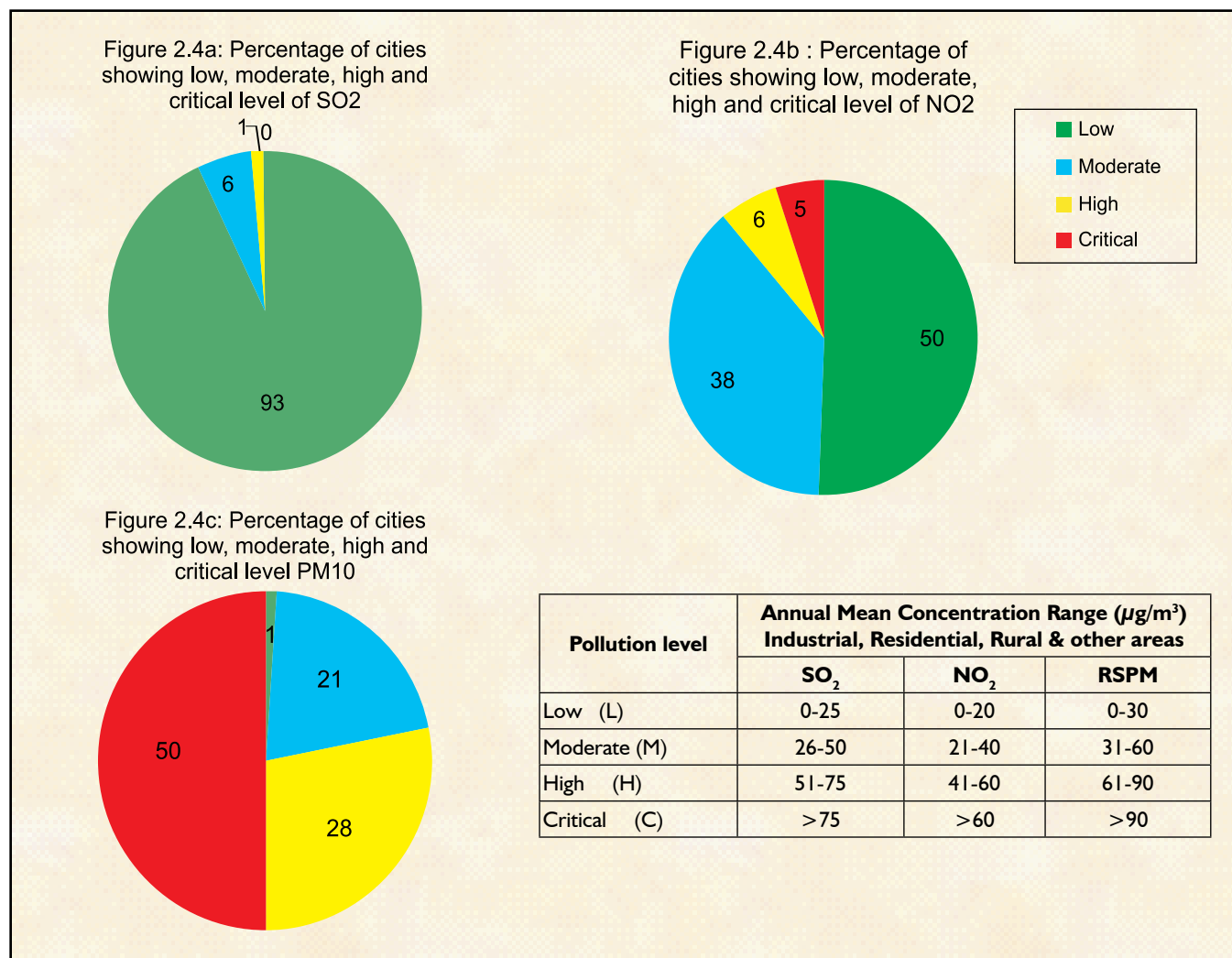


**Figure 2.4: Percentage of cities showing low, moderate, high and critical level of  $\text{SO}_2$ ,  $\text{NO}_2$  and  $\text{PM}_{10}$  (residential / industrial / rural / other area)**



Annual average in each city and its categorization 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  $\text{NO}_2$  and  $\text{PM}_{10}$
- State capital cities like Patna, Raipur, Delhi Ahmedabad, Ranchi, Bhopal, Mumbai, Amritsar, Jaipur, Lucknow, and Kolkata are critical with respect to  $\text{PM}_{10}$
- Industrial cities like Bhilai, Korba, Ahmedabad, Faridabad, Jamshedpur, Jharia, Sindri, Ludhiana, Muradabad, Rourkela, Indore, Kota, Kanpur, Asansol, Durgapur, Howrah are critical with respect to  $\text{PM}_{10}$

**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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|----------------------|----------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|                      |                |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|------------------|--------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|                  |              |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|----------------|----------------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|                |                      |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 Khar-sawan | 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           |
|                | Gulbarga             | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|-------------|-------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|             |             |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|---------------|---------------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|               |                     |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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-trapezium   | 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-trapezium   | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|-------------|----------------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|             |                |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 has also been considered For LMHC classification cities with monitoring days only  $\geq 50$  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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|------------------|----------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|                  |          |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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 <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|---------------|-----------|-----------------|-----------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|               |           |                 |                 | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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.

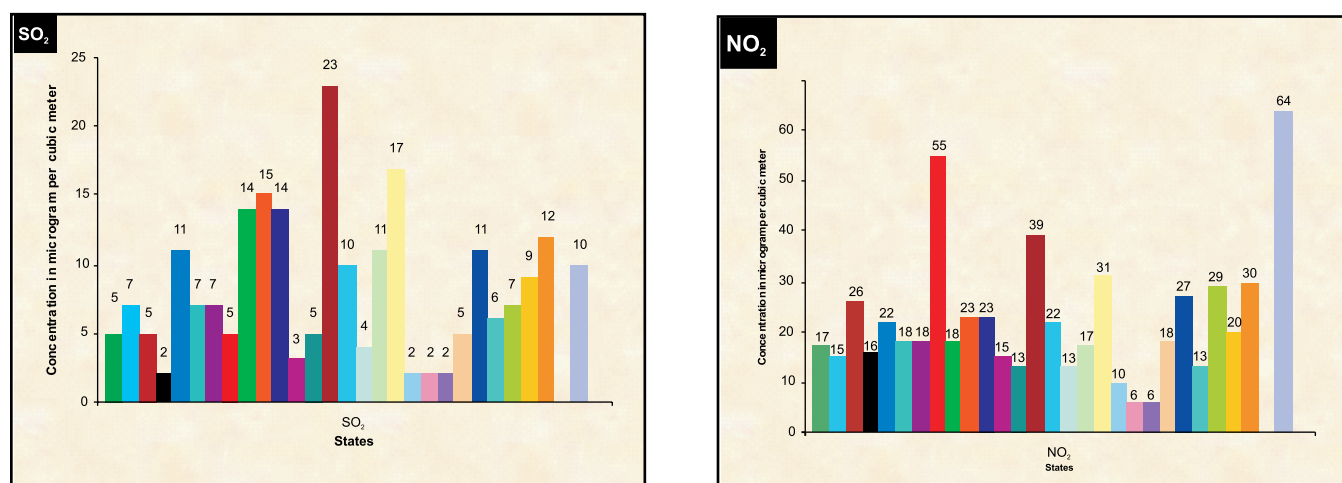
## 2.4 Annual average concentration of pollutants in different States and Union territories

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<sub>2</sub> Jharkhand had the maximum annual average concentration (23 µg/m<sup>3</sup>) followed by Maharashtra (17 µg/m<sup>3</sup>). With respect to NO<sub>2</sub> West Bengal had the maximum annual average concentration (64 µg/m<sup>3</sup>) followed by Delhi (55 µg/m<sup>3</sup>). With respect to PM<sub>10</sub> Delhi had the maximum annual average concentration (261 µg/m<sup>3</sup>) followed by Jharkhand (193 µg/m<sup>3</sup>). 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 <sub>2</sub> |                         | NO <sub>2</sub> |                         | PM <sub>10</sub> |                         |
|-----------------|-------------------------|-----------------|-------------------------|------------------|-------------------------|
| State           | Conc. µg/m <sup>3</sup> | State           | Conc. µg/m <sup>3</sup> | State            | Conc. µg/m <sup>3</sup> |
| 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**



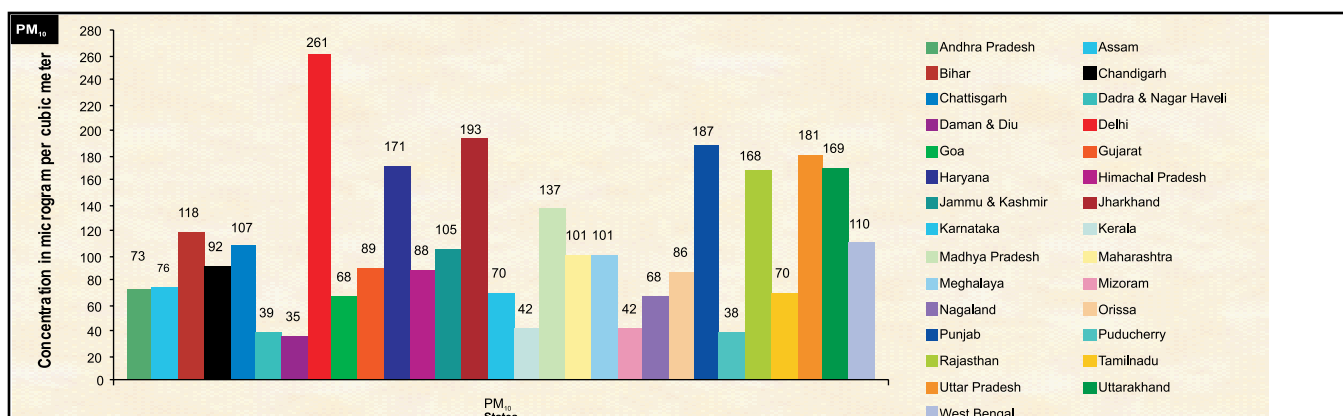


**Table 2.7: Annual average concentration of criteria pollutants in states**  
(residential/industrial/rural/other and sensitive area)

| States & Union territories | SO <sub>2</sub>                     |                    | NO <sub>2</sub>                     |                    | PM <sub>10</sub>                    |                    |
|----------------------------|-------------------------------------|--------------------|-------------------------------------|--------------------|-------------------------------------|--------------------|
|                            | Annual average (µg/m <sup>3</sup> ) | Standard deviation | Annual average (µg/m <sup>3</sup> ) | Standard deviation | Annual average (µg/m <sup>3</sup> ) | 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*                |
| Tamil Nadu                 | 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

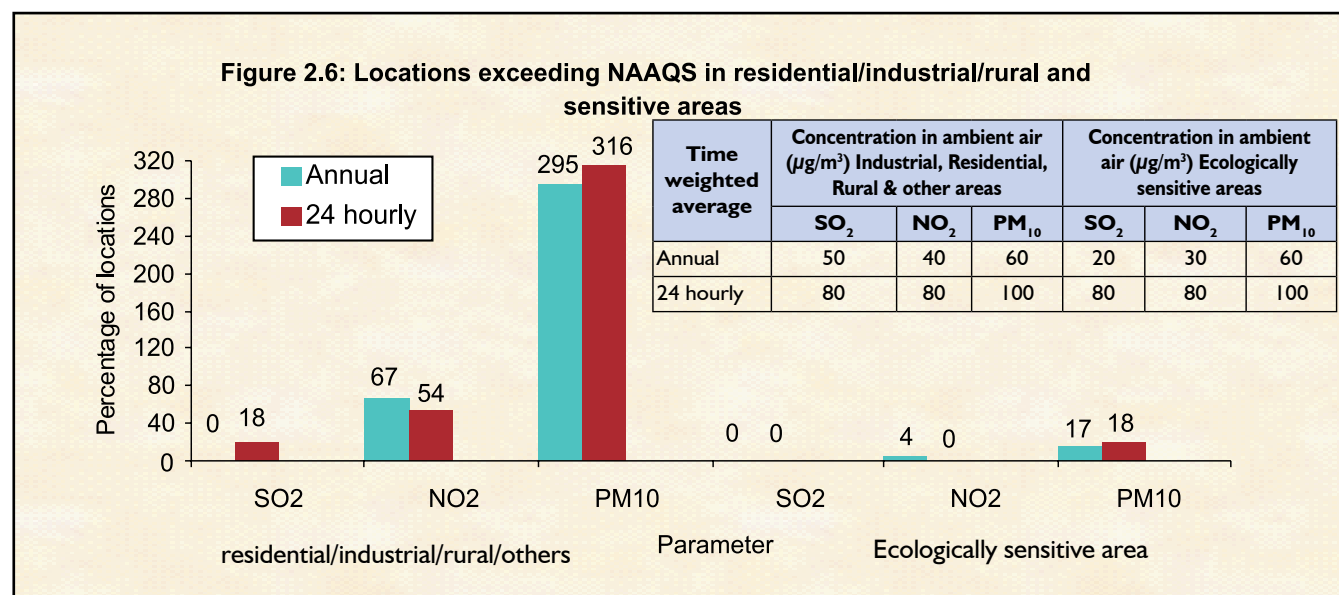
Number of monitoring stations (with adequate data) exceeding NAAQS is presented in Table 2.8, Figure 2.6. For residential/industrial/rural area, taking annual average into consideration, 67 stations (for  $\text{NO}_2$ ) and 295 stations (for  $\text{PM}_{10}$ ) exceed NAAQS. No location exceeds NAAQS for  $\text{SO}_2$ . Considering 24-hourly average data into consideration, 11 stations (for  $\text{SO}_2$ ), 57 stations (for  $\text{NO}_2$ ) and 241 stations (for  $\text{PM}_{10}$ ) exceed NAAQS. For sensitive area, considering annual average into consideration, 4 stations (for  $\text{NO}_2$ ) and 17 stations (for  $\text{PM}_{10}$ ) stations exceed NAAQS. Considering 24-hourly average data, 19 stations (for  $\text{SO}_2$ ), 54 stations (for  $\text{NO}_2$ ), and 316 stations (for  $\text{PM}_{10}$ ) 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  $\mu\text{g}/\text{m}^3$ )

|                      | Residential/Industrial/Rural area |                   |                |                   |                  |                    | Sensitive area |                   |                |                   |                  |                    |
|----------------------|-----------------------------------|-------------------|----------------|-------------------|------------------|--------------------|----------------|-------------------|----------------|-------------------|------------------|--------------------|
|                      | $\text{SO}_2$                     |                   | $\text{NO}_2$  |                   | $\text{PM}_{10}$ |                    | $\text{SO}_2$  |                   | $\text{NO}_2$  |                   | $\text{PM}_{10}$ |                    |
|                      | Annual<br>> 50                    | 24 hourly<br>> 80 | Annual<br>> 40 | 24 hourly<br>> 80 | Annual<br>> 60   | 24 hourly<br>> 100 | Annual<br>> 20 | 24 hourly<br>> 80 | Annual<br>> 30 | 24 hourly<br>> 80 | Annual<br>> 60   | 24 hourly<br>> 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 exceeding NAAQS / exceeding the NAAQS

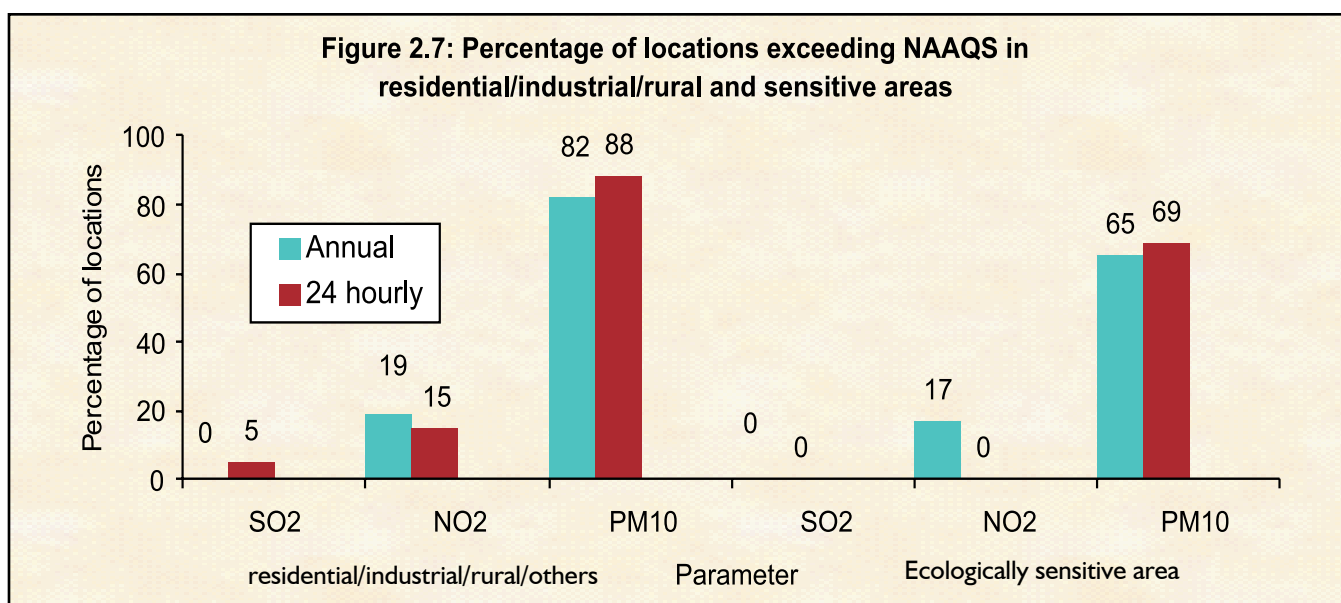


The percentage of locations exceeding national standards with respect to  $\text{NO}_2$ ,  $\text{SO}_2$  and  $\text{PM}_{10}$  is depicted in Table 2.9, Figure 2.7. For residential/industrial/rural area, considering annual average no location for  $\text{SO}_2$ , 19% station (for  $\text{NO}_2$ ) and 82% ( $\text{PM}_{10}$ ) stations exceed NAAQS. Considering 24-hourly average data into consideration, 5% station (for  $\text{SO}_2$ ), 15% ( $\text{NO}_2$ ) stations and 88% stations ( $\text{PM}_{10}$ ) exceed NAAQS. In case of sensitive area considering annual average into 17% station (for  $\text{NO}_2$ ) and 65% ( $\text{PM}_{10}$ ) stations exceed NAAQS. Considering 24-hourly average data into consideration, 69% station ( $\text{PM}_{10}$ ) exceed NAAQS.  $\text{SO}_2$  does not exceed the standard for both annual average and 24-hourly data and  $\text{NO}_2$  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  $\mu\text{g}/\text{m}^3$ )

| % of locations      | Residential/Industrial/Rural area |                   |                |                   |                  |                    | Sensitive area |                   |                |                   |                  |                    |
|---------------------|-----------------------------------|-------------------|----------------|-------------------|------------------|--------------------|----------------|-------------------|----------------|-------------------|------------------|--------------------|
|                     | $\text{SO}_2$                     |                   | $\text{NO}_2$  |                   | $\text{PM}_{10}$ |                    | $\text{SO}_2$  |                   | $\text{NO}_2$  |                   | $\text{PM}_{10}$ |                    |
|                     | Annual<br>> 50                    | 24 hourly<br>> 80 | Annual<br>> 40 | 24 hourly<br>> 80 | Annual<br>> 60   | 24 hourly<br>> 100 | Annual<br>> 20 | 24 hourly<br>> 80 | Annual<br>> 30 | 24 hourly<br>> 80 | Annual<br>> 60   | 24 hourly<br>> 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                 |

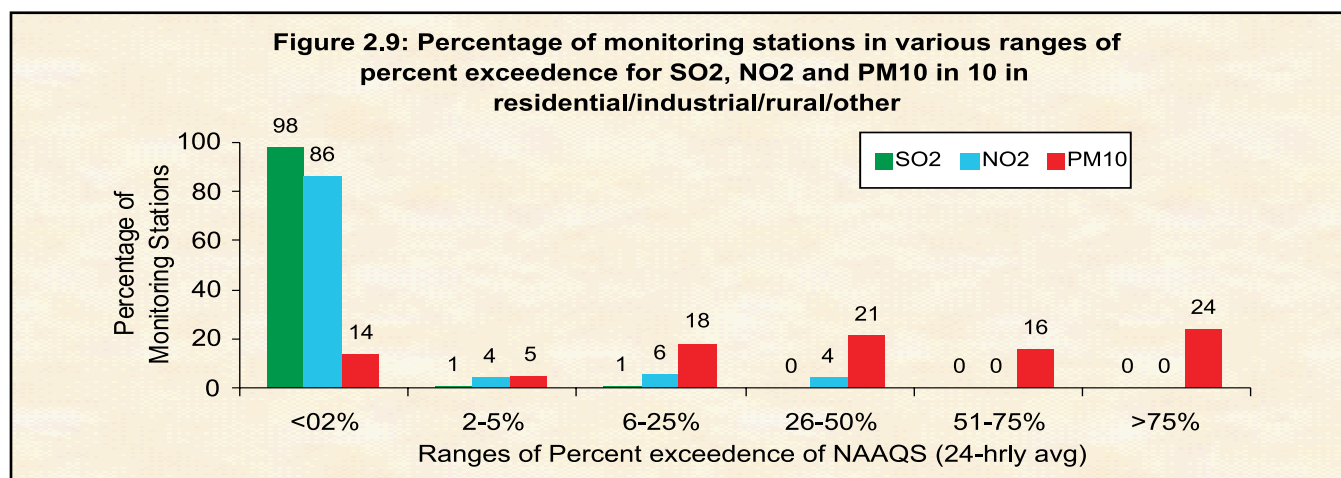
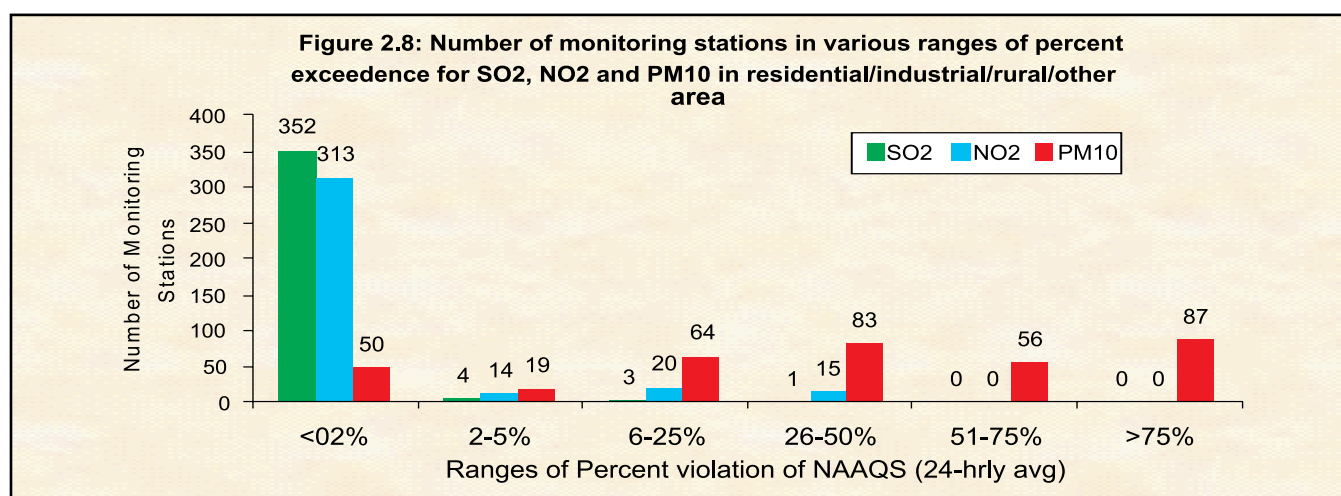


Number and percentage of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of  $\text{PM}_{10}$  is depicted in Table 2.10. The percentage exceedence of NAAQS for residential/industrial/rural/other area was less than 2% at 353 (88%) monitoring stations for  $\text{SO}_2$ , 313 (78%) monitoring stations for  $\text{NO}_2$  and 50 (12%) monitoring stations for  $\text{PM}_{10}$  out of 402 stations. Therefore it can be mentioned that considering daily average values the exceedence from NAAQS for  $\text{SO}_2$  was minimum followed by  $\text{NO}_2$  and was maximum for  $\text{PM}_{10}$ . (Figure 2.8). As for sensitive areas was less than 2% at 25 (81%) monitoring stations for  $\text{SO}_2$  and  $\text{NO}_2$  and 1 (7%) monitoring stations for  $\text{PM}_{10}$  out of 14 stations (Figure 2.9).

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

| Ranges of percent exceedance | Residential/Industrial/rural/other area |              |                 |              |                  |              | Sensitive area  |              |                 |              |                  |              |
|------------------------------|-----------------------------------------|--------------|-----------------|--------------|------------------|--------------|-----------------|--------------|-----------------|--------------|------------------|--------------|
|                              | SO <sub>2</sub>                         |              | NO <sub>2</sub> |              | PM <sub>10</sub> |              | SO <sub>2</sub> |              | NO <sub>2</sub> |              | PM <sub>10</sub> |              |
|                              | 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



### 2.5.2. Cities exceeding NAAQS

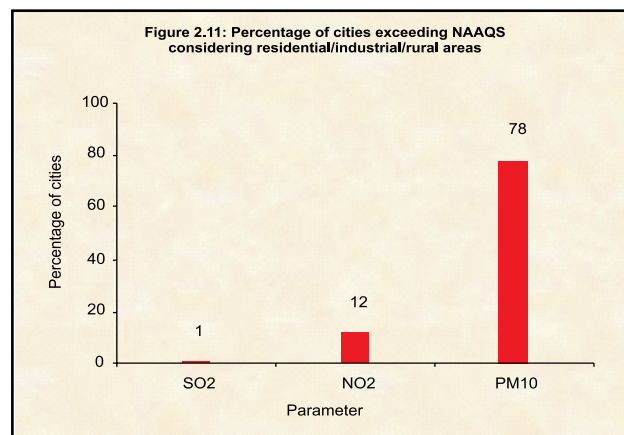
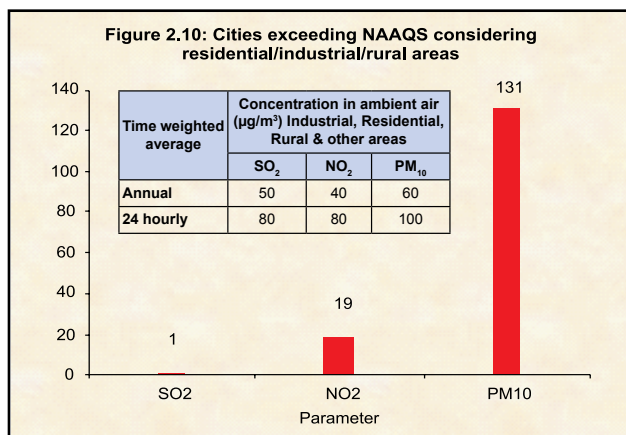
Number and percentage of cities exceeding NAAQS is presented in Table 2.11, Figure 2.10 and 2.11. Considering residential/industrial/rural area, 2 cities (1% for SO<sub>2</sub>), 19 cities (12% for NO<sub>2</sub>) and 131 cities (78% for PM<sub>10</sub>) exceed NAAQS. Considering sensitive area, 1 (8%) cities exceed NAAQS for SO<sub>2</sub> and NO<sub>2</sub> and 10 (77%) exceed for PM<sub>10</sub> respectively.

**Table 2.11. Number of cities exceeding the NAAQS**

(Based on annual average data)

|                     | Residential/Industrial/Rural area |                        |                         | Ecologically sensitive area |                        |                         |
|---------------------|-----------------------------------|------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
|                     | SO <sub>2</sub><br>>50            | NO <sub>2</sub><br>>40 | PM <sub>10</sub><br>>60 | SO <sub>2</sub><br>>20      | NO <sub>2</sub><br>>30 | PM <sub>10</sub><br>>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                      |

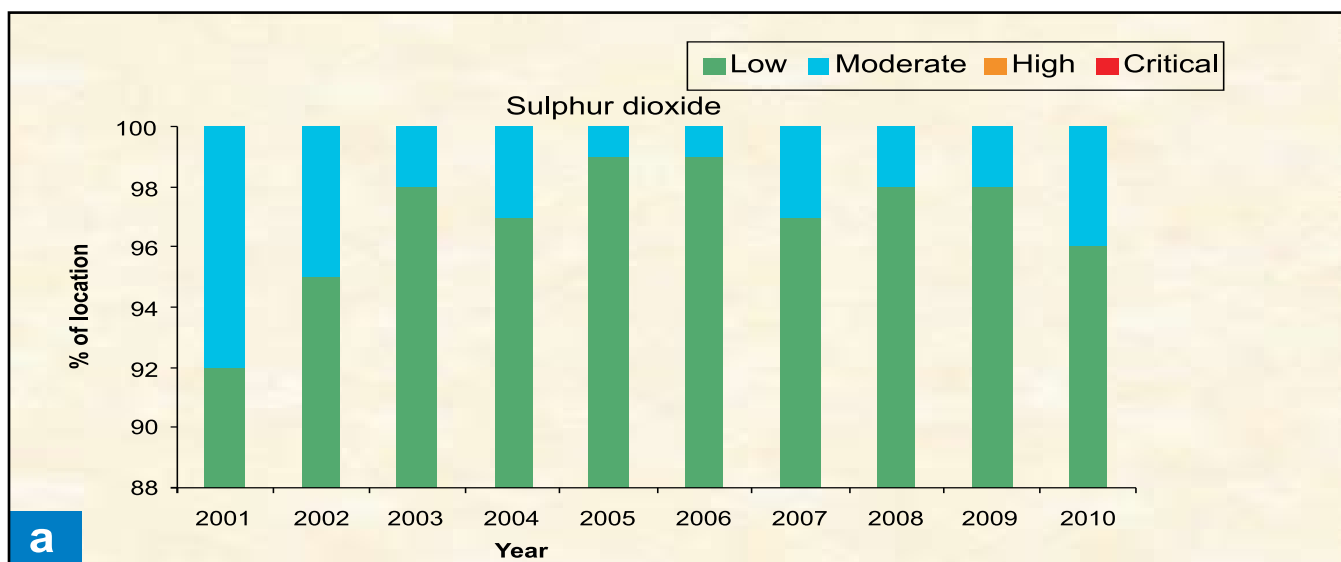
NB. Figures in parenthesis indicate percentage

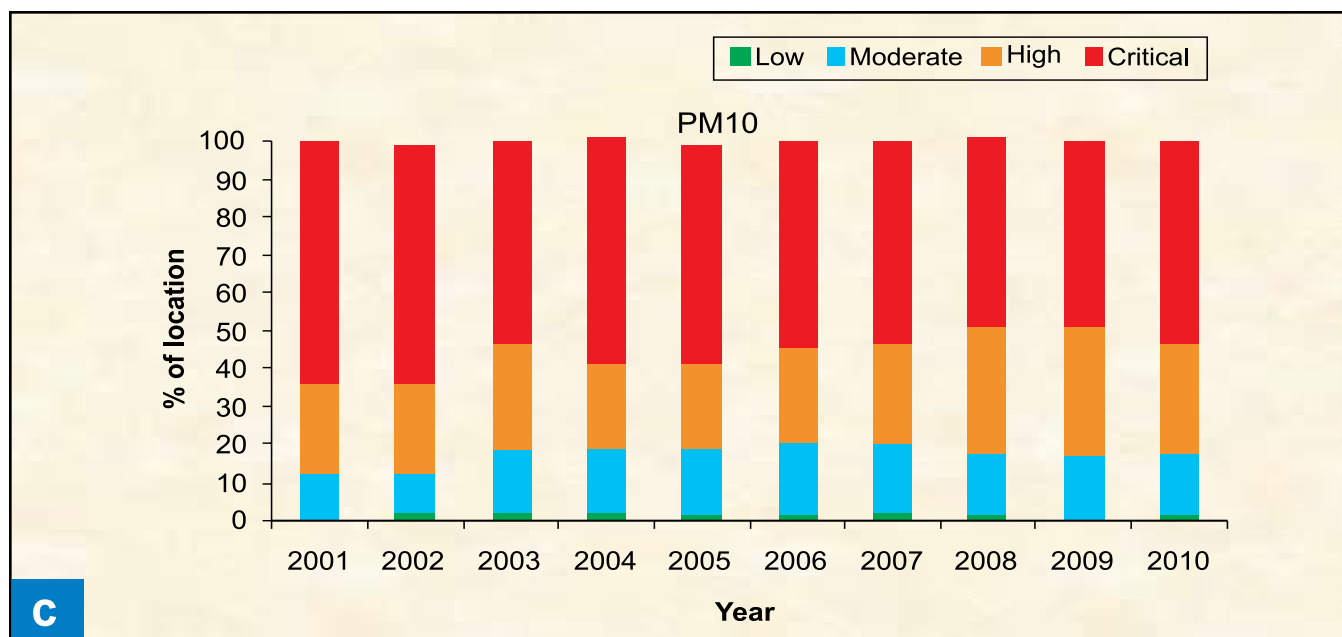
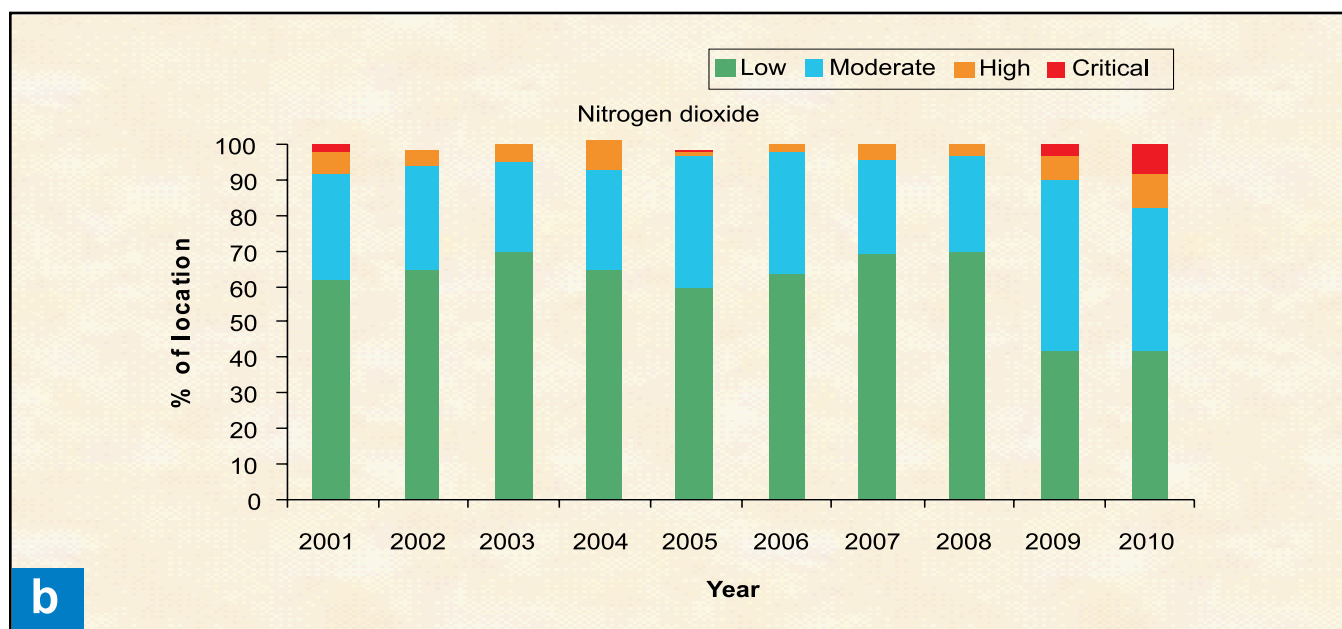


## 2.6 Percentage of residential/industrial/rural/other location in different pollution categories

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<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub> is depicted in Figure 2.10. With respect to SO<sub>2</sub>, percentage of locations are limited to low and moderate category though fluctuating over the years. This indicates a low SO<sub>2</sub> pollution level (Figure 12.10a). NO<sub>2</sub> 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<sub>10</sub> 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<sub>2</sub>, b. NO<sub>2</sub> and c. PM<sub>10</sub> (Residential areas; percentage of location)**

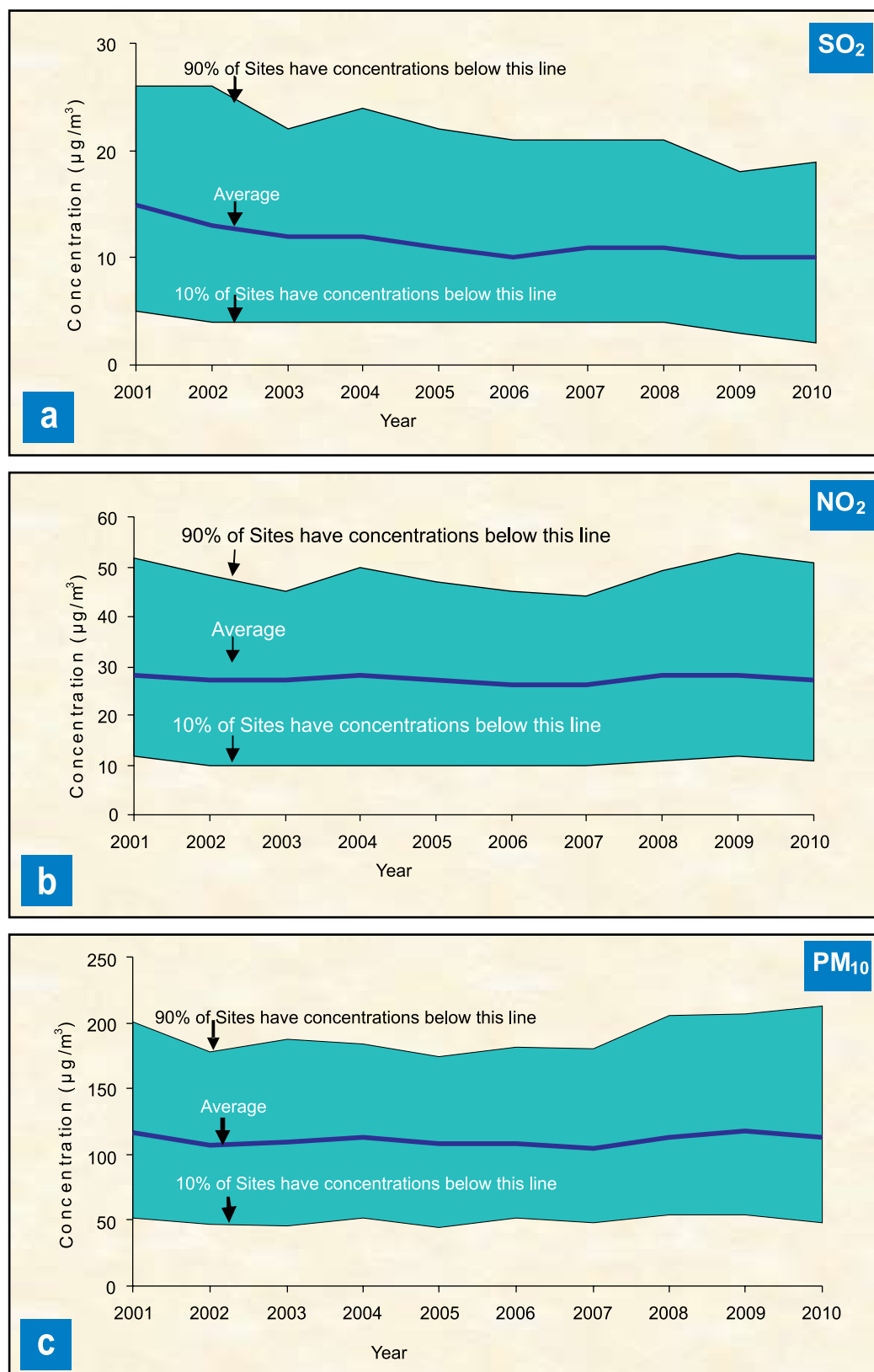




## 2.7 National Mean Concentration

National mean concentration with 90<sup>th</sup> percentile and 10<sup>th</sup> percentile for SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> is depicted in Figure 2.13. National mean of SO<sub>2</sub> concentration has decreased over the years indicating that there has been a decline in SO<sub>2</sub> 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<sub>2</sub> 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<sub>10</sub> 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 10<sup>th</sup> and 90<sup>th</sup> percentile for SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub>**



Sulphur dioxide (SO<sub>2</sub>) 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, 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. SO<sub>2</sub> 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<sub>2</sub> also causes acid rain and aesthetic damage. A compilation of sources and effects of SO<sub>2</sub> are given in Annexure I.

In this chapter a detailed summary of SO<sub>2</sub> 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<sub>2</sub> pollution is given.

### 3.1 Locations, cities and states with highest SO<sub>2</sub> values during 2010

Table 3.1 shows top ten locations in terms of annual average concentration of SO<sub>2</sub> 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 µg/m<sup>3</sup> SO<sub>2</sub> (Table 3.3). Among the states Jharkhand shows highest SO<sub>2</sub> values 23.2 µg/m<sup>3</sup> (Table 3.4).

**Table 3.1: Ten locations with highest SO<sub>2</sub> 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 (µg/m <sup>3</sup> ) | 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<sub>2</sub> exceeded the NAAQS of 50 µg/m<sup>3</sup> 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<sub>2</sub> 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 (µg/m <sup>3</sup> ) | 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<sub>2</sub> exceeded the NAAQS of 20 µg/m<sup>3</sup> 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<sub>2</sub> values (annual average) during 2010**  
(residential / industrial / rural / other area)

| Sl. No. | State         | City                | Min | Max | Annual average (µg/m <sup>3</sup> ) | 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 SO<sub>2</sub> exceeded the NAAQS of 50 µg/m<sup>3</sup> 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

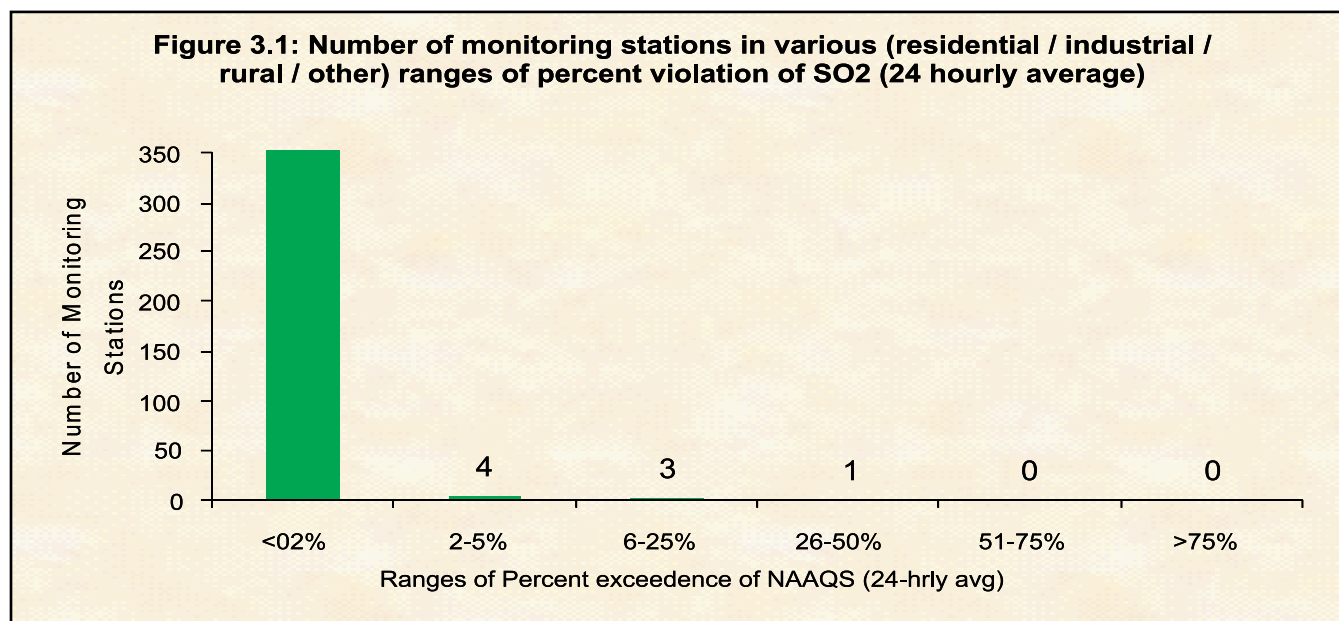
**Table 3.4: Ten states with highest SO<sub>2</sub> values (annual average) during 2010**  
(residential / industrial / rural / other & ecologically sensitive area)

| Sl. No. | State          | Min | Max | Annual average (µg/m <sup>3</sup> ) |
|---------|----------------|-----|-----|-------------------------------------|
| 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<sub>2</sub> exceeded the NAAQS of 50 µg/m<sup>3</sup> 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)

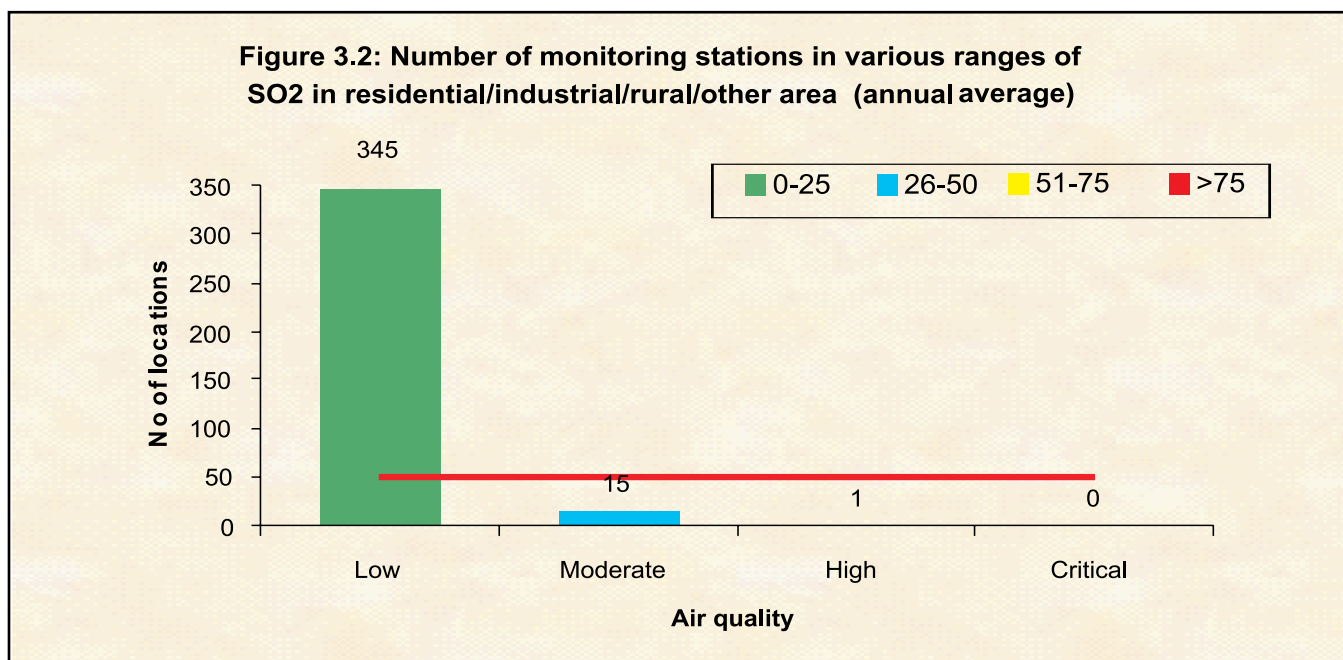
Number of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of SO<sub>2</sub> is depicted in Figure 3.1. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 353 monitoring stations out of 361 stations with adequate data. In the remaining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



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<sub>2</sub> is depicted in Figure 3.2. 345 locations showed low SO<sub>2</sub> level, 15 locations showed moderate and 1 location fall under high pollutin category. None of the location were in the critical category.



NB. Data of monitoring stations with monitoring days  $\geq 50$  has only been considered

Table 3.5: SO<sub>2</sub> 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|----------------|----------------|-----------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Andhra Pradesh | Chittoor       | 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           |
|                |                | Jubilee 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           |
|                |                | 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        | Kamakhyia Temple                              | 580          | RIRuO |                | 94                   | A    | 2   | 2   | 2                                                   | 2             | 2             | 2             | -         | 0                        | L           |
|                | Patancheru     | 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           |
|                | Vishakhapatnam | 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 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           |
|       |            | Head Office, Bamunimaidam                  | 193          | RIRuO |                | 254                  | A    | 3   | 11  | 7                                                   | 5             | 7             | 9             | 1         | 0                        | L           |
|       | Guwahati   | 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           |
|       | Lakhimpur  | Near Pragjyotish College, Santipur         | 541          | RIRuO |                | 264                  | A    | 5   | 13  | 7                                                   | 5             | 7             | 9             | 1         | 0                        | L           |
|       |            | Bazar Patti, North Lakhimpur               | 587          | RIRuO |                | 102                  | A    | 4   | 10  | 6                                                   | 5             | 6             | 8             | 1         | 0                        | L           |
|       |            | Water Resources Div., Christian Patty      | 595          | RIRuO |                | 103                  | A    | 3   | 9   | 6                                                   | 4             | 6             | 8             | 1         | 0                        | L           |
|       |            | PWD Rural Div Office Complex,              | 597          | RIRuO |                | 82                   | A    | 2   | 19  | 7                                                   | 5             | 7             | 9             | 2         | 0                        | L           |
|       | Sibsagar   | Sibsagar 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                        | -           |
|       |            | Beltron Bhawan, Shastri Nagar              | 210          | RIRuO |                | 80                   | A    | 2   | 10  | 5                                                   | 3             | 5             | 7             | 2         | 0                        | L           |
| Bihar | Patna      | Gandhi Maidan Test Centre                  | 284          | RIRuO |                | 46                   | IA   | 4   | 28  | 9                                                   | 4             | 7             | 18            | 6         | 0                        | -           |
|       | 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           |

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|----------------------|-----------|-------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Chattisgarh          | Bhilai    | 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                        | -           |
|                      |           | HIG 21.22.Near Ghantaghar,                | 364          | RIRuO |                | 94                   | A    | 12  | 14  | 13                                                  | 12            | 13            | 14            | 1         | 0                        | L           |
|                      | Korba     | 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           |
|                      |           | New HIG-9, Hirapur                        | 368          | RIRuO |                | 41                   | IA   | 11  | 17  | 14                                                  | 11            | 14            | 15            | 2         | 0                        | -           |
|                      | Raipur    | 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           |
|                      |           | N.Y. School, Sarojini Nagar               | 144          | RIRuO |                | 96                   | A    | 2   | 18  | 4                                                   | 2             | 3             | 9             | 3         | 0                        | L           |
| Delhi                |           | 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           |
|                      | Delhi     | 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           |
|                      | 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                        | -           |
| Goa                  | 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                        | -           |

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|---------|-----------|--------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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 Office                      | 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           |
|         |           | GPCB Office, Geri Vasahat            | 50           | RIRuO |                | 96                   | A    | 8   | 17  | 11                                                  | 8             | 10            | 13            | 2         | 0                        | L           |
|         | Vadodara  | 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           |
|         |           | GEB, Illird Phase, GIDC, Vapi        | 367          | RIRuO |                | 104                  | A    | 11  | 49  | 17                                                  | 13            | 17            | 19            | 6         | 0                        | L           |
|         | Vapi      | Vapi Nagar Palika, Vapi              | 221          | RIRuO |                | 104                  | A    | 10  | 17  | 14                                                  | 12            | 14            | 17            | 2         | 0                        | L           |
|         | 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           |
| Haryana | Hissar    | Urban Estate - II                    | 390          | RIRuO |                | 27                   | IA   | 5   | 11  | 8                                                   | 7             | 8             | 9             | 1         | 0                        | -           |
|         |           | Guru Jambheshwar University          | 414          | RIRuO |                | 52                   | A    | 2   | 18  | 7                                                   | 2             | 6             | 16            | 4         | 0                        | L           |
|         |           | Ballarpur Industries                 | 196          | RIRuO |                | 52                   | A    | 7   | 19  | 12                                                  | 9             | 12            | 16            | 3         | 0                        | L           |

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|------------------|----------------------|---------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Himachal Pradesh | Baddi                | Industry Department Office Building   | 449          | RIRuO |                | 93                   | A    | 0   | 7   | 3                                                   | 2             | 3             | 5             | 1         | 0                        | L           |
|                  |                      | AHC barotiwal                         | 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 Industrial Area              | 461          | RIRuO |                | 156                  | A    | 2   | 10  | 4                                                   | 2             | 4             | 6             | 2         | 0                        | L           |
|                  | Kala Amb             | Trilokpur                             | 530          | RIRuO |                | 155                  | A    | 2   | 5   | 2                                                   | 2             | 2             | 3             | -         | 0                        | L           |
|                  |                      | Municipal Council                     | 565          | RIRuO |                | 66                   | A    | 1   | 8   | 3                                                   | 2             | 3             | 4             | 1         | 0                        | L           |
|                  |                      | Regional Office, Sector- 4            | 132          | RIRuO |                | 147                  | A    | 2   | 5   | 3                                                   | 2             | 2             | 3             | 1         | 0                        | L           |
|                  | Parwanoo             | Asst. Commissioner Building, Sector I | 339          | RIRuO |                | 134                  | A    | 2   | 6   | 3                                                   | 2             | 3             | 4             | 1         | 0                        | L           |
|                  |                      | 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           |
|                  |                      | Regional Office, Jammu                | 184          | RIRuO |                | 88                   | A    | 2   | 9   | 5                                                   | 3             | 4             | 7             | 2         | 0                        | L           |
| Jammu & Kashmir  | Jammu                | M.A. Stadium, Jewel Chowk, Jammu      | 482          | RIRuO |                | 89                   | A    | 2   | 15  | 6                                                   | 4             | 6             | 9             | 2         | 0                        | L           |
|                  |                      | Bari Brahmana Industrial Area, Jammu  | 507          | RIRuO |                | 49                   | IA   | 3   | 19  | 10                                                  | 6             | 9             | 16            | 4         | 0                        | -           |
|                  |                      | EMTI, Bastacola                       | 612          | RIRuO |                | 67                   | A    | 12  | 36  | 16                                                  | 13            | 15            | 18            | 3         | 0                        | L           |
| Jharkhand        | Dhanbad              | 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           |
|                  |                      | Bistupur Vehical Testing Centre       | 351          | RIRuO |                | 89                   | A    | 30  | 41  | 36                                                  | 33            | 36            | 38            | -         | 0                        | M           |
|                  | Jamshedpur           | Golmuri Vehicle Testing Centre        | 382          | RIRuO |                | 91                   | A    | 23  | 42  | 35                                                  | 33            | 35            | 38            | 3         | 0                        | M           |
|                  |                      | M.A.D.A.                              | 332          | RIRuO |                | 68                   | A    | 13  | 36  | 17                                                  | 14            | 17            | 20            | 3         | 0                        | L           |
|                  |                      | Albert Ekka Chowk, Main Road          | 402          | RIRuO |                | 111                  | A    | 16  | 31  | 19                                                  | 17            | 19            | 23            | 3         | 0                        | L           |
|                  | Saraikela Khar-sawan | RO Building, Adityapur                | 614          | RIRuO |                | 86                   | A    | 28  | 41  | 35                                                  | 31            | 35            | 39            | 3         | 0                        | M           |
|                  |                      | BIT / PDIL                            | 46           | RIRuO |                | 33                   | IA   | 11  | 24  | 16                                                  | 12            | 15            | 21            | 3         | 0                        | -           |
|                  |                      | 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 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           |
|           |                | Inanabharathi, 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                        | -           |
|           |                | Karnataka SPCB Office Building              | 460          | ES    | Sahyadri       | 83                   | A    | 2   | 2   | 2                                                   | 2             | 2             | 2             | -         | 0                        | L           |
|           | Belgaum        | Government Hospital                         | 459          | RIRuO |                | 77                   | A    | 2   | 523 | 9                                                   | 2             | 2             | 3             | 59        | 1                        | L           |
|           | Gulbarga       | KSRTC bus stand building                    | 458          | RIRuO |                | 84                   | A    | 4   | 6   | 5                                                   | 4             | 5             | 6             | 1         | 0                        | L           |
|           | Hassan         | Lakmanahali Industrial Area, Dharwad        | 432          | RIRuO |                | 69                   | A    | 2   | 13  | 4                                                   | 2             | 2             | 9             | 3         | 0                        | L           |
|           | Hubli-Dharwad  | 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           |
|           | 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           |
| Kerala    |                | 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           |
|           | Kochi          | 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           |

| State          | City      | Location                                 | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | SO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|----------------|-----------|------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|                |           | Dindayal Nagar                           | 479          | RIRuO |                | 71                   | A    | 17  | 7   | 12                                                  | 9             | 12            | 14            | 2         | 0                        | L           |
|                | Gwalior   | Maharaj Bada                             | 478          | RIRuO |                | 60                   | A    | 19  | 8   | 13                                                  | 10            | 13            | 15            | 2         | 0                        | L           |
|                |           | 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           |
|             | Aurangabad  | Rajkamal Square                                | 547          | RIRuO |                | 96                   | A    | 6   | 18  | 13                                                  | 11            | 14            | 16            | 2         | 0                        | L           |
|             |             | S.B.E.S. College                               | 511          | RIRuO |                | 110                  | A    | 4   | 13  | 7                                                   | 5             | 7             | 9             | 2         | 0                        | L           |
|             |             | Collector Office                               | 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           |
|             |             | Grampanchat Ghughus                            | 267          | RIRuO |                | 93                   | A    | 5   | 86  | 30                                                  | 9             | 23            | 62            | 20        | 1                        | M           |
|             | Chandrapur  | 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, Rajlura             | 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           |
|             | Jalgaon     | Municipal Council, Ballarshah                  | 639          | RIRuO |                | 94                   | A    | 4   | 85  | 20                                                  | 6             | 15            | 35            | 14        | 1                        | L           |
|             |             | 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           |
|             |             | MIDC Water Works                               | 641          | RIRuO |                | 96                   | A    | 4   | 22  | 8                                                   | 4             | 7             | 15            | 4         | 0                        | L           |
|             | Latur       | Terrace of Kshewraj Vidyalaya Shyamnagar       | 642          | RIRuO |                | 104                  | A    | 4   | 22  | 8                                                   | 4             | 6             | 12            | 4         | 0                        | L           |
|             |             | Terrace of Sidheshwar Sahakari Bank Ganjigolai | 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 Prvi organics Ltd                     | 570          | RIRuO |                | 56                   | A    | 11  | 36  | 21                                                  | 12            | 21            | 27            | 6         | 0                        | L           |
|             | Mumbai      | Mahatma Phule Hall, MNP                        | 571          | RIRuO |                | 50                   | A    | 10  | 26  | 16                                                  | 12            | 16            | 22            | 4         | 0                        | L           |
|             |             | 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           |
|             | Nashik      | Maslasath, 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           |
|             |             | 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           |
|             | Navi Mumbai | Nashik Municipal Council Building              | 280          | RIRuO |                | 111                  | A    | 11  | 33  | 21                                                  | 16            | 20            | 26            | 4         | 0                        | L           |
|             |             | 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           |
|             | Pune        | GIDCO Nodal Office Kharghar                    | 494          | RIRuO |                | 105                  | A    | 6   | 43  | 15                                                  | 9             | 13            | 21            | 6         | 0                        | L           |
|             |             | Parvel Residential Area, Talaja                | 495          | RIRuO |                | 96                   | A    | 5   | 30  | 15                                                  | 9             | 15            | 22            | 5         | 0                        | L           |
|             |             | MIDC Collom Facility Building                  | 496          | RIRuO |                | 99                   | A    | 8   | 74  | 30                                                  | 16            | 29            | 44            | 11        | 0                        | M           |
|             |             | Maratha Chamber of commerce, Bhosari           | 312          | RIRuO |                | 104                  | A    | 11  | 195 | 40                                                  | 15            | 31            | 74            | 28        | 10                       | M           |
|             | Pune        | State Electricity Board BLDG Nalstop           | 379          | RIRuO |                | 104                  | A    | 10  | 45  | 23                                                  | 13            | 21            | 38            | 9         | 0                        | L           |
|             |             | Swargate Police Chowki                         | 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           |
|           |            | WIT Campus                                                 | 299          | RIRuO |                | 106                  | A    | 13  | 19  | 17                                                  | 15            | 16            | 18            | 1         | 0                        | L           |
|           | Solapur    | 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                        | -           |
| Meghalaya | 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           |
|           | 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 Premises, Lumpynggad                         | 120          | ES    | Hill station   | 54                   | A    | 2   | 2   | 2                                                   | 2             | 2             | 2             | -         | 0                        | L           |
|           | 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           |
|        |             | Capital Police Station                           | 424          | RIRuO |                | 105                  | A    | 2   | 2   | 2                                                   | 2             | 2             | 2             | -         | 0                        | L           |
|        | Bhubneshwar | 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.PS.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           |
|        |             | M/s Punjab Chemicals & Crop Protection Ltd       | 504          | RIRuO |                | 128                  | A    | 6   | 18  | 10                                                  | 8             | 10            | 14            | 3         | 0                        | L           |
|        | Dera Bassi  | 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           |
|        |             | M/s Modi Oil and General Mills                   | 302          | RIRuO |                | 107                  | A    | 10  | 28  | 17                                                  | 12            | 17            | 21            | 3         | 0                        | L           |
|        | Gobindgarh  | 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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|-----------|-------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Rajasthan | Ludhiana    | Bharat Nagar Chowk                              | 422          | RIRuO |                | 24                   | IA   | 7   | 10  | 9                                                   | 7             | 9             | 9             | 1         | 0                        | -           |
|           |             | Nahar Spinning Mills, 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           |
|           | Naya Nangal | Vishavkarma Chowk                               | 335          | RIRuO |                | 126                  | A    | 5   | 17  | 9                                                   | 6             | 10            | 13            | 2         | 0                        | L           |
|           |             | M/s Punjab Alkalies & 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           |
|           |             | Ceylon Industries                               | 600          | RIRuO |                | 126                  | A    | 3   | 14  | 7                                                   | 4             | 7             | 10            | 2         | 0                        | L           |
|           | Patiala     | Fire Brigade Station, Bahera Road,              | 599          | RIRuO |                | 119                  | A    | 4   | 12  | 6                                                   | 5             | 6             | 8             | 1         | 0                        | L           |
|           |             | DSTC Office Upstairs, AnnaNagar                 | 64           | RIRuO |                | 90                   | A    | 3   | 9   | 6                                                   | 4             | 6             | 8             | 1         | 0                        | L           |
|           | Puducherry  | 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           |
|           |             | Regional Office, Rajasthan SPCB                 | 372          | ES    | Aravali range  | 79                   | A    | 4   | 14  | 7                                                   | 4             | 7             | 9             | 2         | 0                        | L           |
|           | Alwar       | 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           |
| Rajasthan | Jodhpur     | VKIA                                            | 297          | RIRuO |                | 114                  | A    | 5   | 11  | 6                                                   | 5             | 6             | 7             | 1         | 0                        | L           |
|           |             | 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           |
|           | Kota        | 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           |
|           |             | Regional Office, RJPB, Anantpura                | 17           | RIRuO |                | 102                  | A    | 9   | 20  | 13                                                  | 10            | 13            | 15            | 2         | 0                        | L           |
|           | Udaipur     | 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           |

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|---------------|------------|--------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|               |            | Highway (Project -I) Building                    | 306          | RIRuO |                | 102                  | A    | 6   | 16  | 10                                                  | 8             | 10            | 13            | 2         | 0                        | L           |
|               | Madurai    | 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           |
| Uttar Pradesh | Agra       | Raja Agencies                                    | 240          | RIRuO |                | 86                   | A    | 4   | 56  | 11                                                  | 5             | 10            | 17            | 7         | 0                        | L           |
|               |            | 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           |
|               |            | 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 Colony, Sonabhadra                        | 6            | RIRuO |                | 104                  | A    | 13  | 20  | 17                                                  | 1             | 16            | 17            | 18        | 0                        | L           |
|               | Anpara     | 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           |
|               |            |                                                  |              |       |                |                      |      |     |     |                                                     |               |               |               |           |                          |             |

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|---------------|-----------|------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|               |           | 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           |
|               | Kanpur    | 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           |
|               |           | Awasthi 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           |
|               |           | 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           |
|               | Lucknow   | 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 <sub>2</sub> 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 Municipaplity         | 655          | RIRuO |                | 102                  | A    | 5   | 20  | 9                                      | 6             | 9             | 13            | 3         | 0                        | L           |
|             | Barrackpore                                  | Dum Dum Telephone Exchange        | 653          | RIRuO |                | 101                  | A    | 6   | 25  | 11                                     | 7             | 11            | 16            | 4         | 0                        | L           |
|             |                                              | Kharchah Municipality             | 654          | RIRuO |                | 102                  | A    | 7   | 29  | 14                                     | 8             | 13            | 22            | 5         | 0                        | L           |
|             |                                              | DMC Water Works, Angadpur         | 591          | RIRuO |                | 105                  | A    | 5   | 11  | 8                                      | 6             | 8             | 9             | 1         | 0                        | L           |
| Durgapur    | 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                        |             |
|             | WBIDC 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 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, Dalhouse 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 Municipality                           | 662          | RIRuO |                | 105                  | A    | 6   | 13  | 9                                                   | 7             | 9             | 11            | 1         | 0                        | L           |
|             | Raniganj       | 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, Tol-lygunge | 652          | RIRuO |                | 102                  | A    | 4   | 13  | 7                                                   | 5             | 7             | 11            | 3         | 0                        | L           |
|             |                | Baupur Police Station, Barupur                  | 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<sub>2</sub> exceeded the NAAQS of 50 µg/m<sup>3</sup> for Residential/ industrial / other area and 20 µg/m<sup>3</sup> for sensitive area. \*\* Data not available/outlier/ not classified for 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/m<sup>3</sup> for SO<sub>2</sub>).

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. NO<sub>x</sub> are emitted as nitrogen oxide (NO) which is rapidly oxidized to nitrogen dioxide (NO<sub>2</sub>). Nitrogen dioxide (NO<sub>2</sub>) 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. NO<sub>2</sub> irritates the nose and throat increase susceptibility to respiratory infections. In addition, NO<sub>x</sub> 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 NO<sub>x</sub> is emitted as NO, which is rapidly oxidized to non toxic NO<sub>2</sub>.

In this chapter the a detailed summary of NO<sub>2</sub> 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<sub>2</sub> pollution is given.

#### 4.1 Locations, cities and states with highest NO<sub>2</sub> values during 2010

Table 4.1 shows top ten locations in terms of annual average concentration of NO<sub>2</sub> 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 µg/m<sup>3</sup> NO<sub>2</sub> (Table 4.3). Among the states West Bengal shows highest NO<sub>2</sub> values 64 µg/m<sup>3</sup> (Table 4.4)

**Table 4.1: Ten locations with higher NO<sub>2</sub> 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 (µg/m <sup>3</sup> ) | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|---------|-------------|-------------|-----------------------------------------|--------------|----------------------|-----|-----|-------------------------------------|-----------|--------------------------|-------------|
| 1       | West Bengal | Howrah      | Howrah Municipality School, Bandhabghat | 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<sub>2</sub> exceeded the NAAQS of 40 µg/m<sup>3</sup> 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<sub>2</sub> 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 (µg/m <sup>3</sup> ) | Std. Dev. | % exceedance (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<sub>2</sub> exceeded the NAAQS of 30 µg/m<sup>3</sup> 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<sub>2</sub> values (annual average) during 2010 (residential / industrial / rural / other area)**

| Sl. No. | State       | City           | Min | Max | Annual average (µg/m <sup>3</sup> ) | 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<sub>2</sub> exceeded the NAAQS of 40 µg/m<sup>3</sup> for Residential/ 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 considered.

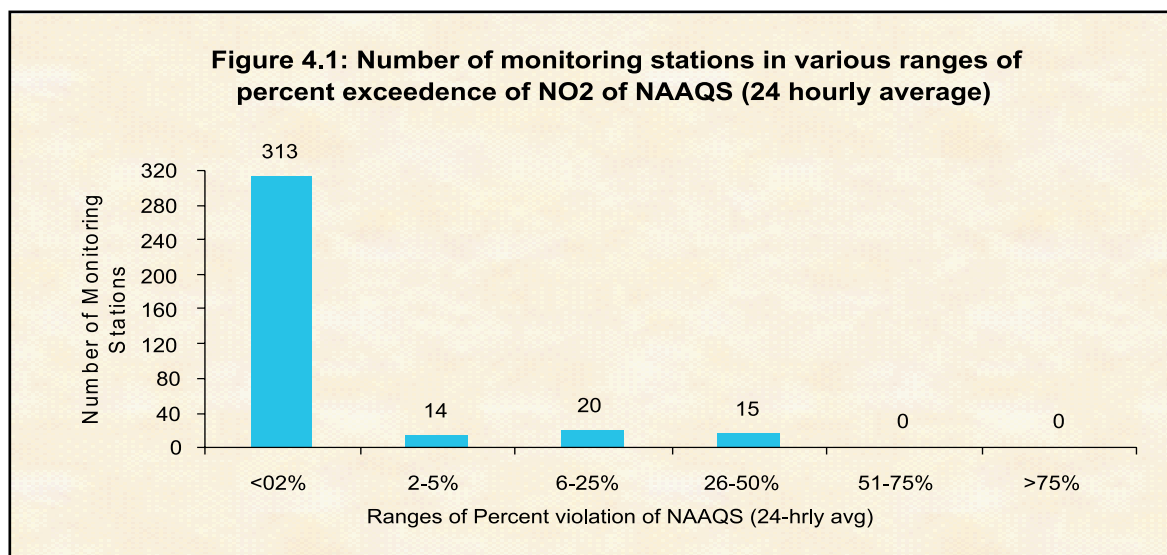
**Table 4.4: Ten state with highest NO<sub>2</sub> values (annual average) during 2010 (residential / industrial / rural / other & ecologically sensitive area)**

| Sl. No. | State         | Min | Max | Annual average (µg/m <sup>3</sup> ) |
|---------|---------------|-----|-----|-------------------------------------|
| 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<sub>2</sub> exceeded the NAAQS of 40 µg/m<sup>3</sup> 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)

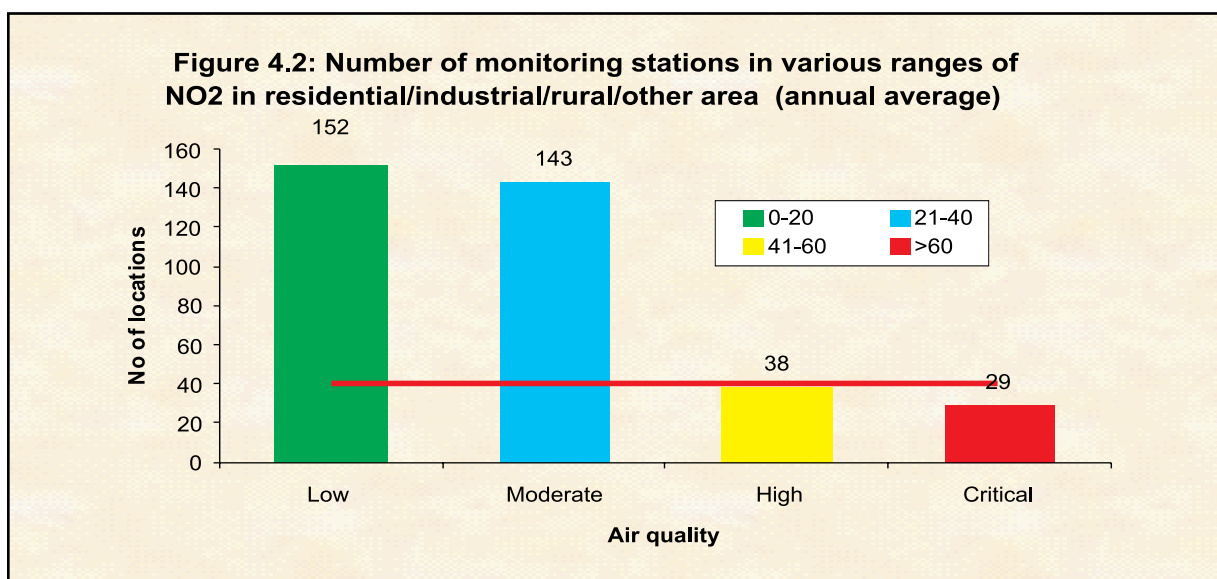
Number of monitoring stations in various ranges of percentage exceedence of NAAQS (24 hourly average) of NO<sub>2</sub> is depicted in Figure 4.1. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 313 monitoring stations out of 362 stations. In the remaining 49 stations, the percentage exceedence of NAAQS (24 hourly avg.) was 2% or more.



NB. Data of monitoring stations with monitoring days  $\geq 50$  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<sub>2</sub> is depicted in Figure 4.2. 152 locations showed low NO<sub>2</sub> 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  $\geq 50$  has only been considered

The annual average concentration of NO<sub>2</sub> 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<sub>2</sub> levels at many monitoring stations (with high and critical air quality) exceeded the prescribed limit.

Table 4.5: NO<sub>2</sub> 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|----------------|----------------|-----------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Andhra Pradesh | Chittoor       | 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           |
|                |                | 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           |
|                | Hydrabad       | 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           |
|                |                | Jubilee 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           |
|                |                | CER Club, Khamam                              | 581          | RIRuO |                | 103                  | A    | 10  | 13  | 11                                                  | 10            | 11            | 12            | 1         | 0                        | L           |
|                | Kothagudem     | Mourya Inn                                    | 466          | RIRuO |                | 118                  | A    | 9   | 9   | 9                                                   | 9             | 9             | 9             | -         | 0                        | L           |
|                | Kurnool        | RO, AP PCB                                    | 577          | RIRuO |                | 108                  | A    | 19  | 29  | 23                                                  | 20            | 24            | 27            | 3         | 0                        | M           |
|                | Nalgonda       | Kamakhyia Temple                              | 580          | RIRuO |                | 94                   | A    | 10  | 13  | 12                                                  | 11            | 12            | 12            | 1         | 0                        | L           |
|                | Nellore        | Police Station, Ramachadrapuram               | 468          | RIRuO |                | 98                   | A    | 18  | 33  | 23                                                  | 20            | 23            | 26            | 3         | 0                        | M           |
|                | Patencheru     | Karimnagar Godavarikhani                      | 465          | RIRuO |                | 98                   | A    | 5   | 50  | 12                                                  | 5             | 9             | 24            | 10        | 0                        | L           |
|                | Ramagundam     | Regional Science Centre, Chittoor Bypass Road | 389          | RIRuO |                | 104                  | A    | 9   | 9   | 9                                                   | 9             | 9             | 9             | -         | 0                        | L           |
|                | Tirupati       | Benz Circle                                   | 462          | RIRuO |                | 113                  | A    | 8   | 15  | 12                                                  | 10            | 13            | 14            | 2         | 0                        | L           |
|                | Vijaywada      | 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           |
|                |                | 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           |
|                | Vishakhapatnam | 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           |

| State | City       | Location                                   | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | NO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|-------|------------|--------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|       |            | 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   | 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           |
| Chattisgarh          | Bhilai     | Kaimbwala Village                         | 464          | RIRuO |                | 146                  | A    | 5   | 39  | 12                                                  | 5             | 11            | 18            | 6         | 0                        | L           |
|                      |            | 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           |
|                      |            | RO, CECB Vyapar Vilhar                    |              | RIRuO |                | 35                   | IA   | 12  | 35  | 19                                                  | 13            | 20            | 24            | 5         | 0                        | -           |
|                      |            | 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           |
|                      |            | 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                        | -           |
| Dadra & Nagar Haveli | Silvassa   | Yatayat Thana, Jai Stambh Chowk           | 447          | RIRuO |                | 44                   | IA   | 17  | 47  | 41                                                  | 39            | 41            | 44            | 4         | 0                        | -           |
|                      |            | 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           |
|                      |            | N.Y. School, Sarojini Nagar               | 144          | RIRuO |                | 96                   | A    | 24  | 124 | 68*                                                 | 41            | 65            | 106           | 23        | 26                       | C           |
| Delhi                | Delhi      | 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                        | -           |
|         |           | 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           |
| Gujarat | Ahmedabad | 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 Office                                  | 374          | RIRuO |                | 104                  | A    | 12  | 20  | 16                                                  | 14            | 16            | 18            | 1         | 0                        | L           |
|         |           | S.V.R. Engg. College                             | 21           | RIRuO |                | 104                  | A    | 13  | 27  | 22                                                  | 18            | 22            | 25            | 3         | 0                        | M           |
|         | Surat     | 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           |
|         |           | GPCB Office, Geri Vasahat                        | 50           | RIRuO |                | 96                   | A    | 10  | 31  | 15                                                  | 11            | 14            | 18            | 3         | 0                        | L           |
|         | Vadodara  | 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, Ilird 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           |

| State            | City                 | Location                              | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | NO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|------------------|----------------------|---------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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 Jambheshwar University           | 414          | RIRuO |                | 52                   | A    | 5   | 10  | 8                                                   | 5             | 8             | 10            | 2         | 0                        | L           |
| Himachal Pradesh | Yamunanagar          | Ballarpur Industries                  | 196          | RIRuO |                | 52                   | A    | 21  | 31  | 26                                                  | 22            | 27            | 29            | 2         | 0                        | M           |
|                  |                      | Industry Department Office Building   | 449          | RIRuO |                | 93                   | A    | 7   | 56  | 18                                                  | 11            | 16            | 26            | 8         | 0                        | L           |
|                  | Baddi                | 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           |
|                  |                      | Regional Office, Sector-4             | 132          | RIRuO |                | 149                  | A    | 4   | 20  | 11                                                  | 6             | 11            | 15            | 3         | 0                        | L           |
|                  | Parwanoo             | Asst. Commissioner Building, Sector I | 339          | RIRuO |                | 134                  | A    | 5   | 21  | 13                                                  | 8             | 13            | 17            | 4         | 0                        | L           |
| Jammu & Kashmir  | Paonta Sahib         | Paonta Sahib                          | 117          | RIRuO |                | 136                  | A    | 12  | 21  | 16                                                  | 13            | 16            | 19            | 2         | 0                        | L           |
|                  |                      | Gondpur 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           |
| Jharkhand        | 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                        | -           |
|                  | 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           |
| Karnataka        | Saraikela Khar-sawan | 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           |
|                  | 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           |
|           |                | Inanabharathi, 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                       | -           |
|           | Belgaum        | Victoria hospital                           | 406          | RIRuO |                | 29                   | IA   | 19  | 38  | 27                                                  | 20            | 28            | 36            | 6         | 0                        | -           |
|           |                | Karnataka SPCB Office Building              | 460          | ES    | Sahyadri       | 83                   | A    | 5   | 38  | 15                                                  | 9             | 13            | 26            | 7         | 0                        | L           |
|           | Gulbarga       | 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  | Lakmanahalli 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           |
|           | 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           |
|           |                | 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           |
|           | Kochi          | Irumanam                                    | 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           |
| Kerala    |                | 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           |
|           |                | PRS Hospital/COSMO                          | 419          | RIRuO |                | 108                  | A    | 15  | 49  | 26                                                  | 21            | 26            | 29            | 4         | 0                        | M           |
|           | Trivandrum     | 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           |
|                |            | Polo Ground                              | 127          | RIRuO |                | 89                   | A    | 8   | 51  | 21                                                  | 11            | 21            | 31            | 8         | 0                        | M           |
|                | Indore     | 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 LightMachinery | 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           |
|                |            | Jayant Township                          | 515          | RIRuO |                | 13                   | IA   | 29  | 22  | 26                                                  | 23            | 25            | 28            | 2         | 0                        | -           |
|                | Singrauli  | 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                        | -           |
| Maharashtra    | 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           |
|                | 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           |
|                |            | S.B.E.S. College                         | 511          | RIRuO |                | 109                  | A    | 12  | 34  | 22                                                  | 15            | 22            | 27            | 5         | 0                        | M           |
|                | Aurangabad | Collector Office                         | 512          | RIRuO |                | 108                  | A    | 11  | 34  | 19                                                  | 14            | 19            | 24            | 4         | 0                        | L           |
|                |            | C.A.D.A. Office, 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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|-------------|------------|-------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Maharashtra | 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           |
|             |            | Municipal 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           |
|             |            | University Campus, Shivaji University,    | 508          | ES    | Sahyadri       | 100                  | A    | 7   | 12  | 10                                                  | 8             | 10            | 12            | 1         | 0                        | L           |
|             | Kolhapur   | 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                        | -           |
|             |            | MIDC Water Works                          | 641          | RIRuO |                | 96                   | A    | 9   | 43  | 17                                                  | 10            | 16            | 25            | 6         | 0                        | L           |
|             | Latur      | Terrace of Kshewraj Vidyalaya Shyamna-gar | 642          | RIRuO |                | 104                  | A    | 9   | 33  | 16                                                  | 9             | 15            | 23            | 5         | 0                        | L           |
|             |            | Terrace of Sidheshwar Sahakari Bank       | 643          | RIRuO |                | 61                   | A    | 9   | 35  | 16                                                  | 10            | 15            | 22            | 5         | 0                        | L           |
|             | Lote       | Ganjigolai                                | 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, MNIP                  | 571          | RIRuO |                | 50                   | A    | 21  | 57  | 37                                                  | 25            | 37            | 48            | 9         | 0                        | M           |
|             |            | Kalbadevi                                 | 169          | RIRuO |                | 84                   | A    | 5   | 74  | 17                                                  | 5             | 10            | 34            | 15        | 0                        | L           |
|             | Mumbai     | 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           |
|             |            | Institution of Engineers                  | 287          | RIRuO |                | 86                   | A    | 25  | 85  | 38                                                  | 27            | 35            | 55            | 12        | 2                        | M           |
|             | Nagpur     | 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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|-------------|-------------|------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Maharashtra | 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           |
|             |             | Parvel Residential Area, Talaja                            | 495          | RIRuO |                | 96                   | A    | 13  | 72  | 34                                                  | 18            | 33            | 49            | 13        | 0                        | M           |
|             |             | MIDC Collom Facility 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           |
|             |             | Udyog bhavan / SRO, MPCB Sangli                            | 574          | RIRuO |                | 105                  | A    | 16  | 43  | 25                                                  | 19            | 24            | 30            | 5         | 0                        | M           |
|             | Sangli      | 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           |
|             |             | WIT Campus                                                 | 299          | RIRuO |                | 106                  | A    | 30  | 49  | 35                                                  | 33            | 35            | 38            | 3         | 0                        | M           |
|             | Solapur     | 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           |
|             | Ulhasnagar  | Kolshet and Balkum, Thane West                             | 305          | RIRuO |                | 36                   | IA   | 11  | 18  | 14                                                  | 12            | 14            | 17            | 2         | 0                        | -           |
|             |             | 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           |
| Mizoram     | Aizawl      | Boards Office Permisses, Lumpyngngad                       | 120          | ES    | Hill station   | 54                   | A    | 5   | 6   | 5                                                   | 5             | 5             | 5             | -         | 0                        | L           |
|             |             | Khatla, M.G-Road, Roof Top of Mizoram SPCB                 | 450          | ES    | Hill station   | 104                  | A    | 5   | 10  | 6                                                   | 5             | 5             | 7             | 1         | 0                        | L           |
|             |             | 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. Ber-ema's residence        | 452          | ES    | Hill station   | 104                  | A    | 5   | 11  | 6                                                   | 5             | 6             | 8             | 1         | 0                        | L           |

| State    | City        | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | NO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|----------|-------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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                        | -           |
|          | Angul       | Industrial Estate                               | 70           | RIRuO |                | 110                  | A    | 16  | 25  | 22                                                  | 21            | 23            | 24            | 2         | 0                        | M           |
|          | Balasore    | NALCO Township                                  | 231          | RIRuO |                | 100                  | A    | 16  | 26  | 19                                                  | 17            | 19            | 23            | 2         | 0                        | L           |
|          |             | 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           |
| Orissa   | Cuttack     | SPCB Building                                   | 322          | RIRuO |                | 113                  | A    | 10  | 23  | 18                                                  | 13            | 19            | 22            | 3         | 0                        | L           |
|          |             | Roof of Traffic Tower, Badambadi                | 426          | RIRuO |                | 105                  | A    | 13  | 38  | 22                                                  | 17            | 21            | 29            | 5         | 0                        | M           |
|          | Rayagada    | R.O. Cuttack Office, Surya Vihar                | 425          | RIRuO |                | 45                   | IA   | 14  | 38  | 19                                                  | 15            | 16            | 32            | 7         | 0                        | -           |
|          |             | Regional Office Orissa SPCB                     | 428          | RIRuO |                | 103                  | A    | 11  | 25  | 20                                                  | 14            | 21            | 23            | 3         | 0                        | L           |
|          | Rourkela    | LPS High School, Jaykaypur                      | 229          | RIRuO |                | 103                  | A    | 11  | 25  | 21                                                  | 15            | 21            | 24            | 3         | 0                        | M           |
|          |             | Regional Office, ORPB                           | 370          | RIRuO |                | 94                   | A    | 9   | 11  | 10                                                  | 10            | 10            | 11            | -         | 0                        | L           |
|          | Sambalpur   | IDL Police Out-post, Sonaparbati                | 227          | RIRuO |                | 104                  | A    | 9   | 26  | 11                                                  | 10            | 11            | 11            | 2         | 0                        | L           |
|          |             | 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.PS.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           |
|          | Bhatinda    | A-1,Platers, Amritsar / VMC                     | 486          | RIRuO |                | 57                   | A    | 32  | 40  | 36                                                  | 33            | 36            | 38            | 2         | 0                        | M           |
|          |             | M/s 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           |
|          | Jalandar    | United Rolling Mills, Mandi Gobindgarh          | 483          | RIRuO |                | 96                   | A    | 25  | 50  | 35                                                  | 30            | 34            | 40            | 4         | 0                        | M           |
|          |             | Municipal Council Tubewell                      | 353          | RIRuO |                | 25                   | IA   | 22  | 33  | 29                                                  | 24            | 30            | 33            | 3         | 0                        | -           |

| State     | City        | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | NO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|-----------|-------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Rajasthan | 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 Spinning Mills, 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           |
|           |             | Vishvakarma Chowk                               | 335          | RIRuO |                | 126                  | A    | 22  | 61  | 33                                                  | 24            | 30            | 45            | 9         | 0                        | M           |
|           | Naya Nangal | M/s Punjab Alkalies & 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  | DSTC Office Upstairs, Anna Nagar                | 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           |
|           |             | Regional Office, Rajasthan SPCB                 | 372          | ES    | Aravali range  | 79                   | A    | 12  | 51  | 26                                                  | 17            | 24            | 38            | 9         | 0                        | M           |
|           | Alwar       | 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           |
| Rajasthan | 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           |
|           | Jodhpur     | Regional Office (North), RSPCB, Vidyadhar 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           |
|           |             | 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           |
|           | Kota        | 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           |
|           | Udaipur     | 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           |
|           | Udaipur     | Samcore Glass Ltd.                              | 325          | RIRuO |                | 103                  | A    | 14  | 59  | 28                                                  | 16            | 23            | 44            | 12        | 0                        | M           |
|           |             | 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           |

| State         | City       | Location                                         | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | NO <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|---------------|------------|--------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|               |            | Highway (Project -I) Building                    | 306          | RIRuO |                | 102                  | A    | 13  | 34  | 24                                                  | 20            | 24            | 29            | 4         | 0                        | M           |
|               | Madurai    | 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|-------------|-------------|------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-----------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Uttarakhand | 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           |
|             |             | 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           |
|             | Kanpur      | 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           |
|             |             | 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           |
|             | Lucknow     | 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           |
|             |             | Begum Bridge                                               | 550          | RIRuO |                | 68                   | A    | 35  | 65  | 52*                                                 | 42            | 53            | 59            | 7         | 0                        | H           |
|             | Meerut      | 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                        | -           |
| West Bengal | 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           |
|             | 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 Municipality                                   | 655          | RIRuO |                | 102                  | A    | 33  | 118 | 65*                                                 | 43            | 64            | 92            | 19        | 22                       | C           |
|             | Barrackpore | Dum Dum Telephone Exchange                                 | 653          | RIRuO |                | 101                  | A    | 40  | 146 | 76*                                                 | 49            | 70            | 116           | 26        | 32                       | C           |
|             |             | Kharcha Municipality                                       | 654          | RIRuO |                | 102                  | A    | 42  | 156 | 80*                                                 | 52            | 72            | 126           | 28        | 39                       | C           |
|             |             | DMC Water Works, Angadpur                                  | 591          | RIRuO |                | 105                  | A    | 39  | 86  | 63*                                                 | 50            | 61            | 79            | 11        | 10                       | C           |
|             | Durgapur    | 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 <sub>2</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (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           |
| Howrah         |        | Supermarket Building, Durgachak                | 15           | RIRuO |                | 108                  | A    | 37  | 61  | 50*                                                 | 43            | 50            | 56            | 5         | 0                        | H           |
|                |        | WBIDC Durgachak                                | 14           | RIRuO |                | 108                  | A    | 43  | 64  | 53*                                                 | 46            | 53            | 59            | 5         | 0                        | H           |
|                |        | 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           |
|                |        | 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           |
| Kolkata        |        | Minto Park, Inside Park A/C 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           |
| Raniganj       |        | 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 Municipality                          | 662          | RIRuO |                | 105                  | A    | 53  | 93  | 70*                                                 | 59            | 70            | 82            | 9         | 13                       | C           |
| Sankrail       |        | 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           |
|                |        | 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           |
| South Suburban |        | 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           |
|                |        | Chanditala Water Supply Pump House, Tollygunge | 652          | RIRuO |                | 102                  | A    | 22  | 119 | 59*                                                 | 34            | 51            | 90            | 24        | 22                       | H           |
|                |        | Bauipur Police Station, Baruiipur              | 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<sub>2</sub> exceeded the NAAQS of 40 µg/m<sup>3</sup> for Residential/ industrial / other area and 30 µg/m<sup>3</sup> 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 exceedance 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/m<sup>3</sup> for NO<sub>2</sub>).

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:

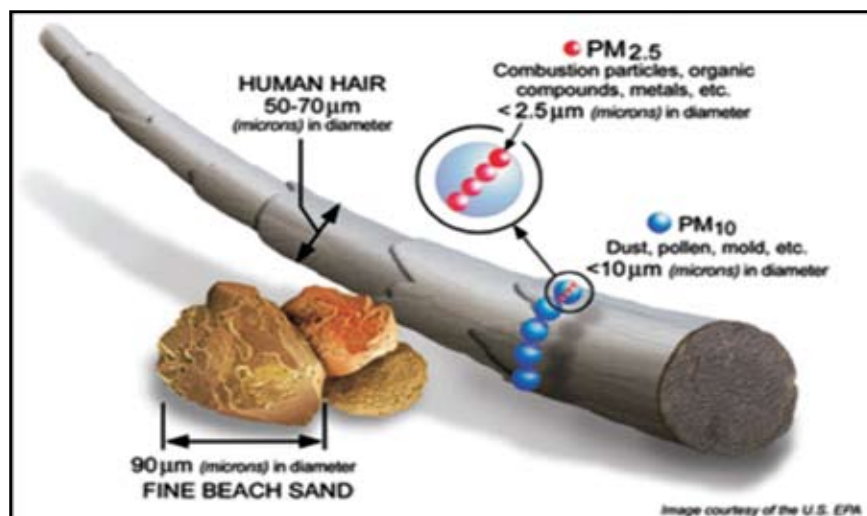
- **Primary PM:** Particulate matter is called primary if it is in the same chemical term in which it is emitted into the atmosphere. The primary particulate matter includes wind blown dust such as road dust, fly ash, soot etc.
- **Secondary PM:** Particulate matter is called secondary if it is formed 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 matter (RSPM) or PM <sub>10</sub> (thoracic fraction) | $\leq 10 \mu\text{m}$ diameter<br>produced by mechanical attrition of industrial dusts<br>lung deposition principally by impaction<br>$2.5 \mu\text{m} - 10 \mu\text{m}$ is called coarse fraction                                                                                                                                                                                                                                                                                                                                                       |
| Accumulation mode or Fine particles or PM <sub>2.5</sub> (respirable fraction)         | $\leq 2.5 \mu\text{m}$ in diameter<br>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)<br>penetrates deeper into the lungs<br>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)                                                              | $\leq 0.1 \mu\text{m}$ large surface area to mass ratio<br>making them potential carriers of harmful gaseous compounds<br>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  $50\ \mu m$  settle rapidly.
  - Condensation Originated - build up from molecular dimension after heating and cooling. Eg. Fumes (Condensation Originated) are produced 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  $10\ \mu m$  aerodynamic diameter (USEPA, 1996). They consist of particles with a diameter up to  $10\ \mu m$ . 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 I.

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<sub>10</sub> 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 (µg/m <sup>3</sup> ) | Std. Dev. | % exceedance (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<sub>10</sub> exceeded the NAAQS of 60 µg/m<sup>3</sup> 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<sub>10</sub> 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 (µg/m <sup>3</sup> ) | Std. Dev. | % exceedance (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<sub>10</sub> exceeded the NAAQS of 60 µg/m<sup>3</sup> 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<sub>10</sub> values (annual average) during 2010 (residential / industrial / rural / other area)**

| Sl. No. | State          | City           | Min | Max | Annual average (µg/m <sup>3</sup> ) | 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      | Jharua         | 131 | 370 | 237*                                | 40        | C           |
| 8       | Punjab         | Khanna         | 152 | 283 | 231*                                | 23        | C           |
| 9       | Punjab         | Gobindgarh     | 125 | 534 | 224*                                | 66        | C           |
| 10      | Punjab         | Amritsar       | 181 | 258 | 219*                                | 20        | C           |

\* - Cities where annual mean concentration of PM<sub>10</sub> exceeded the NAAQS of 60 µg/m<sup>3</sup> 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

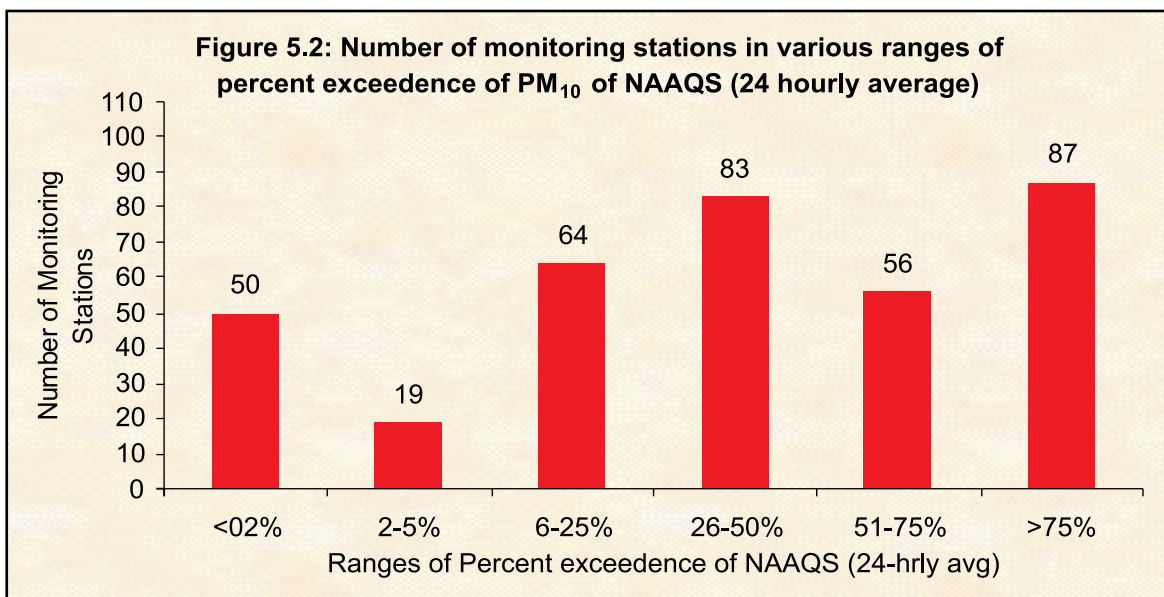
**Table 5.5: Ten states with highest PM<sub>10</sub> values (annual average) during 2010 (residential / industrial / rural / other & ecologically sensitive area)**

| Sl. No. | State          | Min | Max | Annual average (µg/m <sup>3</sup> ) |
|---------|----------------|-----|-----|-------------------------------------|
| 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       | Uttarakhand    | 36  | 656 | 118*                                |
| 10      | Madhya Pradesh | 24  | 308 | 110*                                |

\* - Locations where annual mean concentration of PM<sub>10</sub> exceeded the NAAQS of 60 µg/m<sup>3</sup> 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)

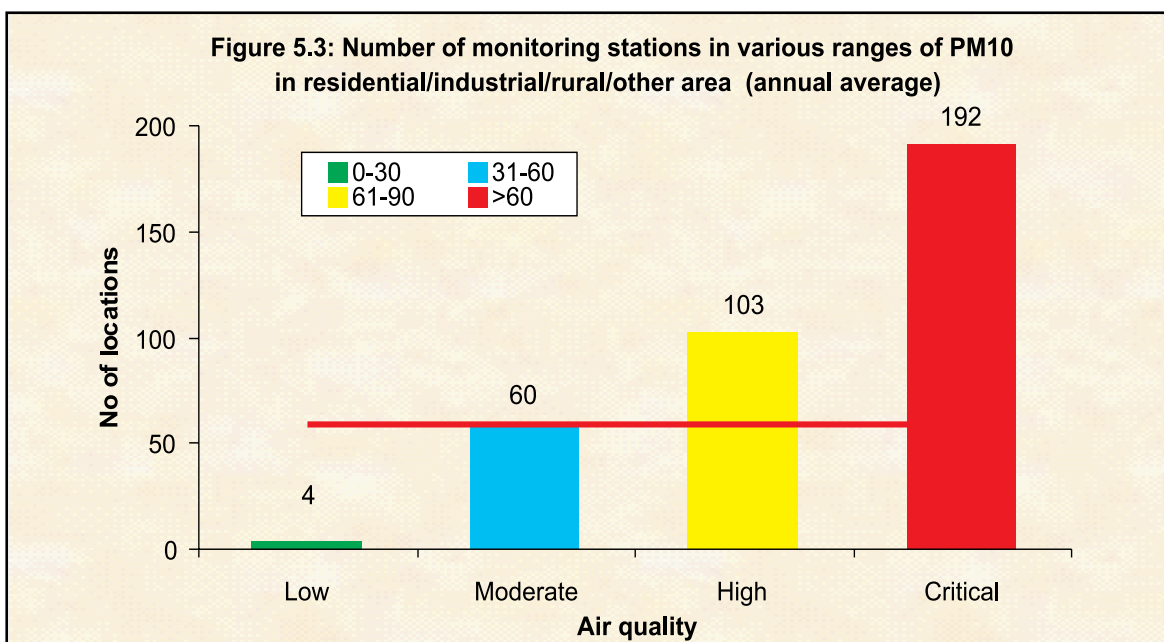
Number of monitoring stations in various ranges of percentage of exceeding limit of NAAQS (24 hourly average) of PM<sub>10</sub> is depicted in Figure 5.2. The percentage exceedence of NAAQS (24 hourly Average) was less than 2% at 50 monitoring stations out of 359 stations. In the remaining 309 stations,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



NB. Data of monitoring stations with monitoring days  $\geq 50$  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<sub>10</sub> is depicted in Figure 5.3. 4 locations showed low PM<sub>10</sub> 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  $\geq 50$  has only been considered

The annual average concentration of PM<sub>10</sub> 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<sub>10</sub> 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 <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|----------------|----------------|-----------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Andhra Pradesh | Chittoor       | 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           |
|                |                | 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           |
|                | Hydrabad       | 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           |
|                |                | Jubilee 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        | Kamakhyas 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           |
|                |                | 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           |
|                | Vishakhapatnam | 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           |
|                |                | Oil India Ltd. Chirang                        | 542          | RIRuO |                | 104                  | A    | 10  | 229 | 64*                                                  | 18            | 50            | 135           | 50        | 22                       | H           |
| Assam          | Bongaigaon     | 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           |
|                |                | 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       | 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           |

| State                | City     | Location                                  | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | PM <sub>10</sub> Annual average (µg/m3) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|----------------------|----------|-------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-----------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
|                      | 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           |          | 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           |
|                      |          | Visak Hostel, Sector-4                    | 65           | RIRuO |                | 93                   | A    | 78  | 113  | 96*                                     | 82            | 92            | 112           | 12        | 38                       | C           |
| Chattisgarh          | Bhillai  | 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 | R.O, CECB Vyapar Vihar                    |              | RIRuO |                |                      |      |     |      |                                         |               |               |               |           |                          |             |
|                      |          | HIG 21.22.Near Ghantaghar,                | 364          | RIRuO |                | 8                    | IA   | 108 | 120  | 116*                                    | 63            | 118           | 120           | 5         | 100                      | -           |
|                      | Korba    | 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           |
|                      |          | New HIG-9, Hirapur                        | 368          | RIRuO |                | 49                   | IA   | 190 | 347  | 267*                                    | 213           | 262           | 317           | 39        | 100                      | -           |
|                      | Raipur   | 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                      | -           |
|                      | Silvassa | Khadoli Industrial Area, Village- Khadoli | 558          | RIRuO |                | 94                   | A    | 18  | 90   | 39                                      | 19            | 26            | 85            | 27        | 0                        | M           |
| Dadra & Nagar Haveli | Daman    | Kadaia Industrial Area, Village- Kadaia   | 560          | RIRuO |                | 96                   | A    | 16  | 106  | 35                                      | 19            | 24            | 67            | 21        | 1                        | M           |
| 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           |

| State   | City        | Location                                          | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|---------|-------------|---------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Goa     |             | 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           |
|         | 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., Mormu-gao taluka | 37           | RIRuO |                | 103                  | A    | 19  | 178  | 61*                                                  | 28            | 51            | 105           | 32        | 14                       | H           |
|         | Curcholem   | Curcholem, 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 |             | 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           |
|         | Ahmedabad   | 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           |
|         |             | 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           |
|         | Anklesvar   | Fisheries Office                                  | 319          | RIRuO |                | 104                  | A    | 85  | 142  | 104*                                                 | 94            | 105           | 112           | 8         | 70                       | C           |
|         | Jamnagar    | Sardhara Industrial Corporation                   | 257          | RIRuO |                | 104                  | A    | 33  | 179  | 115*                                                 | 84            | 117           | 142           | 26        | 68                       | C           |
|         | Rajkot      | Regional Office                                   | 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           |
|         |             | GPCB Office, Geri Vasahat                         | 50           | RIRuO |                | 96                   | A    | 31  | 91   | 51                                                   | 39            | 52            | 50            | 9         | 0                        | M           |
| Haryana | Vadodara    | 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           |
|         |             | GEB, Illird 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           |
|         | 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           |
|         |             | Urban Estate - II                                 | 390          | RIRuO |                | 27                   | IA   | 61  | 226  | 93*                                                  | 66            | 74            | 143           | 38        | 30                       | -           |
|         |             | Guru Jambheshwar 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           |

| State            | City                 | Location                                   | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|------------------|----------------------|--------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Himachal Pradesh | Baddi                | Industry Department Office Building        | 449          | RIRuO |                | 96                   | A    | 30  | 361 | 112*                                                 | 54            | 111           | 159           | 52        | 59                       | C           |
|                  |                      | AHC barotiwalla                            | 564          | RIRuO |                | 85                   | A    | 35  | 241 | 103*                                                 | 52            | 96            | 154           | 43        | 44                       | C           |
|                  |                      | Housing Board                              | 563          | RIRuO |                | 150                  | IA   | 56  | 156 | 100*                                                 | 59            | 101           | 143           | 31        | 82                       | -           |
|                  |                      | Regional Office                            | 268          | RIRuO |                | 150                  | A    | 21  | 165 | 61*                                                  | 37            | 58            | 86            | 21        | 3                        | H           |
|                  | Damtal               | Old Road                                   | 271          | RIRuO |                | 114                  | A    | 29  | 135 | 75*                                                  | 47            | 74            | 102           | 22        | 38                       | H           |
|                  |                      | Kala Amb Industrial Area                   | 461          | RIRuO |                | 156                  | A    | 441 | 230 | 55*                                                  | 141           | 225           | 319           | 73        | 98                       | M           |
|                  | Kala Amb             | Trilokpur                                  | 530          | RIRuO |                | 157                  | A    | 24  | 236 | 102*                                                 | 61            | 96            | 148           | 36        | 46                       | C           |
|                  |                      | 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           |
| Jammu & Kashmir  | 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           |
|                  | Jammu                | Bari Brahmana Industrial Area, Jammu       | 507          | RIRuO |                | 49                   | IA   | 56  | 226 | 136*                                                 | 83            | 129           | 205           | 136       | 82                       | -           |
|                  |                      | EMTI, Bastacola                            | 612          | RIRuO |                | 72                   | A    | 95  | 365 | 214*                                                 | 167           | 208           | 259           | 50        | 99                       | C           |
|                  | Dhanbad              | 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           |
|                  | Jamshepur            | 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           |
|                  | Jhararia             | M.A.D.A.                                   | 332          | RIRuO |                | 71                   | A    | 131 | 370 | 237*                                                 | 188           | 237           | 274           | 40        | 100                      | C           |
|                  |                      | 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           |
|                  |                      | 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           |
|                  |                      | Graphite India                             | 77           | RIRuO |                | 59                   | A    | 22  | 513 | 133*                                                 | 34            | 123           | 226           | 95        | 58                       | C           |
| Karnataka        | Bangalore            | 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           |
|                  | Bangalore            | Jnanabharathi , 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           |
|                  |                      | 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           |
|                  |                      | Lakmanahali Industrial Area, Dharwad       | 432          | RIRuO |                | 69                   | A    | 36  | 173 | 79*                                                  | 46            | 64            | 134           | 35        | 28                       | H           |
|                  | Hubli-Dharwad        | Rani Chennamma Circle, Hubli               | 431          | RIRuO |                | 95                   | A    | 43  | 291 | 104*                                                 | 53            | 88            | 169           | 52        | 42                       | C           |

| State          | City           | Location                                    | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|----------------|----------------|---------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Kerala         | Mangalore      | Stides Premises, Baikampady Industrial Area | 488          | RIRuO |                | 105                  | A    | 21  | 148 | 48                                                   | 32            | 41            | 68            | 21        | 6                        | M           |
|                | Myore          | K.R.Circle                                  | 40           | RIRuO |                | 94                   | A    | 23  | 113 | 46                                                   | 33            | 46            | 59            | 13        | 2                        | M           |
|                | Alappuzha      | KSPCB Bldg. Hebbal Ind. Area                | 328          | RIRuO |                | 117                  | A    | 14  | 73  | 42                                                   | 24            | 41            | 63            | 15        | 0                        | M           |
|                |                | 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           |
|                |                | 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           |
|                | Kochi          | 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           |
|                |                | YTTILA                                      | 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           |
|                | Kozhikode      | Vadavathoor                                 | 361          | RIRuO |                | 96                   | A    | 33  | 50  | 41                                                   | 34            | 42            | 47            | 5         | 0                        | M           |
|                |                | Kozhikode City                              | 360          | RIRuO |                | 108                  | A    | 26  | 55  | 39                                                   | 29            | 37            | 50            | 8         | 0                        | M           |
|                | Malapuram      | Nallalam                                    | 359          | RIRuO |                | 108                  | A    | 23  | 82  | 45                                                   | 30            | 45            | 56            | 11        | 0                        | M           |
|                |                | 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           |
| Madhya Pradesh | 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           |
|                |                | Hamidia Road, M.P. Hastship Vikas Nigam     | 122          | RIRuO |                | 73                   | A    | 29  | 486 | 144*                                                 | 50            | 126           | 240           | 92        | 64                       | C           |
|                | Bhopal         | 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           |
|                | Gwalior        | Vikas Nagar                                 | 523          | RIRuO |                | 88                   | A    | 191 | 26  | 86*                                                  | 56            | 85            | 117           | 30        | 20                       | H           |
|                |                | Dindayal Nagar                              | 479          | RIRuO |                | 75                   | A    | 110 | 624 | 361*                                                 | 224           | 347           | 520           | 118       | 100                      | C           |
|                | Indore         | Maharaj Bada                                | 478          | RIRuO |                | 75                   | A    | 117 | 571 | 254*                                                 | 157           | 231           | 380           | 95        | 100                      | C           |
|                |                | Polo Ground                                 | 127          | RIRuO |                | 89                   | A    | 35  | 341 | 129*                                                 | 58            | 115           | 200           | 66        | 62                       | C           |
|                | Jabalpur       | 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           |
|                | Nagda          | 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           |

| State       | City       | Location                                                       | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|-------------|------------|----------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Maharashtra | Sagar      | Pt.Deendayal Nagar, Housing Board Colony                       | 532          | RIRuO |                | 16                   | IA   | 100 | 42  | 66*                                                  | 48            | 64            | 88            | 16        | 0                        | -           |
|             | Satna      | Sub-divisional Office E/M LightMachinery Regional Office MPPCB | 343          | RIRuO |                | 80                   | A    | 391 | 80  | 252*                                                 | 116           | 255           | 334           | 75        | 93                       | C           |
|             |            |                                                                | 342          | RIRuO |                | 96                   | A    | 277 | 74  | 135*                                                 | 99            | 127           | 193           | 41        | 88                       | C           |
|             | Singrauli  | layant Township                                                | 515          | RIRuO |                | 13                   | IA   | 84  | 67  | 77*                                                  | 70            | 77            | 83            | 5         | 0                        | -           |
|             |            | N.T.P.C., Vidyannagar                                          | 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                        | -           |
|             |            | District Office                                                | 527          | RIRuO |                | 74                   | A    | 183 | 60  | 118*                                                 | 81            | 119           | 157           | 29        | 68                       | C           |
|             | Ujjain     | 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           |
|             |            | M/s Apurva Oil and Industries Pvt. Ltd                         | 549          | RIRuO |                | 88                   | A    | 79  | 165 | 121*                                                 | 93            | 121           | 145           | 19        | 88                       | C           |
|             | Amravati   | 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           |
|             |            | S.B.E.S. College                                               | 511          | RIRuO |                | 110                  | A    | 42  | 201 | 91*                                                  | 56            | 88            | 134           | 32        | 32                       | C           |
|             | Aurangabad | Collector Office                                               | 512          | RIRuO |                | 108                  | A    | 29  | 116 | 68*                                                  | 43            | 69            | 92            | 19        | 4                        | H           |
|             |            | C.A.D.A. Office, 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           |
|             |            | Grampanchat Ghughus                                            | 267          | RIRuO |                | 93                   | A    | 30  | 396 | 214*                                                 | 81            | 215           | 341           | 99        | 80                       | C           |
|             | Chandrapur | 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           |
|             |            | Municipal Council, Ballarshah                                  | 639          | RIRuO |                | 94                   | A    | 18  | 492 | 132*                                                 | 44            | 134           | 209           | 73        | 67                       | C           |
|             |            | B. J. Market                                                   | 644          | RIRuO |                | 69                   | A    | 74  | 153 | 115*                                                 | 87            | 116           | 143           | 20        | 72                       | C           |
|             | Jalgaon    | 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           |
|             |            | University Campus, Shivaji University,                         | 508          | ES    | Sahyadri       | 101                  | A    | 42  | 64  | 54                                                   | 48            | 55            | 60            | 5         | 0                        | M           |
|             | Kolhapur   | 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           |
|             |            | MIDC Water Works                                               | 641          | RIRuO |                | 99                   | A    | 19  | 174 | 85*                                                  | 33            | 87            | 126           | 35        | 34                       | H           |
|             | Latur      | Terrace of Kshewraj Vidyalyaya Shyamnagar                      | 642          | RIRuO |                | 104                  | A    | 29  | 224 | 126*                                                 | 88            | 122           | 177           | 34        | 83                       | C           |
|             |            | Terrace of Sidhsheshwar Sahakari Bank                          | 643          | RIRuO |                | 61                   | A    | 55  | 233 | 108*                                                 | 69            | 105           | 148           | 34        | 56                       | C           |
|             |            | Ganigolai                                                      |              |       |                |                      |      |     |     |                                                      |               |               |               |           |                          |             |
|             | 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                       | -           |
|             |            | Water treatment plant, Bhirwadi                                | 569          | RIRuO |                | 66                   | A    | 33  | 210 | 94*                                                  | 45            | 90            | 142           | 38        | 39                       | C           |
|             | Mahad      | 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           |
|             |            | Kalbadevi                                                      | 169          | RIRuO |                | 83                   | A    | 28  | 177 | 78*                                                  | 35            | 72            | 143           | 40        | 28                       | H           |
|             | Mumbai     | 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           |

| State       | City           | Location                                                   | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|-------------|----------------|------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Maharashtra | 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, Hingana                 | 165          | RIRuO |                | 80                   | A    | 44  | 725 | 147*                                                 | 60            | 120           | 231           | 104       | 65                       | C           |
|             | Nashik         | 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           |
|             |                | 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           |
|             | Navi Mumbai    | Nashik Municipal Council Building                          | 280          | RIRuO |                | 111                  | A    | 23  | 189 | 77*                                                  | 44            | 71            | 125           | 31        | 23                       | H           |
|             |                | 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           |
|             | Pune           | CIDCO Nodal Office Kharghar                                | 494          | RIRuO |                | 105                  | A    | 19  | 393 | 95*                                                  | 49            | 87            | 150           | 50        | 32                       | C           |
|             |                | Panvel Residential Area, Talaja                            | 495          | RIRuO |                | 96                   | A    | 31  | 312 | 99*                                                  | 49            | 91            | 153           | 51        | 39                       | C           |
|             |                | MIDC Collom Facility Building                              | 496          | RIRuO |                | 99                   | A    | 63  | 389 | 198*                                                 | 101           | 193           | 315           | 80        | 90                       | C           |
|             |                | Maratha Chamber of commerce, Bhosari                       | 312          | RIRuO |                | 104                  | A    | 15  | 219 | 83*                                                  | 27            | 73            | 161           | 51        | 33                       | H           |
| Karnataka   | Pune           | 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 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           |
|             |                | WIT Campus                                                 | 299          | RIRuO |                | 106                  | A    | 34  | 118 | 68*                                                  | 47            | 64            | 94            | 18        | 6                        | H           |
|             | Solapur        | Voronoko School / Chitale Clinic                           | 300          | RIRuO |                | 107                  | A    | 34  | 128 | 64*                                                  | 44            | 63            | 88            | 18        | 3                        | H           |
|             |                | Maternity Hospital, Dhobighat, Kopri                       | 303          | RIRuO |                | 114                  | A    | 45  | 61  | 49                                                   | 46            | 48            | 56            | 4         | 0                        | M           |
|             |                | 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 Dawki | EPIP, Ri-Bhoi district                                     | 568          | RIRuO |                | 87                   | A    | 143 | 257 | 175*                                                 | 157           | 174           | 195           | 19        | 100                      | C           |
|             |                | Terrace building, Jaintia Hills District                   | 588          | RIRuO |                | 68                   | A    | 27  | 123 | 71*                                                  | 41            | 67            | 100           | 24        | 12                       | H           |
|             |                | Office building of Add Chief Engineer, Garo Hills District | 608          | RIRuO |                | 34                   | IA   | 44  | 77  | 63*                                                  | 52            | 63            | 73            | 8         | 0                        | -           |
|             |                | State Tuberculosis Hospital                                | 340          | ES    | Hill station   | 79                   | A    | 65  | 124 | 103*                                                 | 89            | 104           | 115           | 10        | 68                       | C           |
| Mizoram     | Shillong       | Boards Office Premises, Lumpyngngad                        | 120          | ES    | Hill station   | 54                   | A    | 40  | 75  | 56                                                   | 45            | 55            | 66            | 8         | 0                        | M           |
|             |                | Khatla, M.G.-Road, Roof Top of Mizoram SPCB                | 450          | ES    | Hill station   | 104                  | A    | 26  | 78  | 43                                                   | 31            | 43            | 57            | 11        | 0                        | M           |
|             |                | Laipuitlang, Residence of Chairman, MPCB                   | 451          | ES    | Hill station   | 104                  | A    | 17  | 64  | 33                                                   | 23            | 30            | 47            | 9         | 0                        | M           |
|             |                | Bawngkawn, Roof Top of Mr.K.L. Berman's residence          | 452          | ES    | Hill station   | 104                  | A    | 30  | 81  | 49                                                   | 38            | 47            | 64            | 10        | 0                        | M           |

| State    | City        | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|----------|-------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|------------------------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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                       | -           |
|          | 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           |
|          |             | Capital Police Station                          | 424          | RIRuO |                | 105                  | A    | 37  | 381 | 97*                                                  | 43            | 88            | 146           | 54        | 39                       | C           |
|          | Bhubneshwar | 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           |
| Orissa   | 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           |
|          |             | Coal Field Area / MCL AREA                      | 471          | RIRuO |                | 66                   | A    | 66  | 253 | 137*                                                 | 95            | 134           | 186           | 38        | 82                       | C           |
|          | Talcher     | T.T.PS.Colony                                   | 68           | RIRuO |                | 103                  | A    | 39  | 202 | 96*                                                  | 66            | 96            | 112           | 28        | 38                       | C           |
|          | 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           |
|          |             | M/s Punjab Chemicals and Crop Protection Ltd.   | 504          | RIRuO |                | 128                  | A    | 78  | 316 | 184*                                                 | 110           | 163           | 278           | 67        | 92                       | C           |
|          | Dera Bassi  | 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           |
|          |             | M/s Modi Oil and General Mills                  | 302          | RIRuO |                | 107                  | A    | 95  | 519 | 214*                                                 | 158           | 207           | 251           | 66        | 99                       | C           |
|          | Gobindgarh  | 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           |
| Punjab   | Jalandar    | Municipal Council Tubewell                      | 353          | RIRuO |                | 25                   | IA   | 119 | 151 | 144*                                                 | 139           | 146           | 150           | 6         | 100                      | -           |
|          |             | Markfed Vanaspati, Khanna                       | 485          | RIRuO |                | 123                  | A    | 136 | 284 | 233*                                                 | 208           | 233           | 262           | 22        | 100                      | C           |
|          | Khanna      | AS School, Khanna                               | 484          | RIRuO |                | 134                  | A    | 167 | 282 | 229*                                                 | 197           | 232           | 258           | 24        | 100                      | C           |
|          |             | Bharat Nagar Chowk                              | 422          | RIRuO |                | 24                   | IA   | 118 | 214 | 154*                                                 | 123           | 147           | 204           | 31        | 100                      | -           |
|          | Ludhiana    | Nahar Spinning 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           |
|          |             | Vishvakarma Chowk                               | 335          | RIRuO |                | 126                  | A    | 139 | 301 | 232*                                                 | 183           | 237           | 260           | 30        | 100                      | C           |
|          | Naya Nangal | M/s Punjab Alkalies & 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           |

| State                               | City                 | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | PM <sub>10</sub> Annual average (µg/m3) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedence (24 hourly) | Air Quality |
|-------------------------------------|----------------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-----------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| 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           |
|                                     | 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           |
|                                     |                      | Ajmeri Gate                                     | 296          | RIRuO |                | 1                    | IA   | 21  | 388  | 131*                                    | 50            | 96            | 249           | 83        | 5200                     | -           |
|                                     | Jaipur               | 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           |
| Rajasthan                           |                      | 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           |
|                                     |                      | DIC Office, Industrial Estate                   | 413          | RIRuO |                | 96                   | A    | 27  | 671  | 156*                                    | 54            | 144           | 239           | 110       | 65                       | C           |
|                                     | Jodhpur              | Solati 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           |
|                                     | Kota                 | Shastri Nagar Police Thana                      | 412          | RIRuO |                | 102                  | A    | 22  | 778  | 174*                                    | 65            | 147           | 300           | 116       | 75                       | C           |
|                                     |                      | 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           |
| Udaipur                             | Samcore Glass Ltd.   | 325                                             | RIRuO        |       | 103            | A                    | 20   | 428 | 120* | 32                                      | 110           | 207           | 77            | 55        | C                        |             |
|                                     | 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           |
|                                     | Coimbatore           | 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           |
|                                     | Madurai              | 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           |
|                                     | Salem                | 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                        |             |
| Uttar Pradesh                       | Agra                 | Sowdeswari College Building                     | 309          | RIRuO |                | 118                  | A    | 30  | 835  | 85*                                     | 47            | 71            | 123           | 76        | 27                       | H           |
|                                     |                      | 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           |
|                                     |                      | Regional Office, Bodla Nunhai                   | 323          | ES    | Taj-trapezium  | 89                   | A    | 96  | 311  | 179*                                    | 46            | 123           | 179           | 233       | 99                       | C           |
|                                     |                      | Taj Mahal                                       | 324          | ES    | Taj-trapezium  | 96                   | A    | 94  | 283  | 196*                                    | 46            | 135           | 195           | 258       | 97                       | C           |
|                                     |                      |                                                 | 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           |

| State       | City      | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | PM <sub>10</sub> Annual average (µg/m3) | 10 percentile | 50 percentile | 90 percentile | Std. Dev. | % exceedance (24 hourly) | Air Quality |
|-------------|-----------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-----------------------------------------|---------------|---------------|---------------|-----------|--------------------------|-------------|
| Uttarakhand | Allahabad | 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           |
|             |           | Square crossing circle of Laxmi Talkies         | 554          | RIRuO |                | 105                  | A    | 99  | 649  | 254*                                    | 92            | 160           | 245           | 348       | 99                       | C           |
|             | Anpara    | Bharat Yantra Nigam Ltd                         | 555          | RIRuO |                | 105                  | A    | 58  | 466  | 181*                                    | 63            | 107           | 179           | 261       | 92                       | C           |
|             |           | 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           |
|             |           | M/s Atlas Cycles Industries Ltd, Sahibabad      | 258          | RIRuO |                | 97                   | A    | 163 | 503  | 301*                                    | 200           | 306           | 398           | 88        | 100                      | C           |
|             | Ghaziabad | Industrial Area                                 | 369          | RIRuO |                | 88                   | A    | 160 | 517  | 280*                                    | 177           | 283           | 376           | 90        | 100                      | C           |
|             |           | Bulandshaar Road Industrial Area                | 517          | RIRuO |                | 120                  | A    | 92  | 292  | 131*                                    | 106           | 132           | 146           | 25        | 94                       | C           |
|             |           | lail Chauraha                                   | 518          | RIRuO |                | 120                  | A    | 72  | 184  | 106*                                    | 81            | 107           | 123           | 17        | 66                       | C           |
|             | Jhansi    | Veeranga Nagar                                  | 212          | RIRuO |                | 98                   | A    | 137 | 248  | 200*                                    | 163           | 207           | 226           | 26        | 100                      | C           |
|             |           | Forest & Training Centre, Kidwai Nagar          | 98           | RIRuO |                | 91                   | A    | 159 | 252  | 207*                                    | 180           | 209           | 233           | 22        | 100                      | C           |
|             |           | Chamber Of Commerce, Darshapurwa                | 86           | RIRuO |                | 81                   | A    | 145 | 273  | 221*                                    | 189           | 222           | 253           | 29        | 100                      | C           |
|             | Kanpur    | Fazalgani                                       | 391          | RIRuO |                | 80                   | A    | 131 | 308  | 196*                                    | 151           | 201           | 222           | 30        | 100                      | C           |
|             |           | Dabauli                                         | 395          | RIRuO |                | 93                   | A    | 126 | 254  | 194*                                    | 167           | 196           | 220           | 23        | 100                      | C           |
|             |           | Awass Vikas, Jajmau                             | 534          | RIRuO |                | 58                   | A    | 157 | 292  | 191*                                    | 161           | 174           | 265           | 38        | 100                      | C           |
|             | Khurja    | Central Glass & Ceramic Research Institute      | 535          | RIRuO |                | 58                   | A    | 136 | 200  | 155*                                    | 139           | 150           | 178           | 17        | 100                      | C           |
|             |           | Ahirpara                                        | 377          | RIRuO |                | 74                   | A    | 135 | 228  | 185*                                    | 146           | 189           | 217           | 27        | 100                      | C           |
|             |           | Mahanagar                                       | 398          | RIRuO |                | 109                  | A    | 103 | 6307 | 243*                                    | 151           | 194           | 220           | 587       | 100                      | C           |
|             | Lucknow   | Chandganj Garden, Aliganj                       | 109          | RIRuO |                | 82                   | A    | 129 | 236  | 192*                                    | 153           | 194           | 223           | 26        | 100                      | C           |
|             |           | Kapoor Hotel, Hazratganj                        | 113          | RIRuO |                | 81                   | A    | 150 | 243  | 205*                                    | 163           | 212           | 232           | 26        | 100                      | C           |
|             |           | Talkatora                                       | 397          | RIRuO |                | 102                  | A    | 147 | 304  | 194*                                    | 155           | 197           | 226           | 31        | 100                      | C           |
|             | Meerut    | S.M.K Chowk, Aminabad                           | 550          | RIRuO |                | 69                   | A    | 109 | 286  | 178*                                    | 119           | 197           | 240           | 54        | 100                      | C           |
|             |           | Begum Bridge                                    | 551          | RIRuO |                | 42                   | IA   | 104 | 286  | 155*                                    | 110           | 124           | 222           | 53        | 100                      | -           |
|             |           | Thana Railway Road, Kesarganj                   |              | RIRuO |                | 28                   | IA   | 57  | 569  | 221*                                    | 88            | 219           | 294           | 102       | 86                       | -           |
|             | Muradabad | Budh Bazar                                      |              | RIRuO |                | 30                   | IA   | 46  | 480  | 169*                                    | 90            | 167           | 237           | 83        | 83                       | -           |
|             |           | PTC                                             | 403          | RIRuO |                | 95                   | A    | 65  | 168  | 130*                                    | 103           | 132           | 147           | 21        | 91                       | C           |
|             |           | Regional Office, UP PCB                         | 378          | RIRuO |                | 96                   | A    | 71  | 194  | 134*                                    | 108           | 136           | 156           | 22        | 8800                     | C           |
|             | Noida     | Geep-Pee Electroplating and Engineering Work    | 362          | RIRuO |                | 24                   | IA   | 122 | 136  | 128*                                    | 124           | 127           | 133           | 4         | 100                      | -           |
|             |           | Regional Office, Jawahar Nagar                  | 553          | RIRuO |                | 8                    | IA   | 126 | 127* | 127*                                    | 126           | 127           | 128           | 1         | 100                      | -           |
|             |           | Sigra                                           | 90           | ES    | Doon valley    | 30                   | IA   | 80  | 169  | 121*                                    | 93            | 120           | 153           | 22        | 83                       | -           |
|             | Dehradun  | Rajpur Road, Near parag Diary                   | 89           | ES    | Doon valley    | 50                   | A    | 92  | 263  | 169*                                    | 129           | 164           | 220           | 36        | 98                       | C           |
|             |           | Clock Tower, PWD Guest House                    | 637          | ES    | Doon valley    | 3                    | IA   | 158 | 236  | 195*                                    | 191           | 214           | 232           | 39        | 100                      | -           |
|             |           | Himalaya Drug Co. Near ISBT                     | 625          | RIRuO |                | 1                    | IA   | -   | -    | 196*                                    | -             | -             | -             | -         | -                        | -           |
|             | Haldwani  | Govt. Women Hospital                            | 635          | RIRuO |                | 3                    | IA   | 100 | 179  | 139*                                    | 107           | 119           | 139           | 40        | 200                      | -           |
|             |           | SIDCUL, Haridwar                                | 627          | RIRuO |                | 1                    | IA   | -   | -    | 46                                      | -             | -             | -             | -         | -                        | -           |
|             |           | BSNL Office, Kashipur                           | 636          | ES    | Hill station   | 3                    | IA   | 186 | 238  | 212*                                    | 191           | 199           | 212           | 26        | 100                      | -           |
|             | Rishikesh | Nagar Palika Parishad                           |              |       |                |                      |      |     |      |                                         |               |               |               |           |                          |             |

| State       | City           | Location                                       | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | PM <sub>10</sub> Annual average (µg/m <sup>3</sup> ) | 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 Municipality                       | 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           |
|             |                | 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           |
|             | Durgapur       | 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           |
|             |                | WBIDC 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           |
|             |                | Salt Lake, Rooftop of CK Market                | 474          | RIRuO |                | 103                  | A    | 18  | 257 | 83*                                                  | 26            | 51            | 192           | 64        | 32                       | H           |
|             | Kolkata        | 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 Chowraha, Traffic Guard Building        | 476          | RIRuO |                | 103                  | A    | 16  | 364 | 98*                                                  | 33            | 63            | 220           | 76        | 37                       | C           |
| West Bengal | Kolkata        | 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, Dalhouse 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           |
|             |                | Chanditala Water Supply Pump House, Tollygunge | 652          | RIRuO |                | 102                  | A    | 14  | 272 | 80*                                                  | 24            | 44            | 188           | 67        | 34                       | H           |
|             | South Suburban | Bauiapur Police Station, Baruiapur             | 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<sub>10</sub> exceeded the NAAQS of 60 µg/m<sup>3</sup> for Residential/ industrial / other area and 60 µg/m<sup>3</sup> for sensitive area. ' - Data not available/ outlier/not classified as monitoring days < 50 days 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 5 µg/m<sup>3</sup> for PM<sub>10</sub>).

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 ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|----------------|------------|-----------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-------------------------------------------------|-----------|
| Andhra Pradesh | Chittoor   | 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        |
|                |            | 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        |
|                | Hydrabad   | Balanagar                                     | 95           | RIRuO |                | 108                  | A    | 194 | 413 | 302                                             | 38        |
|                |            | Uppal, IDA                                    | 203          | RIRuO |                | 108                  | A    | 183 | 361 | 282                                             | 37        |
|                |            | Jubilee 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    | Kamakhyia Temple                              | 580          | RIRuO |                | 94                   | A    | 88  | 156 | 130                                             | 13        |
|                | Patancheru | 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        |
|                |            | Benz Circle                                   | 462          | RIRuO |                | 113                  | A    | 128 | 331 | 224                                             | 51        |
|                | Vijaywada  | Autonagar                                     | 469          | RIRuO |                | 113                  | A    | 120 | 430 | 261                                             | 86        |
|                | Warangal   | KUDA Office, Hanumakonda                      | 579          | RIRuO |                | 102                  | A    | 43  | 351 | 140                                             | 65        |
|                |            | Panchayat Raj office, Mindi                   | 234          | RIRuO |                | 108                  | A    | 50  | 267 | 133                                             | 44        |
| Assam          |            | 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        |
|                |            | Oil India Ltd. Chirang                        | 542          | RIRuO |                | 104                  | A    | 29  | 403 | 121                                             | 98        |
|                | Bongaigaon | 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        |
|                |            | 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   | 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 ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|-------------|-------------|-------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| Assam       | Lakhimpur   | Central Dairy, Khanapara, Kamrup          | 596          | RIRuO |                | 106                  | A    | 56  | 494  | 190                                             | 98        |
|             |             | Near Pragjyotish College, Santipur        | 541          | RIRuO |                | 264                  | A    | 36  | 539  | 178                                             | 112       |
|             |             | Bazar Patti, North Lakhimpur              | 587          | RIRuO |                | 102                  | A    | 38  | 348  | 143                                             | 81        |
|             |             | Water Resources Div., Christian Patty     | 595          | RIRuO |                | 103                  | A    | 32  | 649  | 198                                             | 137       |
|             |             | PWD Rural Div Office Complex,             | 597          | RIRuO |                | 82                   | A    | 30  | 418  | 139                                             | 84        |
|             |             | Sibasagar Office Building                 | 537          | RIRuO |                | 107                  | A    | 33  | 399  | 147                                             | 83        |
|             |             | Usha Lodge, near ONGCL Colony             | 604          | RIRuO |                | 24                   | IA   | 20  | 195  | 65                                              | 37        |
|             |             | 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 Office Building                    | 536          | RIRuO |                | 104                  | A    | 24  | 606  | 135                                             | 95        |
|             |             | 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        |
|             |             | Beltron Bhawan, Shastri Nagar             | 210          | RIRuO |                | 88                   | A    | 82  | 883  | 268                                             | 145       |
| Bihar       | Patna       | Gandhi Maidan Test Centre                 | 284          | RIRuO |                | 52                   | A    | 137 | 1526 | 720                                             | 371       |
| Chandigarh  | Chandigarh  | Modern Foods, Industrial Area             | 106          | RIRuO |                | 148                  | A    | 65  | 1129 | 240                                             | 146       |
|             |             | Sector-17 C                               | 263          | RIRuO |                | 150                  | A    | 42  | 709  | 174                                             | 97        |
| Chattisgarh | Bhillai     | Punjab Engineering College, Sector 12     | 264          | RIRuO |                | 153                  | A    | 31  | 641  | 151                                             | 87        |
|             |             | Sector-39, IMTECH                         | 463          | RIRuO |                | 150                  | A    | 41  | 563  | 182                                             | 92        |
|             |             | Kaimbwa Village                           | 464          | RIRuO |                | 146                  | A    | 38  | 664  | 170                                             | 108       |
|             |             | Visak Hostel, Sector-4                    | 65           | RIRuO |                | 93                   | A    | 156 | 200  | 182                                             | 11        |
|             | Bilaspur    | 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        |
|             | Korba       | RO, CECB Vyapar Vihar                     | 364          | RIRuO |                | 35                   | IA   | 170 | 645  | 394                                             | 81        |
|             |             | HIG 21,22.Near Ghantaghar,                | 407          | RIRuO |                | 93                   | A    | 114 | 281  | 205                                             | 47        |
|             | Raipur      | Pragati Nagar NTPC Colony                 | 249          | RIRuO |                | 97                   | A    | 93  | 243  | 184                                             | 34        |
|             |             | I.T.I., Rampur                            | 407          | RIRuO |                | 95                   | A    | 109 | 316  | 220                                             | 45        |
|             | Silvassa    | 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        |
|             | Daman & Diu | Yatayat Thana, Jai Stambh Chowk           | 447          | RIRuO |                | 50                   | A    | 273 | 471  | 375                                             | 43        |
|             |             | Khadoli Industrial Area, Village- Khadoli | 558          | RIRuO |                | 94                   | A    | 37  | 290  | 110                                             | 104       |
| Delhi       | Daman       | Kadaiya Industrial Area, Village- Kadaiya | 560          | RIRuO |                | 96                   | A    | 32  | 254  | 93                                              | 79        |
|             |             | N.Y. School, Sarojini Nagar               | 144          | RIRuO |                | 91                   | A    | 53  | 1045 | 426                                             | 224       |
|             | Delhi       | 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 ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|---------|-------------|--------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| 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       |
|         |             | Old GSPCB premises, Patto                        | 327          | RIRuO |                | 105                  | A    | 39  | 332  | 134                                             | 60        |
| Goa     | Panaji      | Fire Brigade Station, Port Trust                 | 435          | RIRuO |                | 118                  | A    | 15  | 310  | 103                                             | 48        |
|         | Marmagao    | Fuse Call Office of Elec. Dept., Mormugao taluka | 37           | RIRuO |                | 103                  | A    | 38  | 319  | 119                                             | 64        |
|         | Vasco       | Naroda, G.I.D.C., Ahmadabad                      | 101          | RIRuO |                | 157                  | A    | 611 | 180  | 383                                             | 104       |
|         | Ahmedabad   | 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        |
|         |             | Rallis India Ltd.                                | 252          | RIRuO |                | 104                  | A    | 110 | 219  | 170                                             | 27        |
|         |             | Durga Traders, Bhavanafarm Society               | 253          | RIRuO |                | 104                  | A    | 93  | 188  | 147                                             | 21        |
|         |             | Fisheries Office                                 | 319          | RIRuO |                | 104                  | A    | 149 | 281  | 195                                             | 16        |
| Gujarat | Anklesvar   | Sardhara Industrial Corporation                  | 257          | RIRuO |                | 104                  | A    | 64  | 306  | 208                                             | 40        |
|         |             | Regional Office                                  | 374          | RIRuO |                | 104                  | A    | 87  | 297  | 142                                             | 32        |
|         | Jamnagar    | 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       |
|         | Rajkot      | Air India Office                                 | 23           | RIRuO |                | 104                  | A    | 122 | 226  | 164                                             | 21        |
|         |             | GPCB Office, Geri Vasahat                        | 50           | RIRuO |                | 96                   | A    | 69  | 167  | 111                                             | 19        |
|         | Surat       | Dandia Bazaar                                    | 333          | RIRuO |                | 96                   | A    | 134 | 320  | 210                                             | 34        |
|         |             | CETP Nandesari                                   | 334          | RIRuO |                | 96                   | A    | 201 | 402  | 322                                             | 36        |
|         | Vadodara    | GEB, Ilird 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 Jambheshwar University                      | 414          | RIRuO |                | 52                   | A    | 104 | 2253 | 216                                             | 299       |
|         | Yamunanagar | Ballarpur Industries                             | 196          | RIRuO |                | 52                   | A    | 105 | 636  | 361                                             | 121       |
|         |             | Industry Department Office Building              | 449          | RIRuO |                | 96                   | A    | 62  | 610  | 218                                             | 96        |
|         | Baddi       | AHC barotiwalla                                  | 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 ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|-----------------|----------------------|---------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| Jammu & Kashmir | 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                | Regional Office, Jammu                      | 184          | RIRuO |                | 88                   | A    | 79  | 258  | 171                                             | 46        |
| Jharkhand       |                      | 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        |
|                 |                      | EMTI, Bastacola                             | 612          | RIRuO |                | 72                   | A    | 174 | 472  | 277                                             | 59        |
|                 | Dhanbad              | 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       |
| Karnataka       | 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       |
|                 |                      | 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       |
|                 | Bangalore            | AMCO Batteries, Mysore Road                 | 78           | RIRuO |                | 100                  | A    | 60  | 558  | 160                                             | 76        |
|                 |                      | Inanabharathi , 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        |
|                 | Gulbarga             | 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        |
|                 |                      | K.R.Circle                                  | 40           | RIRuO |                | 94                   | A    | 45  | 215  | 93                                              | 26        |
|                 | Mysore               | KSPCB Bldg. Hebbal Ind. Area                | 328          | RIRuO |                | 117                  | A    | 27  | 143  | 78                                              | 27        |

| State          | City           | Location                                  | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max | SPM Annual average ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|----------------|----------------|-------------------------------------------|--------------|-------|----------------|----------------------|------|-----|-----|-------------------------------------------------|-----------|
| 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          | Floor I                                   | 149          | RIRuO |                | 90                   | A    | 24  | 306 | 65                                              | 40        |
|                |                | Floor II                                  | 29           | RIRuO |                | 91                   | A    | 27  | 237 | 83                                              | 39        |
|                |                | Irumpalam                                 | 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        |
|                | Kollam         | Kalamassery                               | 346          | RIRuO |                | 108                  | A    | 14  | 148 | 62                                              | 29        |
|                |                | KSPCB, District Office, Kadappakada       | 621          | RIRuO |                | 117                  | A    | 43  | 275 | 107                                             | 42        |
|                |                | KMML Chavara                              | 620          | RIRuO |                | 56                   | A    | 22  | 132 | 54                                              | 24        |
|                |                | Kottayam                                  | 187          | RIRuO |                | 96                   | A    | 50  | 63  | 57                                              | 3         |
|                | Kottayam       | Vadavathoor                               | 361          | RIRuO |                | 96                   | A    | 35  | 53  | 43                                              | 6         |
|                |                | Kozhikode City                            | 360          | RIRuO |                | 108                  | A    | 55  | 115 | 80                                              | 15        |
|                | Kozhikode      | Nallalam                                  | 359          | RIRuO |                | 108                  | A    | 49  | 115 | 85                                              | 15        |
|                |                | Kakkanchery Sijmak oils                   | 623          | RIRuO |                | 108                  | A    | 27  | 70  | 43                                              | 7         |
|                | Malapuram      | SEPR Refractories India Ltd.              | 311          | RIRuO |                | 121                  | A    | 17  | 137 | 61                                              | 22        |
|                | Palakkad       | Near District Office KSPCB, Makkamkundu   | 619          | RIRuO |                | 120                  | A    | 22  | 64  | 42                                              | 8         |
|                | Pathanamthitta | KSPCB, District Office, Poonkunnam        | 624          | RIRuO |                | 93                   | A    | 37  | 284 | 82                                              | 49        |
|                | Thissur        | Sulthan Bathery                           | 622          | RIRuO |                | 119                  | A    | 54  | 94  | 70                                              | 8         |
|                | Wayanad        | PRS Hospital/COSMO                        | 419          | RIRuO |                | 108                  | A    | 46  | 73  | 59                                              | 6         |
|                | Trivandrum     | SMV School                                | 181          | RIRuO |                | 109                  | A    | 39  | 305 | 65                                              | 25        |
|                |                | VELI                                      | 357          | RIRuO |                | 106                  | A    | 43  | 110 | 77                                              | 14        |
|                | Bhopal         | PETTAH                                    | 358          | RIRuO |                | 107                  | A    | 43  | 85  | 57                                              | 6         |
|                |                | Hamidia Road, M.P. Hastship Vikas Nigam   | 122          | RIRuO |                | 73                   | A    | 80  | 803 | 363                                             | 171       |
|                |                | C E T P Govindpura                        | 123          | RIRuO |                | 74                   | A    | 41  | 753 | 277                                             | 158       |
|                |                | EID Perry (I) Limited                     | 525          | RIRuO |                | 88                   | A    | 681 | 66  | 255                                             | 420       |
|                |                | Dewas Metal Section                       | 524          | RIRuO |                | 58                   | A    | 278 | 57  | 173                                             | 58        |
| Madhya Pradesh | Dewas          | Vikas Nagar                               | 523          | RIRuO |                | 88                   | A    | 455 | 85  | 203                                             | 71        |
|                |                | Dindayal Nagar                            | 479          | RIRuO |                | 75                   | A    | 715 | 172 | 474                                             | 131       |
|                | Gwalior        | Maharaj Bada                              | 478          | RIRuO |                | 75                   | A    | 713 | 174 | 366                                             | 116       |
|                |                | Polo Ground                               | 127          | RIRuO |                | 79                   | A    | 59  | 628 | 256                                             | 103       |
|                | Indore         | 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 LightMachinery  | 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., Vidyannagar                     | 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        |

| State       | City        | Location                                      | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | SPM Annual average ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|-------------|-------------|-----------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| Maharashtra | Aurangabad  | S.B.E.S. College                              | 511          | RiRuO |                | 111                  | A    | 103 | 478  | 266                                             | 95        |
|             |             | Collector Office                              | 512          | RiRuO |                | 108                  | A    | 60  | 286  | 169                                             | 46        |
|             |             | C.A.D.A. Office, Garkheda                     | 513          | RiRuO |                | 103                  | A    | 67  | 306  | 170                                             | 66        |
|             | Badlapur    | BIWA Office                                   | 649          | RiRuO |                | 92                   | A    | 37  | 299  | 141                                             | 57        |
|             |             | Grampanchat Ghughus                           | 267          | RiRuO |                | 93                   | A    | 66  | 1733 | 643                                             | 364       |
|             |             | MIDC Chandrapur                               | 281          | RiRuO |                | 96                   | A    | 156 | 924  | 428                                             | 164       |
|             | Chandrapur  | 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       |
|             |             | Municipal Council, Ballarshah                 | 639          | RiRuO |                | 94                   | A    | 25  | 1203 | 385                                             | 207       |
|             |             | B. J. Market                                  | 644          | RiRuO |                | 69                   | A    | 131 | 291  | 191                                             | 37        |
|             |             | Girna water tank                              | 645          | RiRuO |                | 68                   | A    | 120 | 262  | 195                                             | 33        |
|             | Jalgaon     | MIDC Jalgaon                                  | 646          | RiRuO |                | 70                   | A    | 133 | 268  | 207                                             | 37        |
|             |             | 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        |
|             | Kolhapur    | Mahadwar Road, Near Mahalaxmi Temple          | 510          | ES    | Sahyadri       | 102                  | A    | 142 | 306  | 226                                             | 39        |
|             |             | MIDC Water Works                              | 641          | RiRuO |                | 99                   | A    | 51  | 334  | 179                                             | 67        |
|             |             | Terrace of Kshewraj Vidyalyaya Shyamnagar     | 642          | RiRuO |                | 104                  | A    | 91  | 622  | 297                                             | 108       |
|             | Latur       | Terrace of Sidheshwar Sahakari Bank Ganigolai | 643          | RiRuO |                | 61                   | A    | 116 | 765  | 253                                             | 104       |
|             |             | 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, MNIP                      | 571          | RiRuO |                | 50                   | A    | 63  | 343  | 156                                             | 77        |
|             |             | Kalbadevi                                     | 169          | RiRuO |                | 84                   | A    | 52  | 421  | 206                                             | 95        |
|             | Mumbai      | Parel , Ambedkar Road                         | 170          | RiRuO |                | 98                   | A    | 70  | 568  | 246                                             | 110       |
|             |             | Worli                                         | 349          | RiRuO |                | 89                   | A    | 57  | 323  | 176                                             | 62        |
|             |             | Institution of Engineers                      | 287          | RiRuO |                | 87                   | A    | 73  | 384  | 141                                             | 51        |
|             | Nagpur      | 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, Iwari                              | 166          | RiRuO |                | 87                   | A    | 39  | 691  | 226                                             | 124       |
|             |             | NEERI Lab, Nehru Marg                         | 167          | RiRuO |                | 61                   | A    | 40  | 457  | 128                                             | 68        |
|             |             | R.T.O. Colony Tank                            | 259          | RiRuO |                | 112                  | A    | 28  | 355  | 145                                             | 75        |
|             | Nashik      | 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        |
|             |             | T.B.I.A, Rabale , Airoli, TTC                 | 491          | RiRuO |                | 102                  | A    | 35  | 582  | 203                                             | 100       |
|             | Navi Mumbai | 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 Facility Building                 | 496          | RiRuO |                | 99                   | A    | 112 | 821  | 497                                             | 182       |

| 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. |    |
|----------------------------|------------------------------------|---------------------------------------------------------|-----------------------------|-------|----------------|----------------------|------|-----|-----|----------------------------|-----------|----|
|                            | 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        |    |
| Mizoram                    | 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        |    |
|                            | 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 resi-<br>dence | 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        |    |
|                            |                                    | Capital Police Station                                  | 424                         | RIRuO |                | 105                  | A    | 65  | 547 | 172                        | 95        |    |
|                            | Bhubneshwar                        | 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        |    |
|                            | Rajasthan                          | 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                         |           |    |
|                            | Coal Field Area / MCL AREA         | 471                                                     | RIRuO                       |       | 66             | A                    | 123  | 438 | 277 | 69                         |           |    |
|                            | Talcher                            | T.T.PS.Colony                                           | 68                          | RIRuO |                | 103                  | A    | 84  | 363 | 203                        | 55        |    |

| State      | City        | Location                                        | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | SPM Annual average ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|------------|-------------|-------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| 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        |
| Puducherry |             | Fire Brigade Station, Bahera Road,              | 599          | RIRuO |                | 50                   | A    | 162 | 235  | 194                                             | 21        |
|            |             | DSTC Office Upstairs, AnnaNagar                 | 64           | RIRuO |                | 90                   | A    | 30  | 94   | 60                                              | 13        |
|            |             | PIPDIC Ind. Estate Mettupalayam                 | 93           | RIRuO |                | 82                   | A    | 36  | 123  | 70                                              | 18        |
| Alwar      |             | Chamber Of Commerce                             | 337          | RIRuO |                | 83                   | A    | 23  | 71   | 45                                              | 10        |
|            |             | 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       |
| Jaipur     |             | RIICO Pump House, MIA                           | 219          | ES    | Aravali range  | 72                   | A    | 87  | 961  | 281                                             | 153       |
|            |             | Aimeri Gate                                     | 296          | RIRuO |                | 1                    | IA   | 47  | 1190 | 345                                             | 184       |
|            |             | RJPB Office, Jhalana Doongari                   | 298          | RIRuO |                | 108                  | A    | 23  | 1056 | 235                                             | 188       |
| Rajasthan  |             | 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       |
| Jodhpur    |             | VKIA                                            | 297          | RIRuO |                | 114                  | A    | 98  | 2015 | 547                                             | 290       |
|            |             | DIC Office, Industrial Estate                   | 413          | RIRuO |                | 96                   | A    | 78  | 992  | 348                                             | 194       |
|            |             | Sojati Gate                                     | 273          | RIRuO |                | 103                  | A    | 106 | 1180 | 453                                             | 205       |
| Kota       |             | 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       |
| Udaipur    |             | Shastri Nagar Police Thana                      | 412          | RIRuO |                | 102                  | A    | 72  | 1210 | 418                                             | 223       |
|            |             | Regional Office, RJPB, Anantpura                | 17           | RIRuO |                | 102                  | A    | 38  | 886  | 287                                             | 166       |
|            |             | Municipal Corporation Building                  | 326          | RIRuO |                | 101                  | A    | 37  | 688  | 230                                             | 127       |
| Chennai    |             | Samcore Glass Ltd.                              | 325          | RIRuO |                | 103                  | A    | 31  | 552  | 214                                             | 132       |
|            |             | Ambamata                                        | 320          | RIRuO |                | 92                   | A    | 130 | 493  | 284                                             | 90        |
|            |             | Town Hall                                       | 294          | RIRuO |                | 93                   | A    | 132 | 660  | 313                                             | 120       |
| Tamilnadu  |             | Regional Office, MIA                            | 321          | RIRuO |                | 83                   | A    | 166 | 807  | 407                                             | 145       |
|            |             | Kathivakkam, Municipal Kalyana Mandapam         | 38           | RIRuO |                | 100                  | A    | 63  | 335  | 174                                             | 58        |
|            |             | Govt. High School, Manali                       | 71           | RIRuO |                | 102                  | A    | 47  | 407  | 161                                             | 64        |
| Coimbatore |             | 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        |
| Madurai    |             | Thiruvottiyur Municipal Office                  | 161          | RIRuO |                | 95                   | A    | 24  | 258  | 99                                              | 40        |
|            |             | 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        |
| Salem      |             | SIDCO Office Kurichi                            | 237          | RIRuO |                | 93                   | A    | 77  | 1403 | 262                                             | 153       |
|            |             | 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        |
| Tuticorin  |             | Kunnathur Chatram Girls HS School               | 308          | RIRuO |                | 97                   | A    | 64  | 267  | 120                                             | 41        |
|            |             | Sowdeswari College Building                     | 309          | RIRuO |                | 118                  | A    | 52  | 267  | 120                                             | 47        |
|            |             | Fisheries College                               | 239          | RIRuO |                | 78                   | A    | 38  | 586  | 143                                             | 100       |
|            |             | Raja Agencies                                   | 240          | RIRuO |                | 90                   | A    | 72  | 724  | 289                                             | 140       |

| State         | City      | Location                                                   | Station code | Type  | Category of ES | No. of mon. days (n) | A/IA | Min | Max  | SPM Annual average ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|---------------|-----------|------------------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| 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       |
|               |           | Square crossing circle of Laxmi Talkies                    | 554          | RIRuO |                | 105                  | A    | 229 | 1144 | 518                                             | 146       |
|               | Allahabad | 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        |
|               |           | Center for Development of Glass Industry ( CDGI)           | 399          | ES    | Taj-trapezium  | 104                  | A    | 98  | 638  | 446                                             | 164       |
|               | Ferozabad | 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       |
|               |           | Raunaq Auto Ltd, J.P. Nagar                                | 140          | RIRuO |                | 88                   | A    | 202 | 596  | 353                                             | 81        |
|               | Gajraula  | 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       |
|               |           | 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        |
|               |           | Mahanagar                                                  | 377          | RIRuO |                | 74                   | A    | 277 | 477  | 381                                             | 56        |
|               | Lucknow   | 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        |
|               |           | Begum Bridge                                               | 550          | RIRuO |                | 66                   | A    | 415 | 621  | 486                                             | 45        |
|               | Meerut    | 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 ( $\mu\text{g}/\text{m}^3$ ) | Std. Dev. |
|-------------|-------------|------------------------------------------------|--------------|-------|----------------|----------------------|------|-----|------|-------------------------------------------------|-----------|
| Uttarakhand | 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         |
|             | 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        |
|             | Haldwani    | Himalaya Drug Co. Near ISBT                    | 637          | ES    | Doon valley    | 3                    | IA   | 344 | 521  | 454                                             | 96        |
|             | Haridwar    | Govt. Women Hospital                           | 625          | RIRuO |                | 1                    | IA   |     |      | 343                                             |           |
|             | Kashipur    | SIDCUL, Haridwar                               | 635          | RIRuO |                | 3                    | IA   | 232 | 279  | 263                                             | 27        |
|             | Rishikesh   | BSNL Office, Kashipur                          | 627          | RIRuO |                | 1                    | IA   |     |      | 153                                             |           |
|             |             | Nagar Palika Parishad                          | 636          | ES    | Hill station   | 3                    | IA   | 481 | 505  | 495                                             | 12        |
|             | Asansol     | Asansol Municipal Corporation                  | 386          | RIRuO |                | 105                  | A    | 56  | 817  | 287                                             | 174       |
|             |             | Kangsabati Spinning Mill, Barjora              | 593          | RIRuO |                | 105                  | A    | 67  | 747  | 297                                             | 190       |
| West Bengal | Barrackpore | Burnpur Town Department, Burnpur               | 592          | RIRuO |                | 105                  | A    | 42  | 901  | 325                                             | 203       |
|             |             | Barrackpore Municipality                       | 655          | RIRuO |                | 102                  | A    | 59  | 425  | 219                                             | 100       |
|             |             | Dum Dum Telephone Exchange                     | 653          | RIRuO |                | 101                  | A    | 70  | 522  | 250                                             | 113       |
|             |             | Kharchah 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        |
|             |             | WBIDC 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 ( $\mu\text{g}/\text{m}^3$ ) | 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       |
|       |                | Bharat Co-operative Housing Society            | 657          | RIRuO |                | 104                  | A    | 41  | 410 | 196                                             | 102       |
|       | Sankrail       | 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        |
|       |                | Chanditala Water Supply Pump House, Tollygunge | 652          | RIRuO |                | 102                  | A    | 39  | 494 | 178                                             | 123       |
|       | South Suburban | 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  $5 \mu\text{g}/\text{m}^3$  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  $\text{SO}_2$ ,  $\text{NO}_2$  and  $\text{PM}_{10}$  in the 35 metropolitan cities (population  $\geq 10$  lacs; Census 2001). An analysis of ten years data reveals a decreasing trend of  $\text{SO}_2$ . 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.  $\text{NO}_2$  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.  $\text{PM}_{10}$  concentration shows fluctuating trend. Vehicular emission are a major source of  $\text{PM}_{10}$ . 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                               |
|              |                     | Bhopal        | 4                               |
| Central Zone | Madhya Pradesh (8)  | 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  $\text{SO}_2$  reveals all the cities except Jamshedpur and Pune are in the low category and all are within the prescribed standard. As for  $\text{NO}_2$ , 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  $\text{PM}_{10}$ , 8 under high and 24 cities fall in the critical category (Table 6.2). 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 |               |                  |
|                     | $\text{SO}_2$                                        | $\text{NO}_2$ | $\text{PM}_{10}$ | $\text{SO}_2$               | $\text{NO}_2$ | $\text{PM}_{10}$ |
| 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                |
| <b>Total cities</b> | <b>34</b>                                            | <b>34</b>     | <b>34</b>        | <b>1</b>                    | <b>1</b>      | <b>1</b>         |

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  $\text{NO}_2$  and  $\text{PM}_{10}$  in the residential / industrial / rural / commercial areas. None of the cities exceed the standard limit with respect to  $\text{SO}_2$  (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 |               |                  |
|                     | $\text{SO}_2$                                        | $\text{NO}_2$ | $\text{PM}_{10}$ | $\text{SO}_2$               | $\text{NO}_2$ | $\text{PM}_{10}$ |
| Not exceeding NAAQS | 34                                                   | 29            | 2                | 1                           | 1             | 0                |
| Exceeding NAAQS     | 0                                                    | 5             | 32               | 0                           | 0             | 1                |
| <b>Total cities</b> | <b>34</b>                                            | <b>34</b>     | <b>34</b>        | <b>1</b>                    | <b>1</b>      | <b>1</b>         |

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

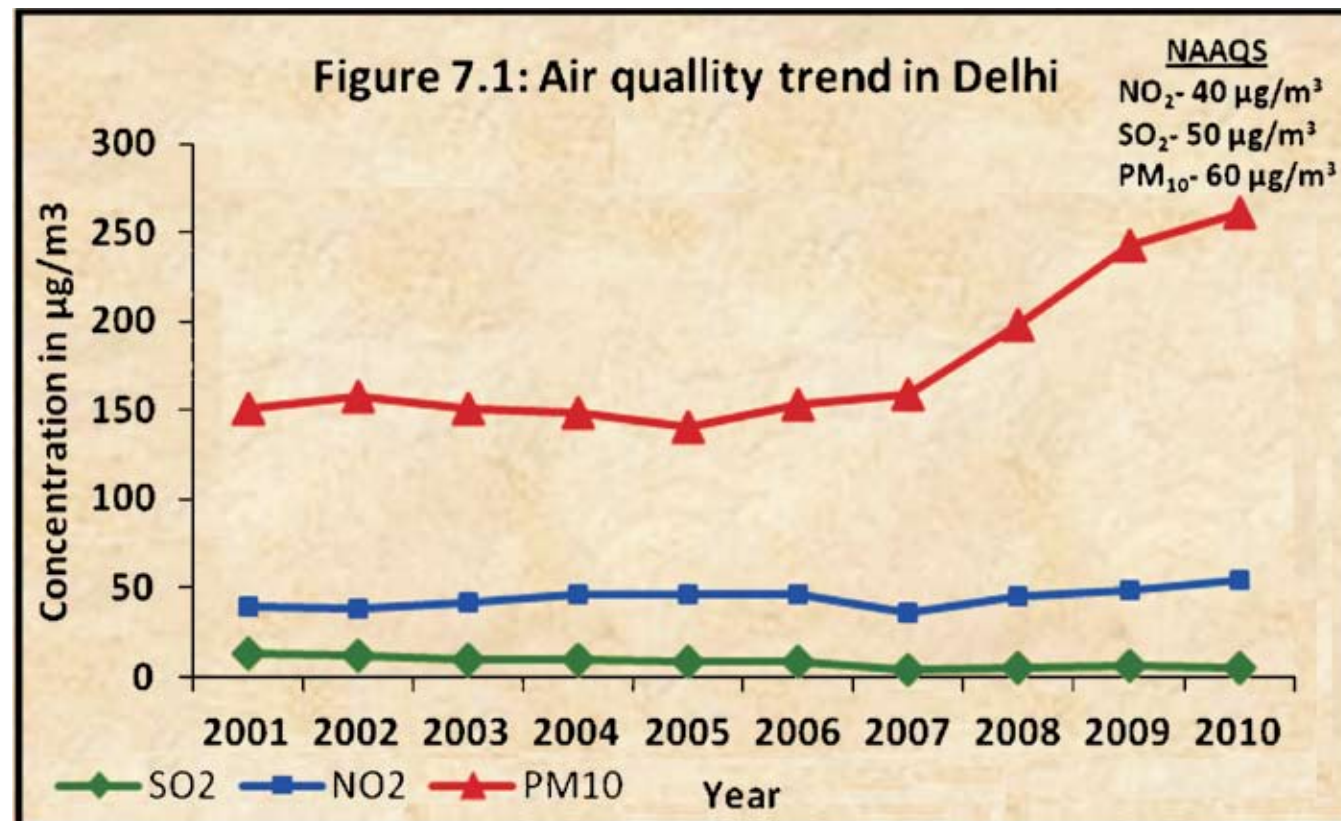
| State          | City           | Type                  | SO <sub>2</sub>                     |             | NO <sub>2</sub>                     |             | PM <sub>10</sub>                    |             |
|----------------|----------------|-----------------------|-------------------------------------|-------------|-------------------------------------|-------------|-------------------------------------|-------------|
|                |                |                       | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | Air quality | Annual average (µg/m <sup>3</sup> ) | 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<br>(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  $\geq 50$  has only been considered

### 7.3 Air quality trend in metropolitan cities

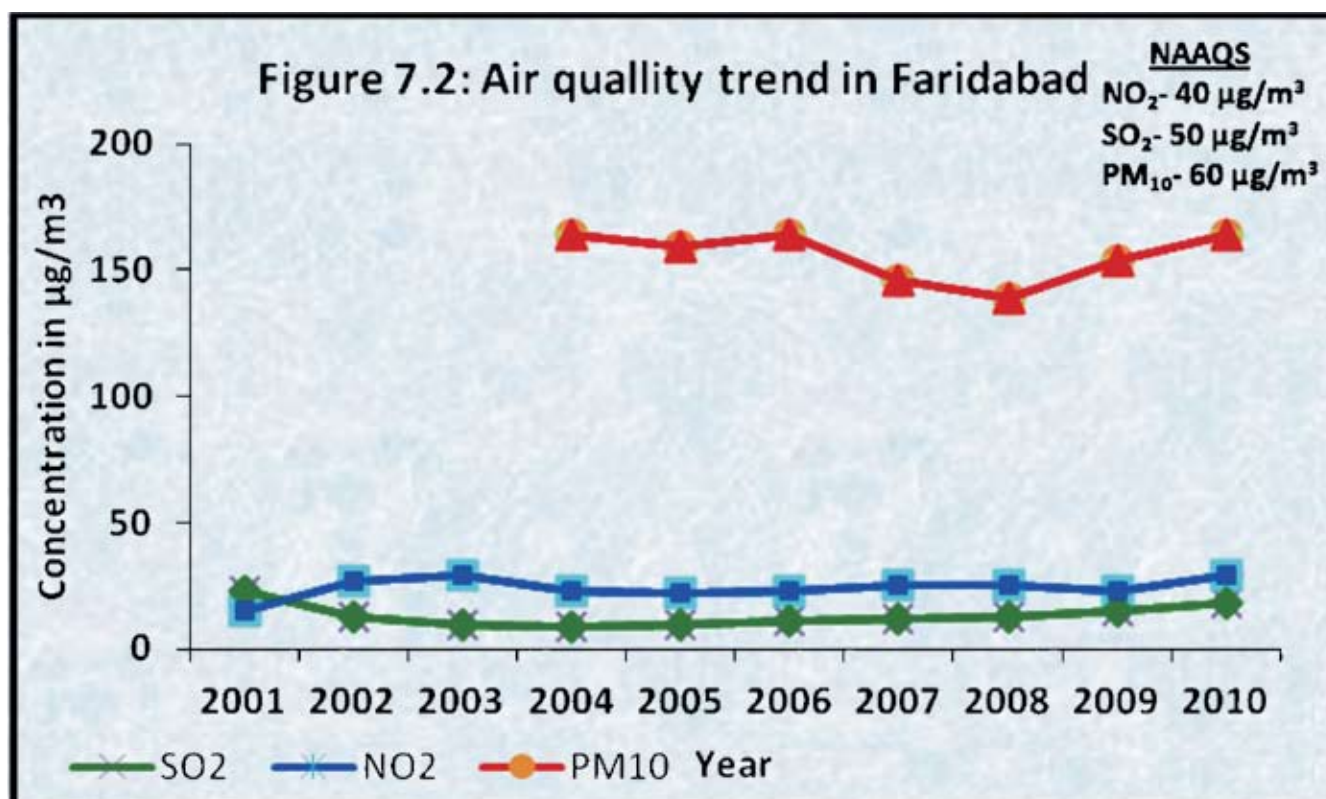
#### 7.3.1 DELHI – the capital city

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 <sup>2</sup> (573 sq mi) of which 783 km <sup>2</sup> (302 sq mi) is rural, and 700 km <sup>2</sup> (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.<br><br>Temperature: 45°C in summers to 4°C in winters<br><br>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 <sub>10</sub> , a decreasing trend for SO <sub>2</sub> and fluctuating for NO <sub>2</sub> (Figure 7.1). The increasing trend for PM <sub>10</sub> may be attributed to the increasing number of vehicles and natural dust.                                                                                                                                                                               |



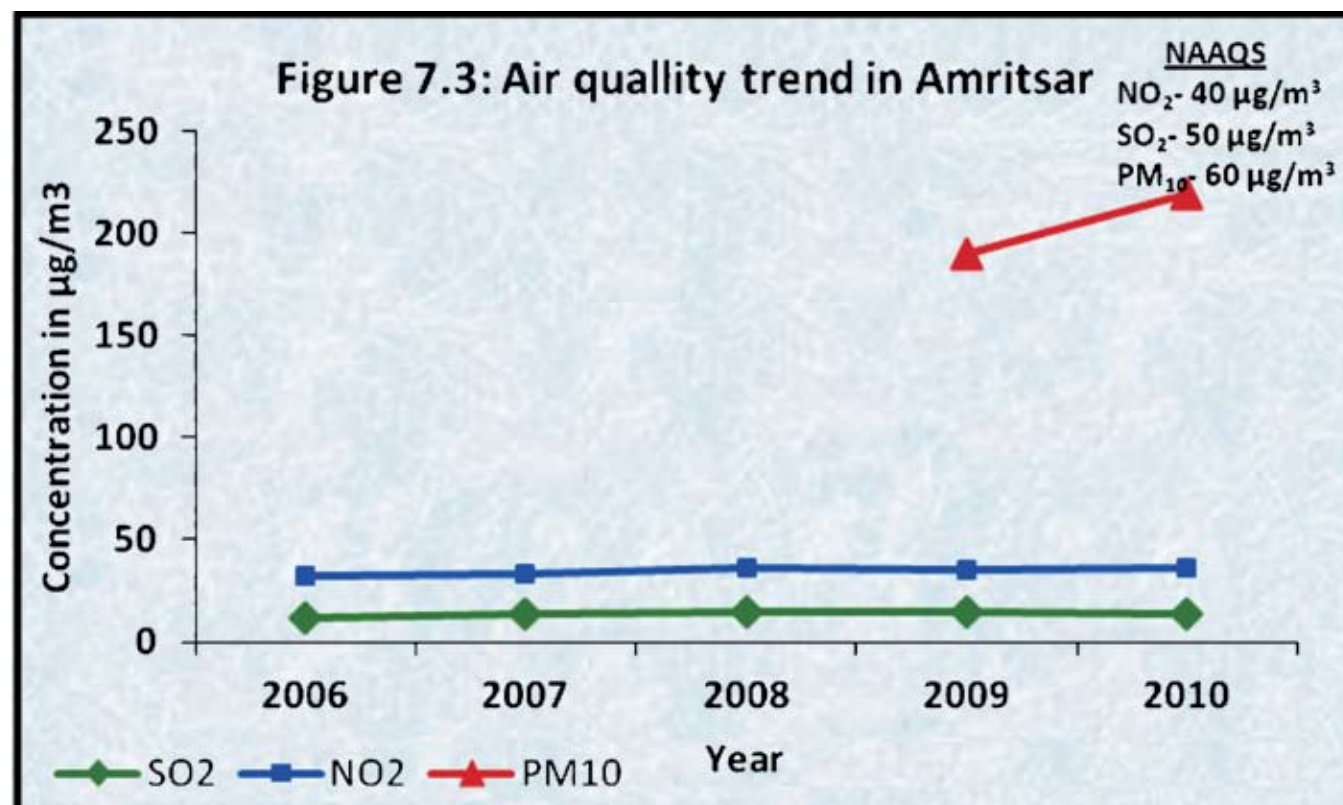
## 7.3.2 FARIDABAD

|                      |                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Haryana                                                                                                                                                                                                                                             |
| Location             | 28° 15' N and 77° 13' 12" E                                                                                                                                                                                                                         |
| Area                 | 216.4 km <sup>2</sup>                                                                                                                                                                                                                               |
| Population           | 10, 54, 981                                                                                                                                                                                                                                         |
| Climate              | Temperature: extreme conditions of summer and cold with maximum and minimum temperatures of 45 and 5°C respectively<br>Rainfall: July to September with 562.9 mm                                                                                    |
| Geography            | Alluvium and pre-combrian sediments systems. The stratigraphic 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 <sub>10</sub> , a decreasing trend for SO <sub>2</sub> and a stable trend for NO <sub>2</sub> (Figure 7.2).                                                                 |



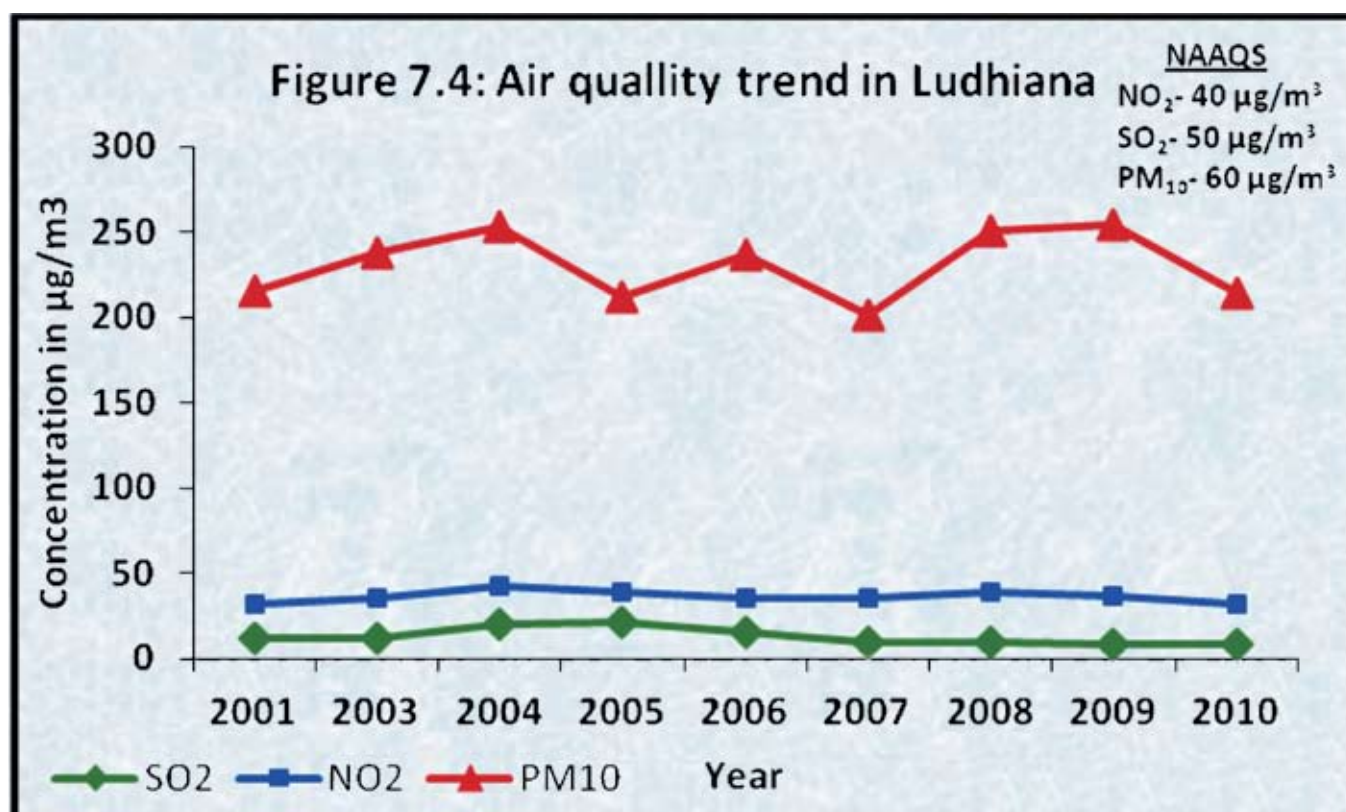
## 7.3.3 AMRITSAR

|                      |                                                                                                                                                                                                                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Punjab                                                                                                                                                                                                                                                                                                                              |
| Location             | 31°38' N and 74°52' E                                                                                                                                                                                                                                                                                                               |
| Area                 | 50 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                  |
| Population           | 10, 11,327                                                                                                                                                                                                                                                                                                                          |
| Climate              | Tropical type with three well defined seasons winter, summer and monsoon<br>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 <sub>2</sub> and NO <sub>2</sub> , both lying within the NAAQS. (Figure 7.3).                                                                                                                                                                  |



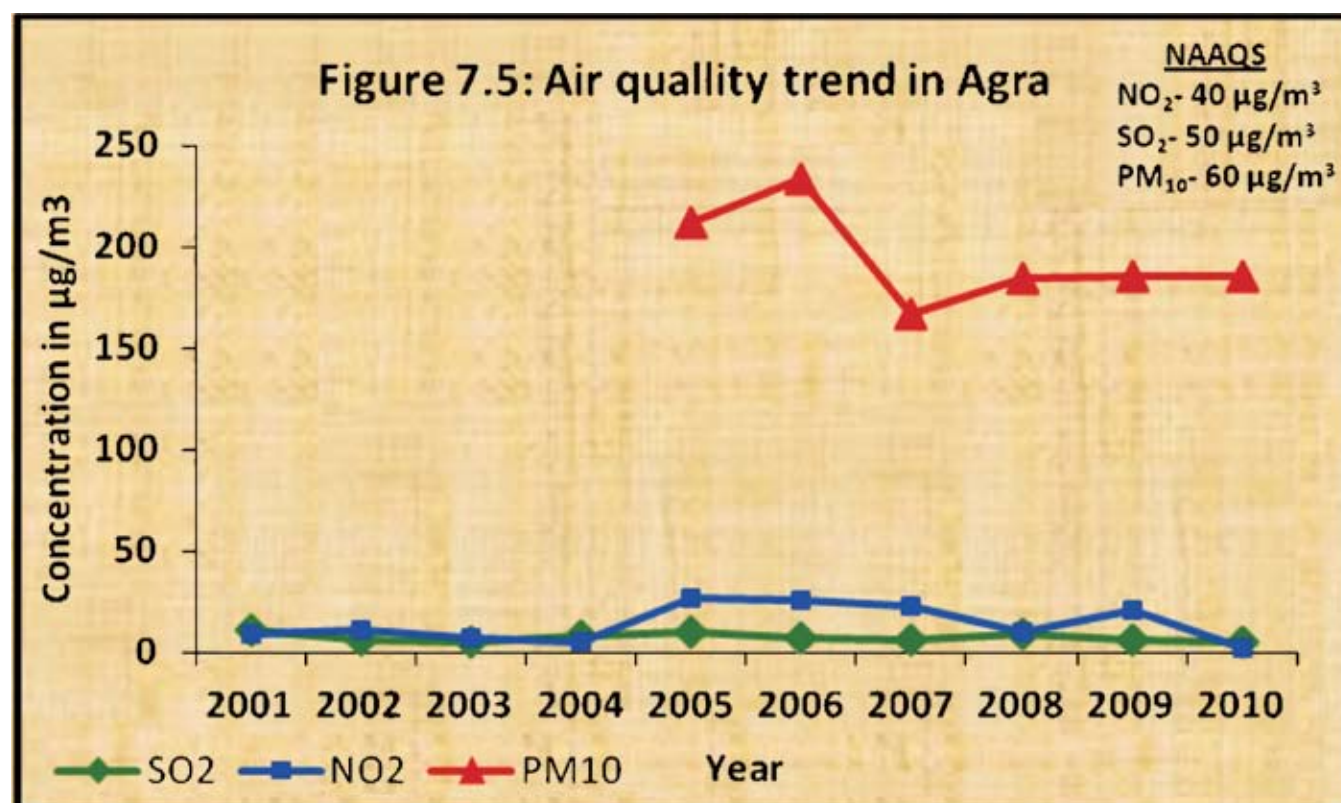
## 7.3.4 LUDHIANA

|                      |                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 <sup>2</sup>                                                                                                                                                                                          |
| 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.<br>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<br>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 <sub>10</sub> , a decreasing trend for SO <sub>2</sub> and a stable trend for NO <sub>2</sub> (Figure 7.4).                            |



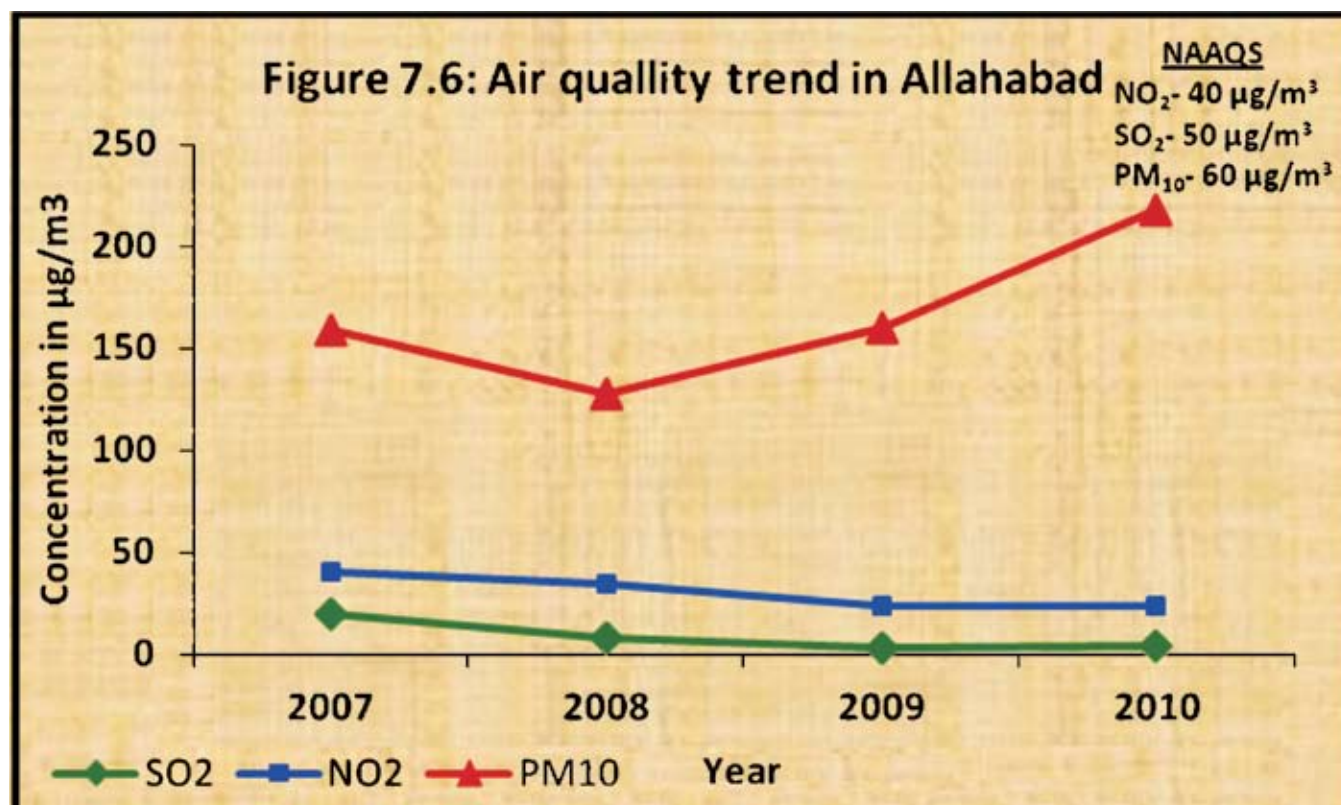
## 7.3.5 AGRA

|                      |                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Uttar Pradesh                                                                                                                                                                                                                                                                                          |
| Location             | 27°8' to 27°14' N and 77°57' to 78°04' E                                                                                                                                                                                                                                                               |
| Area                 | 140 km <sup>2</sup>                                                                                                                                                                                                                                                                                    |
| Population           | 13, 21,410                                                                                                                                                                                                                                                                                             |
| Climate              | Semiarid climate that borders on a humid subtropical climate. Mild winters, hot and dry summers and a monsoon season<br>Temperature: extreme temperature<br>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<br>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 <sub>10</sub> shows a decreasing trend and nine year trend for SO <sub>2</sub> shows a stable trend. As for NO <sub>2</sub> for the trend slightly increased during 2005, 2006 and 2007 but again declined in the later years (Figure 7.5)               |



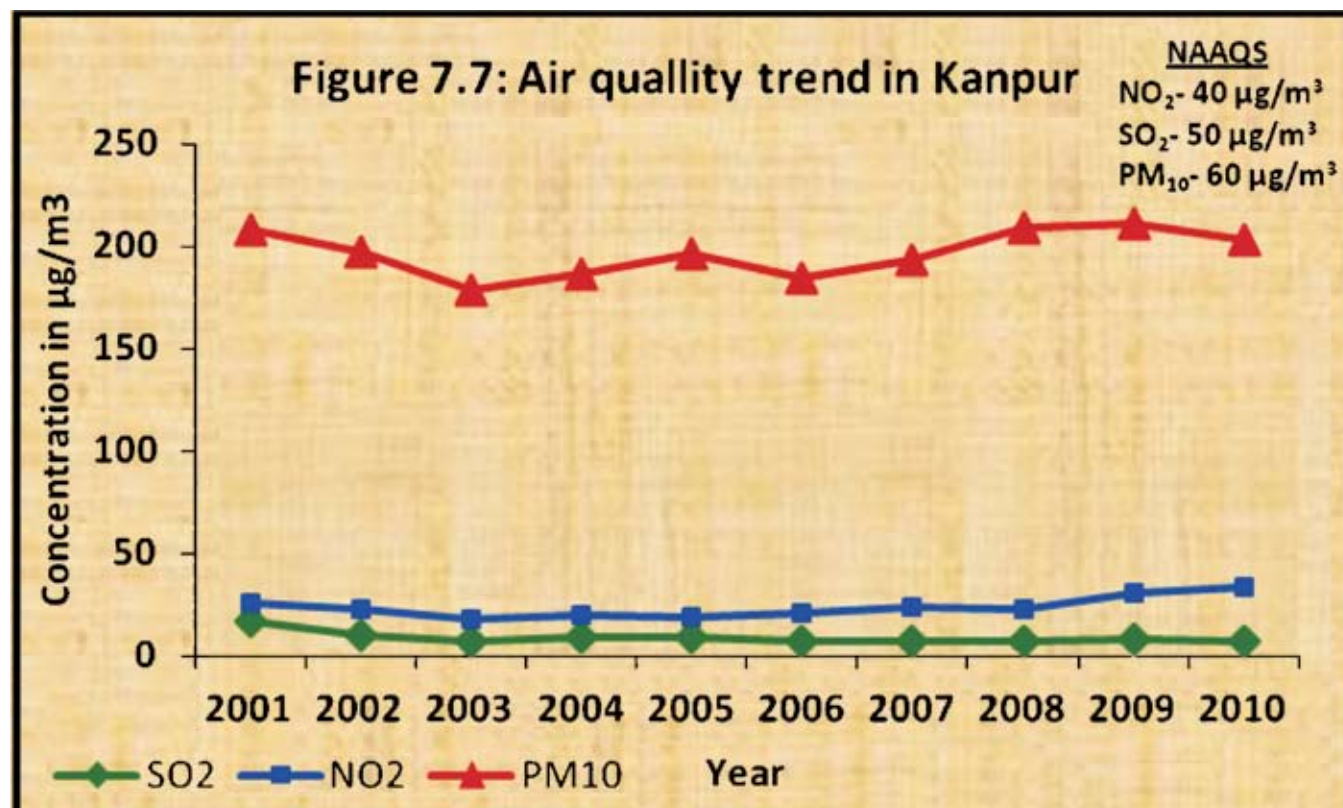
## 7.3.6 ALLAHABAD

|                      |                                                                                                                                                                                                                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.<br>Temperature: ranging between 22 °C (72 °F) and 10 °C (50 °F). Severe fog in January<br>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 <sub>2</sub> and NO <sub>2</sub> , both lying within the NAAQS (Figure 7.6).                                                                                                                                                                     |



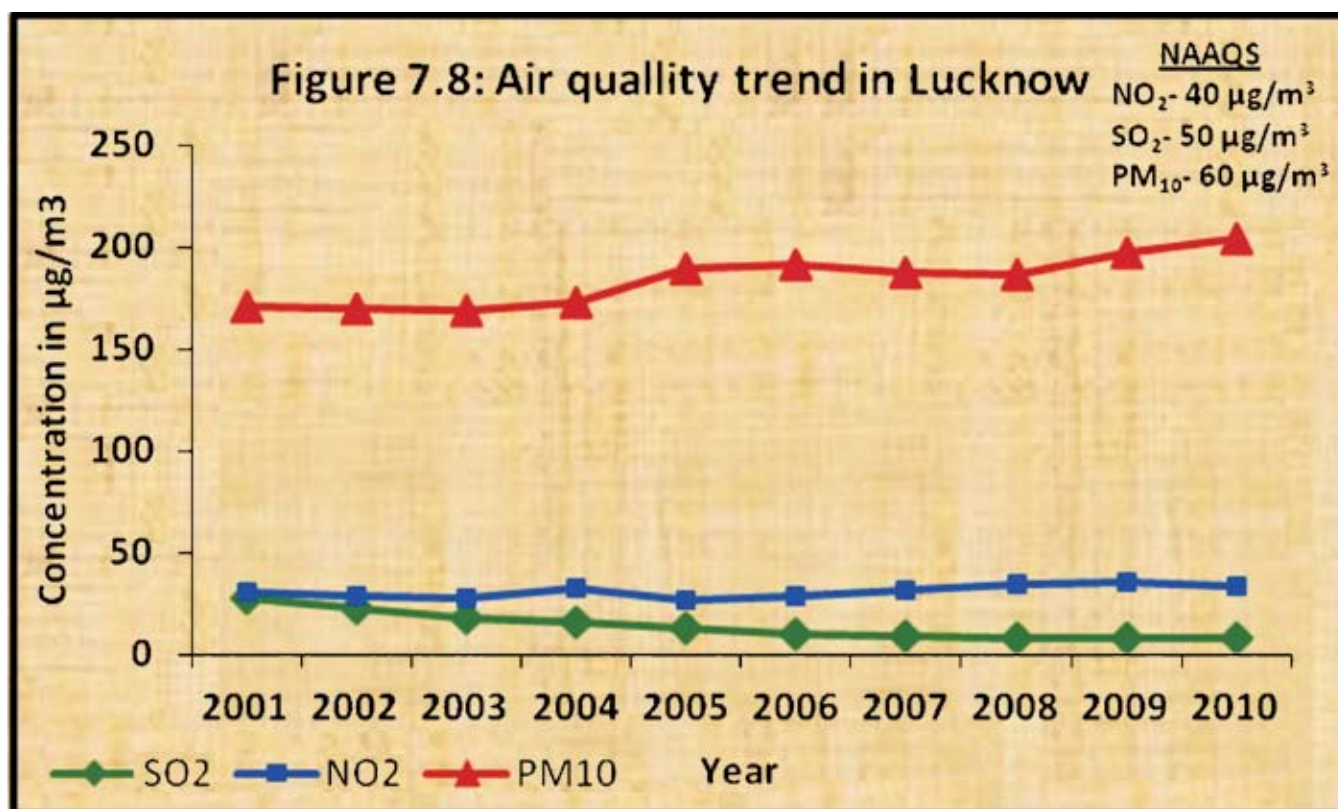
## 7.3.7 KANPUR

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Uttar Pradesh                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Location             | 26°28'N and 80°21' E                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Area                 | 278 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 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.<br><br>Temperature: mean maximum monthly temperatures 41.7°C during May and minimum 22.8°C in January<br><br>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 <sub>2</sub> and NO <sub>2</sub> , both lying within the NAAQS. For PM <sub>10</sub> however, a fluctuating trend is seen which exceeds the NAAQS (Figure 7.7).                                                                                                                                                                                                                              |



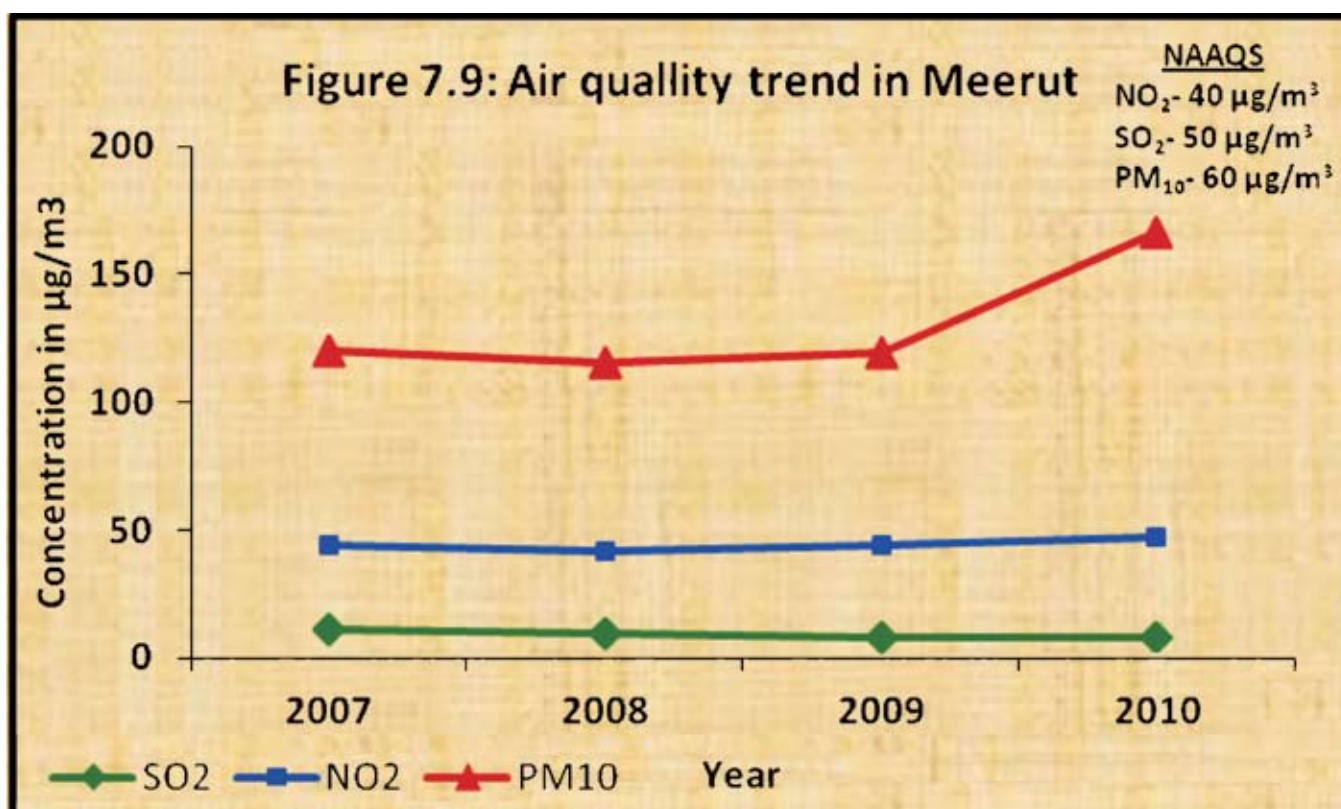
## 7.3.8 LUCKNOW

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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<br>Temperature: In winter the maximum temperature is around 25 °C and the minimum is in the 6 to 8 °C. Summers are very hot with temperatures rising to the 40 to 45 °C<br>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 <sub>2</sub> and a declining trend for NO <sub>2</sub> , both lying within the NAAQS. For PM <sub>10</sub> however, an increasing trend is seen which exceeds the NAAQS (Figure 7.8).                                                                                                                                                                                                                                                        |



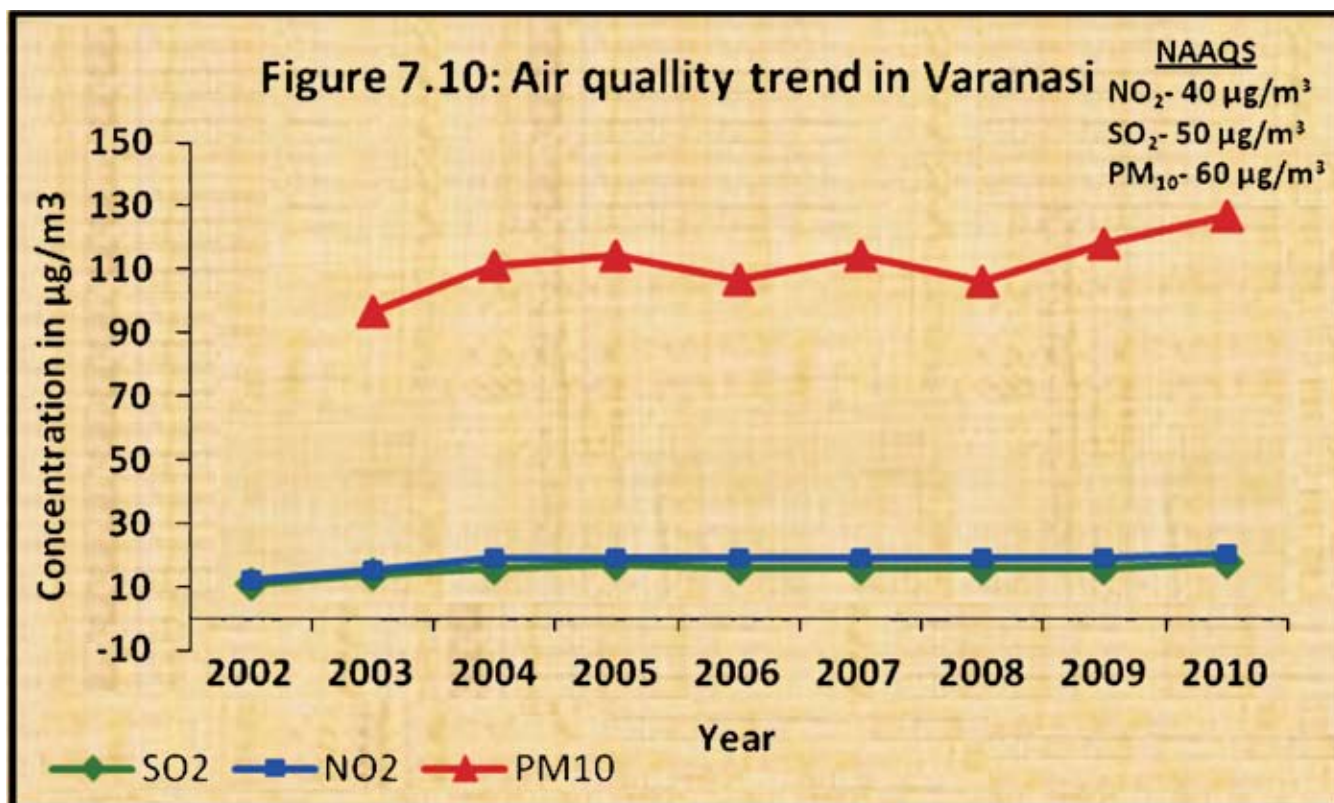
## 7.3.9 MEERUT

|                      |                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Uttar Pradesh                                                                                                                                                                                                                                                                                                                                                            |
| Location             | 28°57' to 29°02' N and 77°40' to 77°45' E                                                                                                                                                                                                                                                                                                                                |
| Area                 | 142 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                      |
| 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.<br>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 <sub>10</sub> however, exceeds the NAAQS (Figure 7.9).                                                                                                                                                                                                              |



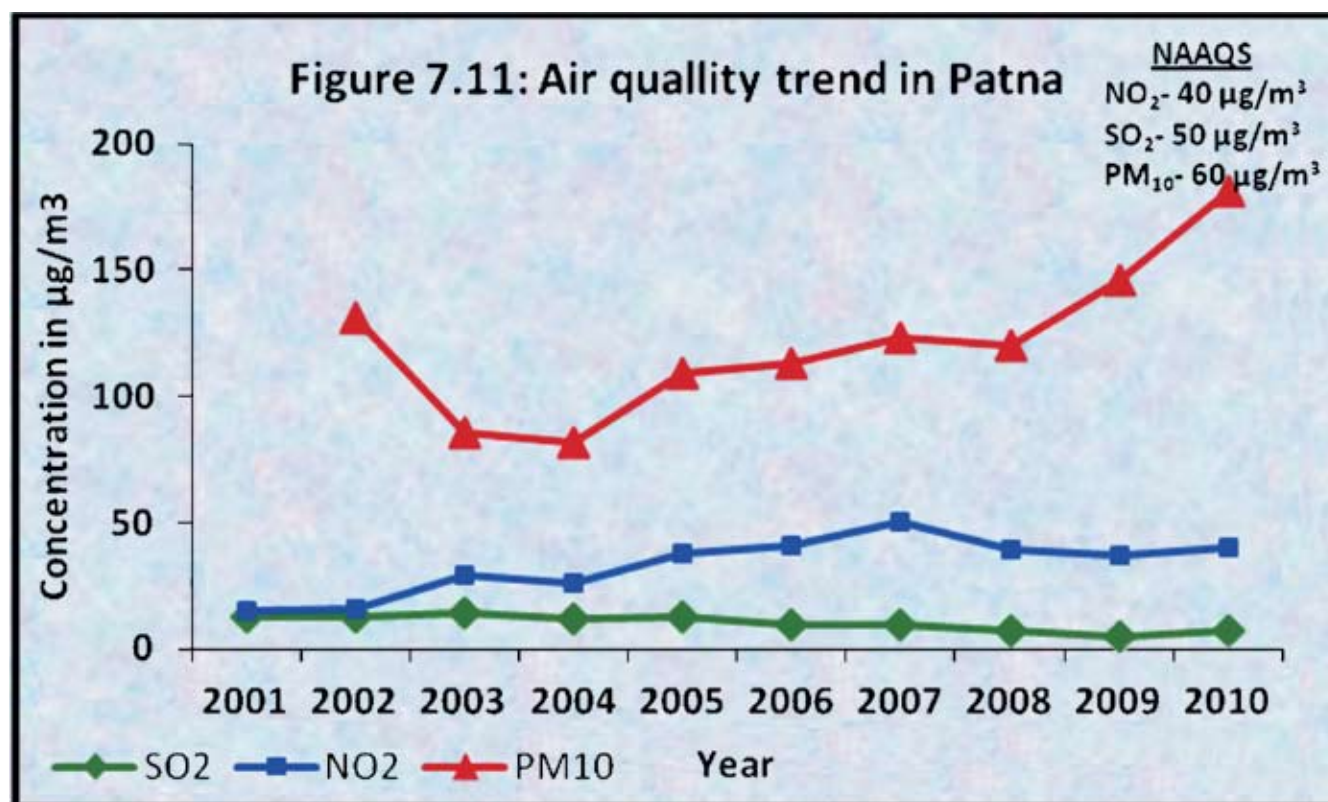
## 7.3.10 VARANASI

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Uttar Pradesh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Location             | Between 82° 15' to 83° 30' E and 24° 35' to 25° 30' N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Area                 | 112.26 km <sup>2</sup> (approximately 43 mi <sup>2</sup> ). Mean elevation is 80.71 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Population           | 14 lacs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Climate              | <p>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</p> <p>Temperature: The temperature ranges between 32°C – 46 °C (90°F – 115 °F) in the summers and below 5 °C during December to February</p> <p>Rainfall: average normal rainfall of the city is varied from min 3.3 mm to the highest of 1113.4 mm</p> |
| 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 <sub>2</sub> and. PM <sub>10</sub> however, shows an increasing trend and exceeds the NAAQS (Figure 7.10).                                                                                                                                                                                                                                                                                                                                                                                                            |



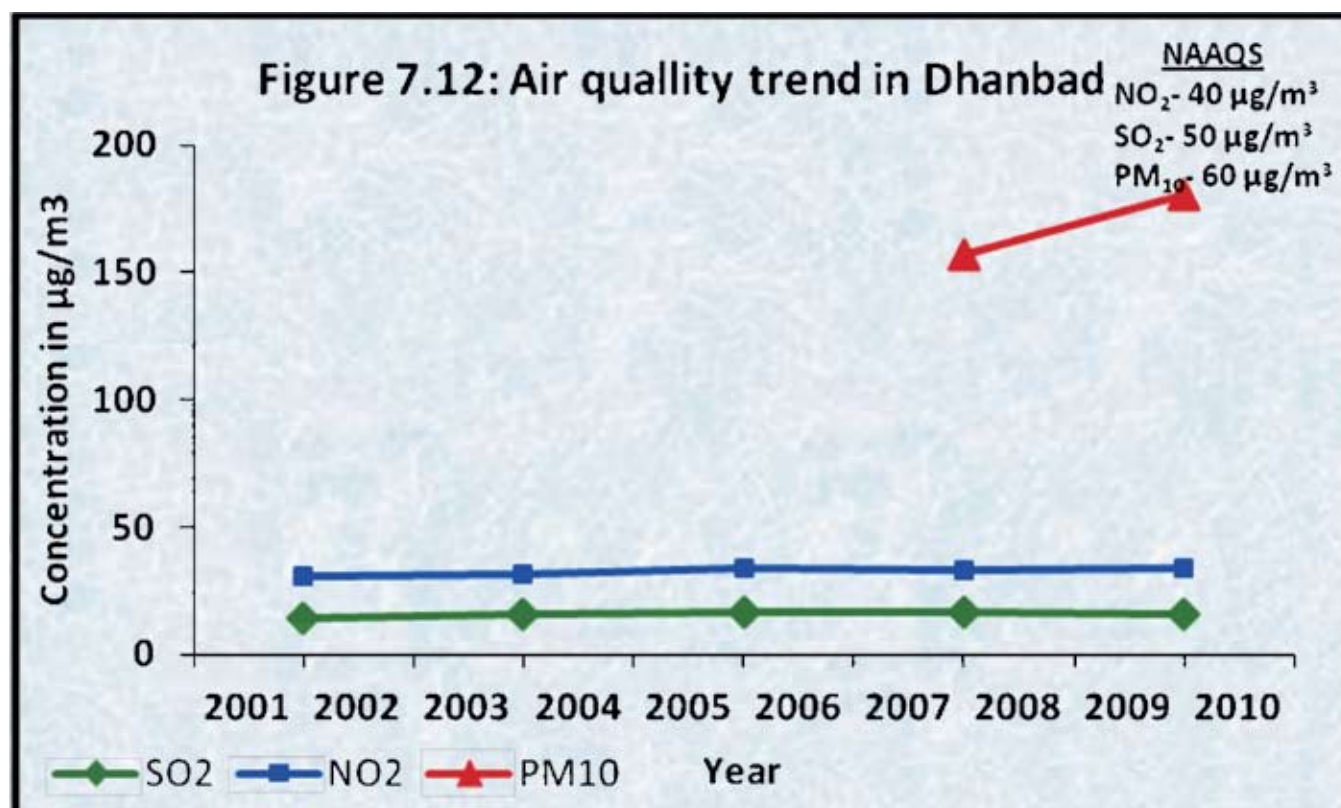
## 7.3.11 PATNA

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Bihar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Location             | 25°22'12" N and 85°7'48" E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Area                 | 125 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Population           | 17,07,429                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Climate              | Tropical type characterized by three distinct seasons<br>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<br>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 <sub>2</sub> and. PM <sub>10</sub> however, shows an increasing trend and exceeds the NAAQS (Figure 7.11).                                                                                                                                                                                                                                                                                                                                  |



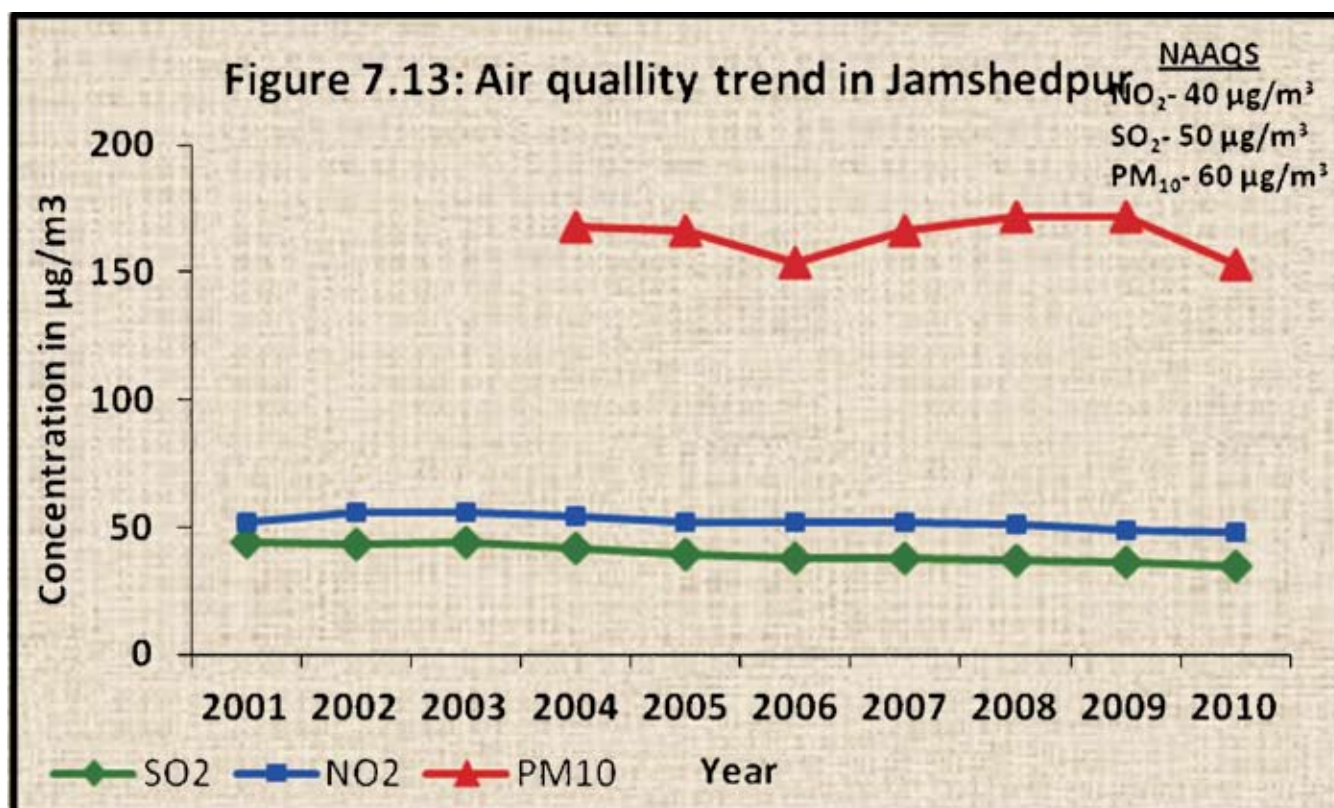
## 7.3.12 DHANBAD

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Jharkhand                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Location             | 23°48' N and 86°27' E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Area                 | 355.77 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Population           | 10,64,357                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Climate              | <p>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</p> <p>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.</p> <p>Rainfall: Average rainfall of the area is 1310.6 mm</p> |
| 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 <sub>2</sub> and. PM <sub>10</sub> however, shows an increasing trend and exceeds the NAAQS (Figure 7.12).                                                                                                                                                                                                                                                                                                                                                                                                                                             |



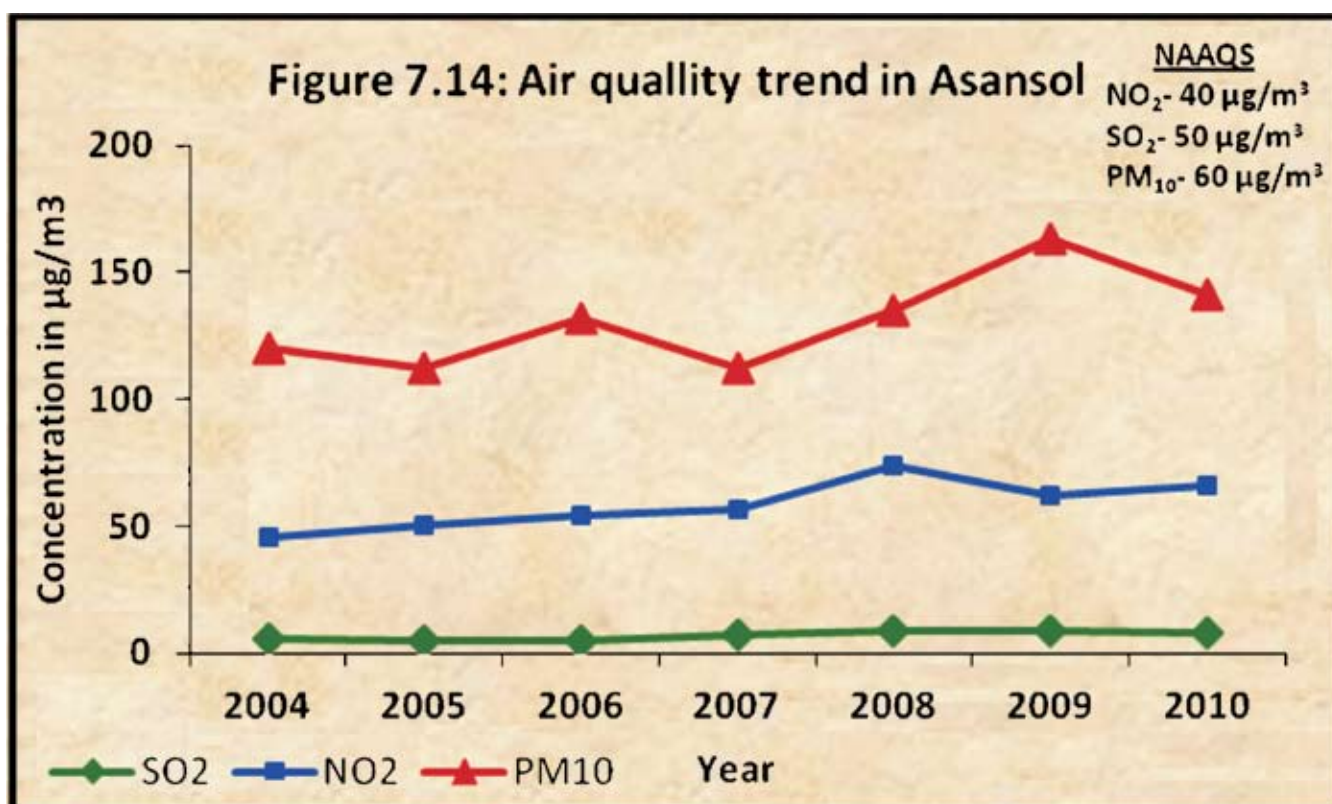
## 7.3.13 JAMSHEDPUR

|                      |                                                                                                                                                                                                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Jharkhand                                                                                                                                                                                                                                                               |
| Location             | 22°48' N and 86°11' E                                                                                                                                                                                                                                                   |
| Area                 | 149.23 km <sup>2</sup>                                                                                                                                                                                                                                                  |
| Population           | 11,01,804                                                                                                                                                                                                                                                               |
| Climate              | Humid climate due to inland position and presence of hills<br><br>Temperature: day temperature is quite high in summer, generally around 43°C occasionally reaching up to 48°C<br><br>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 <u>iron ore</u> , <u>coal</u> , <u>manganese</u> and <u>lime</u> .                                                          |
| Industries           | The main industries include <u>iron</u> and <u>steel</u> , 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 NAAQS. SO <sub>2</sub> and PM <sub>10</sub> however, shows a stable trend (Figure 7.13).                                                                                             |



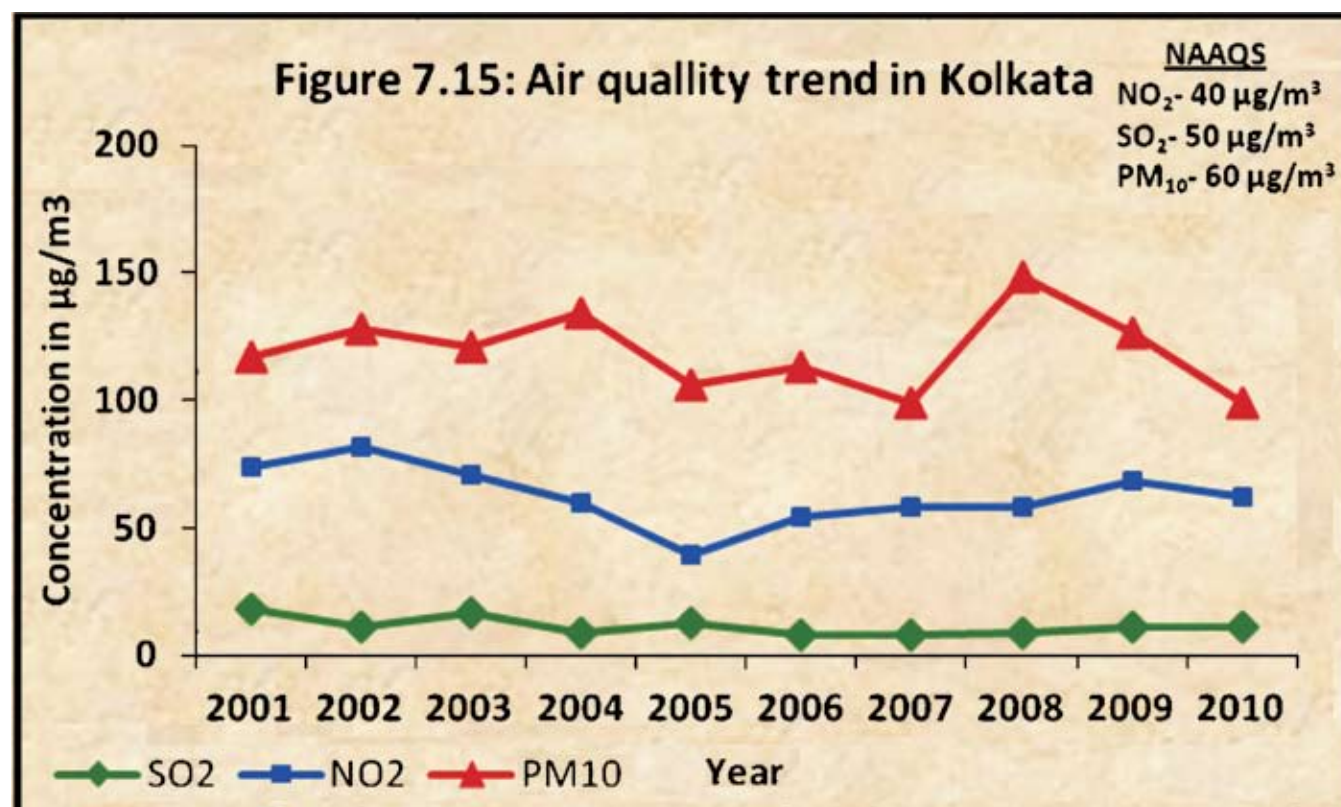
## 7.3.14 ASANSOL

|                      |                                                                                                                                                                                                                                                                                                 |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | West Bengal                                                                                                                                                                                                                                                                                     |
| Location             | 23°41' N and 86°59' N E                                                                                                                                                                                                                                                                         |
| Area                 | 127.237 km <sup>2</sup>                                                                                                                                                                                                                                                                         |
| 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<br><br>Temperature: Maximum temperature 35°C during summer and minimum of 4°C during winter<br><br>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, iron and steel, polymer industries, cement, plastic, mustard 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 <sub>2</sub> and. NO <sub>2</sub> , shows a stable trend. (Figure 7.14).                                                                                                                           |



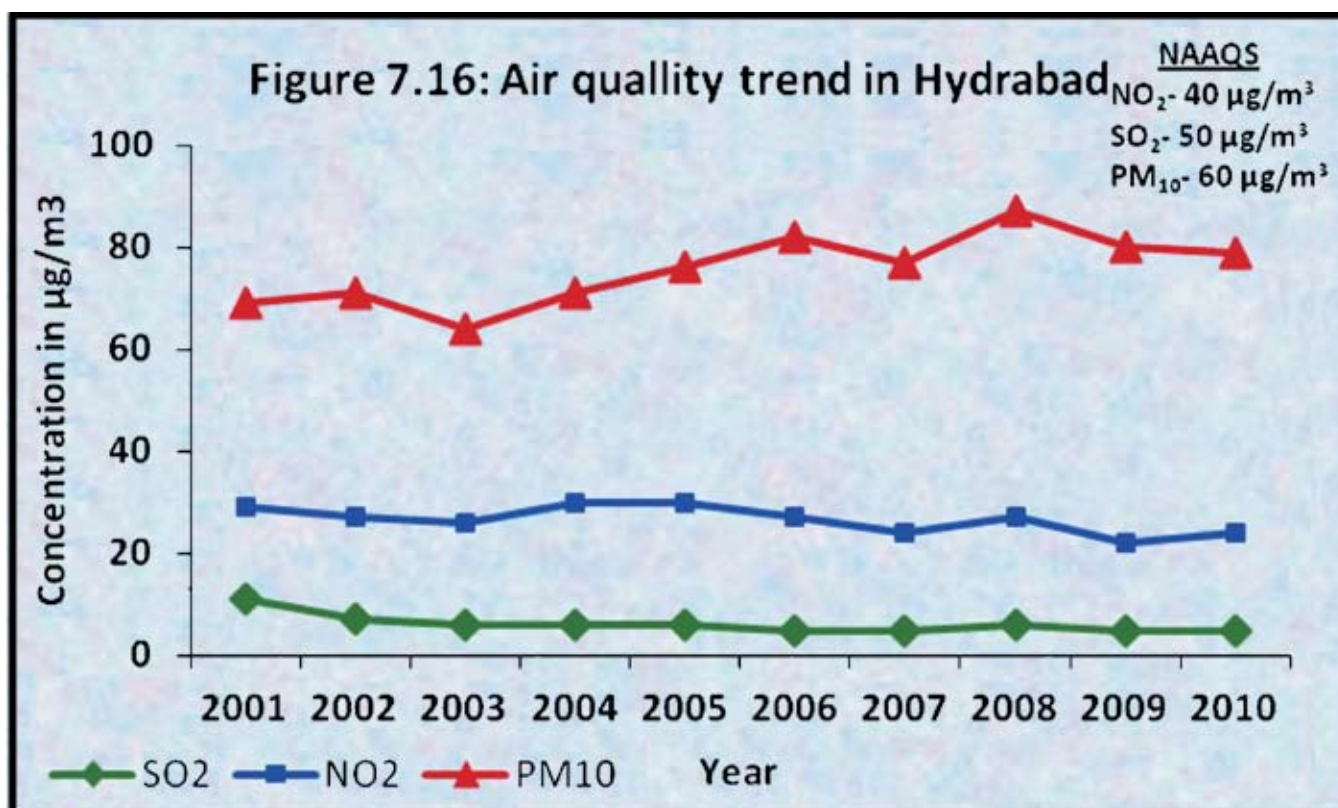
## 7.3.15 KOLKATA

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | West Bengal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Location             | 22°33' N and 88°20' E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Area                 | 1750 km <sup>2</sup> . elevation ranging between 1.5 m (5 ft) to 9 m (30 ft) <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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. <u>Southeast monsoon</u> rains lash the city between June and September<br>Temperature: annual mean temperature is 26.8 °C; monthly mean temperatures range from 19 °C to 30 °C<br>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 <sub>10</sub> shows a fluctuating trend. However, 2009 shows a reduction in the pollutant. NO <sub>2</sub> shows a slightly increasing trend. Both PM <sub>10</sub> and NO <sub>2</sub> exceeds the NAAQS. SO <sub>2</sub> seems stable and well within limits. (Figure 7.15).                                                                                                                                                                                                                                                                                                                                                           |



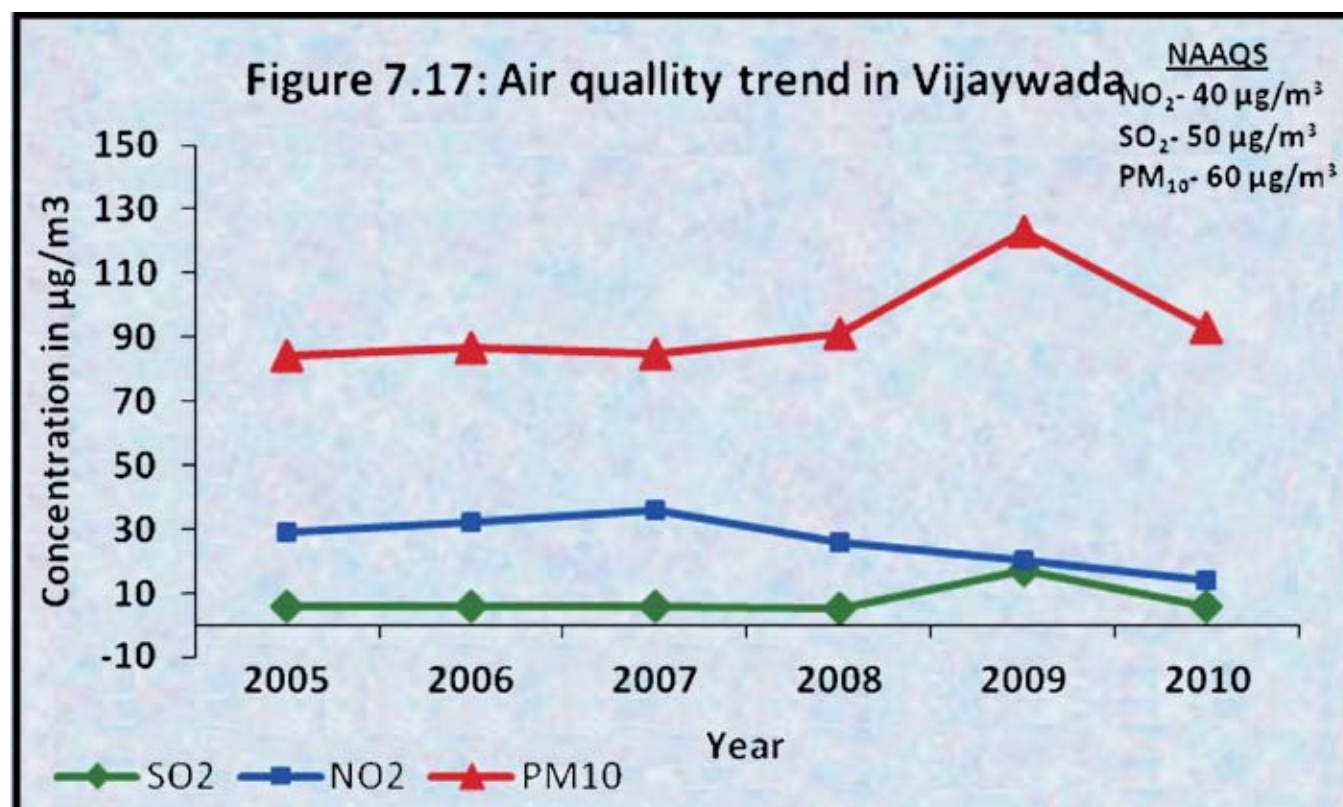
## 7.3.16 HYDRABAD

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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<br><br>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 <sub>10</sub> shows a fluctuating trend. However, 2009 shows a reduction in the pollutant. NO <sub>2</sub> shows a slightly increasing trend. Both PM <sub>10</sub> and NO <sub>2</sub> exceeds the NAAQS. SO <sub>2</sub> seems stable and well within limits. (Figure 7.16).                                                                                                                                      |



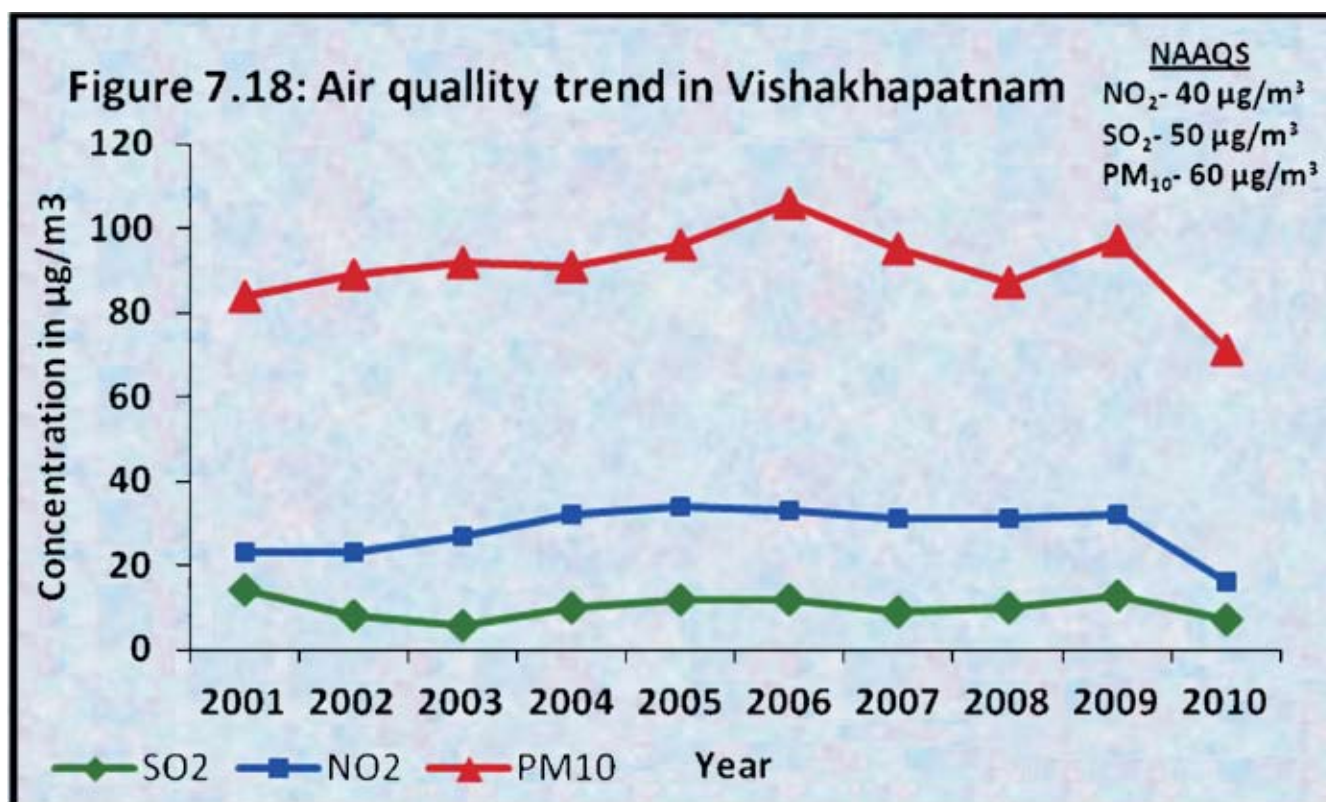
## 7.3.17 VIJAYWADA

|                      |                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Andhra Pradesh                                                                                                                                                                                                                                                                                                                                                        |
| Location             | 16°31' N and 80°39' E                                                                                                                                                                                                                                                                                                                                                 |
| Area                 | 73 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                    |
| Population           | 10,11,152.                                                                                                                                                                                                                                                                                                                                                            |
| Climate              | Tropical, specifically a tropical wet and dry climate, with hot summers and moderate winters.<br>Temperature: peak temperature reaches 47 °C (117 °F) in May-June, while the winter temperature is 20-27 °C<br>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 <sub>10</sub> and SO <sub>2</sub> shows an fluctuating trend, NO <sub>2</sub> shows a decreasing trend. However NO <sub>2</sub> and SO <sub>2</sub> are within NAAQS (Figure 7.17).                                                                                                                                      |



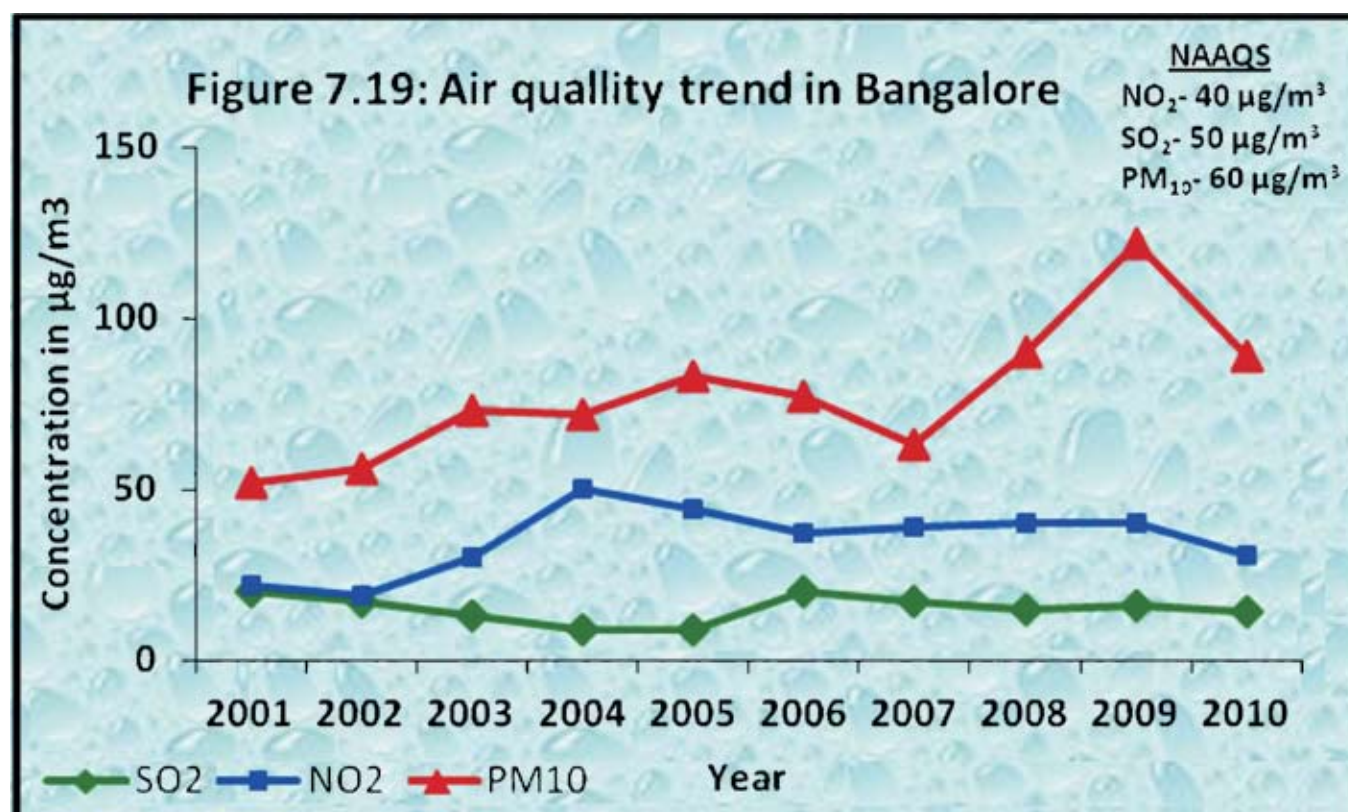
## 7.3.18 VISHAKHAPATNAM

|                      |                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Andhra Pradesh                                                                                                                                                                                                                                                                                                                                                  |
| Location             | 17°43' N and 83°17' E                                                                                                                                                                                                                                                                                                                                           |
| Area                 | Vishakhapatnam urban area comprises Vishakhapatnam Municipal Corporation covering 111 km <sup>2</sup> and Gajuvaka Municipality with an area of 97 km <sup>2</sup>                                                                                                                                                                                              |
| 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<br><br>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, fertilisers, 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 <sub>10</sub> shows a fluctuating trend, NO <sub>2</sub> and SO <sub>2</sub> shows a stable trend and are within NAAQS (Figure 7.18).                                                                                                                                                                              |



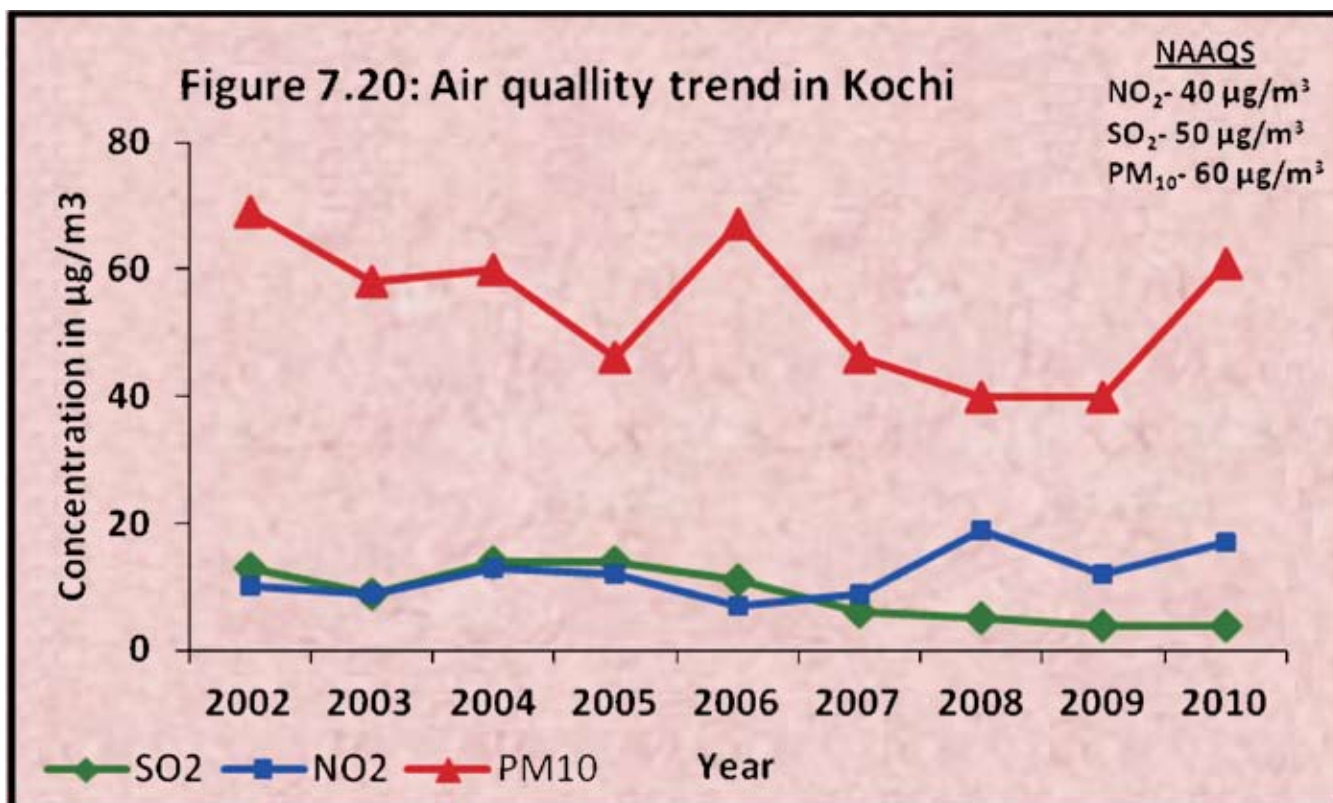
## 6.3.19 BANGALORE

|                      |                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Karnataka                                                                                                                                                                                                                                                                                                                                                                                              |
| Location             | 12°34'48" N and 77°22'48" E. Altitude of 920 m above MSL                                                                                                                                                                                                                                                                                                                                               |
| Area                 | 1000 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                   |
| Population           | 56,86,844                                                                                                                                                                                                                                                                                                                                                                                              |
| Climate              | <p>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.</p> <p>Temperature: 28 to 36°C during hottest months (April/May) to 16 to 25°C during winter months (December/January).</p> <p>Rainfall: average rainfall is 686 mm</p> |
| 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 <sub>10</sub> shows an increasing trend with an abrupt increase after 2007. SO <sub>2</sub> and NO <sub>2</sub> is more or less stable after 2006 and are within NAAQS (Figure 7.19).                                                                                                                                                                     |



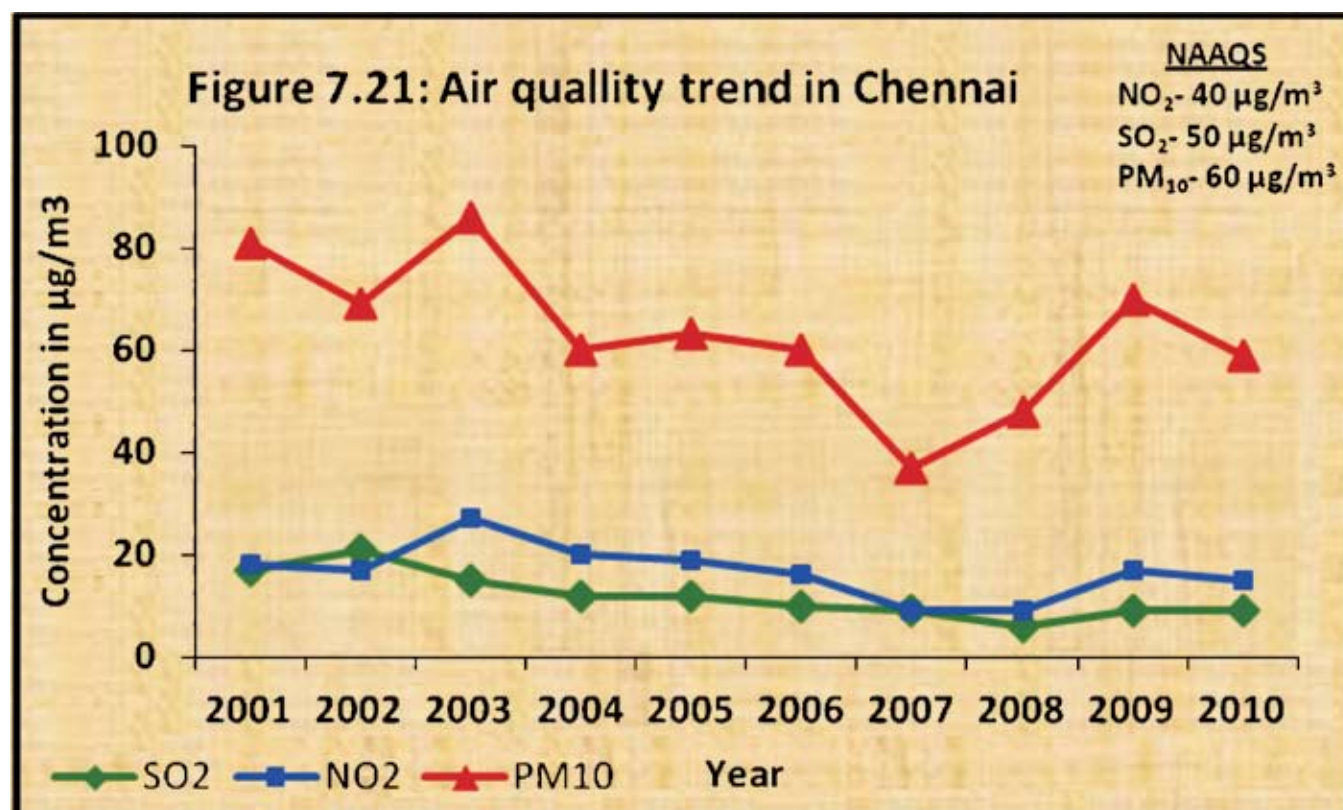
## 6.3.20 KOCHI

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Kerala                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Location             | 9°58'N to 9.967°N and 76°13'E to 76.217°E                                                                                                                                                                                                                                                                                                                                                                                                         |
| Area                 | 2408 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 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.<br><br>Temperature: maximum of 40 °C while in winter it is around 25°C<br><br>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 <u>Archaean</u> -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 <sub>10</sub> shows an increasing trend with an abrupt increase after 2007. SO <sub>2</sub> and NO <sub>2</sub> is more or less stable after 2006 and are within NAAQS (Figure 7.20).                                                                                                                                                                                                                |



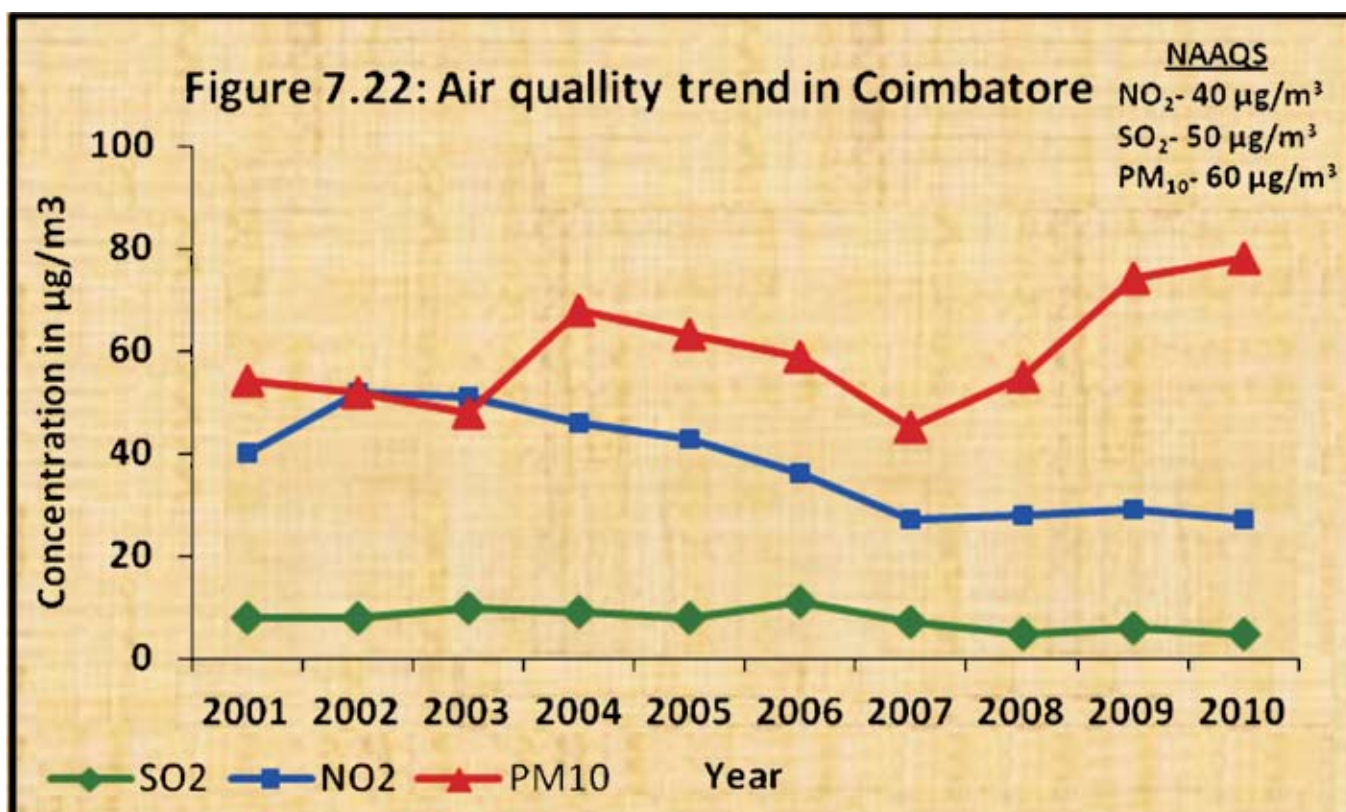
## 6.3.21 CHENNAI

|                      |                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Tamilnadu                                                                                                                                                                                                                                                                                                                                                                                     |
| Location             | 13°04' N and 80°17'E. Average elevation is around 6.7 metres                                                                                                                                                                                                                                                                                                                                  |
| Area                 | 173 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                           |
| 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<br><br>Temperature: 24.3° C (min) to 32.9 °C (max)<br><br>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 <sub>10</sub> shows an increasing trend with an abrupt increase after 2007. SO <sub>2</sub> and NO <sub>2</sub> is more or less stable after 2006 and are within NAAQS (Figure 7.21).                                                                                                                                                            |



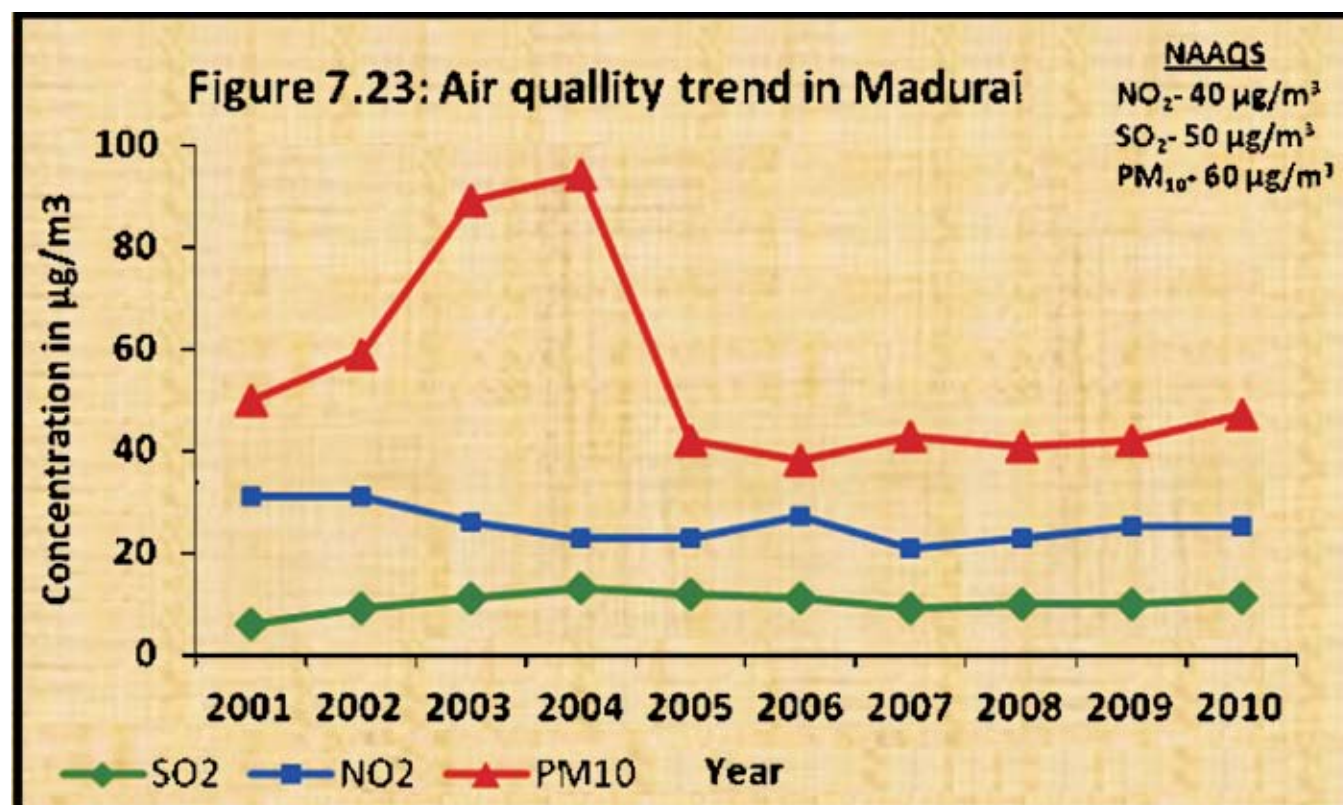
## 6.3.22 COIMBATORE

|                      |                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Tamilnadu                                                                                                                                                                                                                                                                                                                   |
| Location             | 11°00' N and 77°00' E, Elevation of about 398 meters                                                                                                                                                                                                                                                                        |
| Area                 | 140 km <sup>2</sup>                                                                                                                                                                                                                                                                                                         |
| 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.<br>Temperature: The mean maximum and minimum temperatures during summer and winter varies between 35°C to 18°C.<br>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 flourish                                                                                            |
| Air quality stations | 3 (2 residential, 1 industrial)                                                                                                                                                                                                                                                                                             |
| Air quality trend    | Analysis of nine year air quality data of PM <sub>10</sub> shows fluctuating trend with an abrupt increase after 2007. NO <sub>2</sub> shows a decline over the years and SO <sub>2</sub> is stable and within NAAQS (Figure 7.22).                                                                                         |



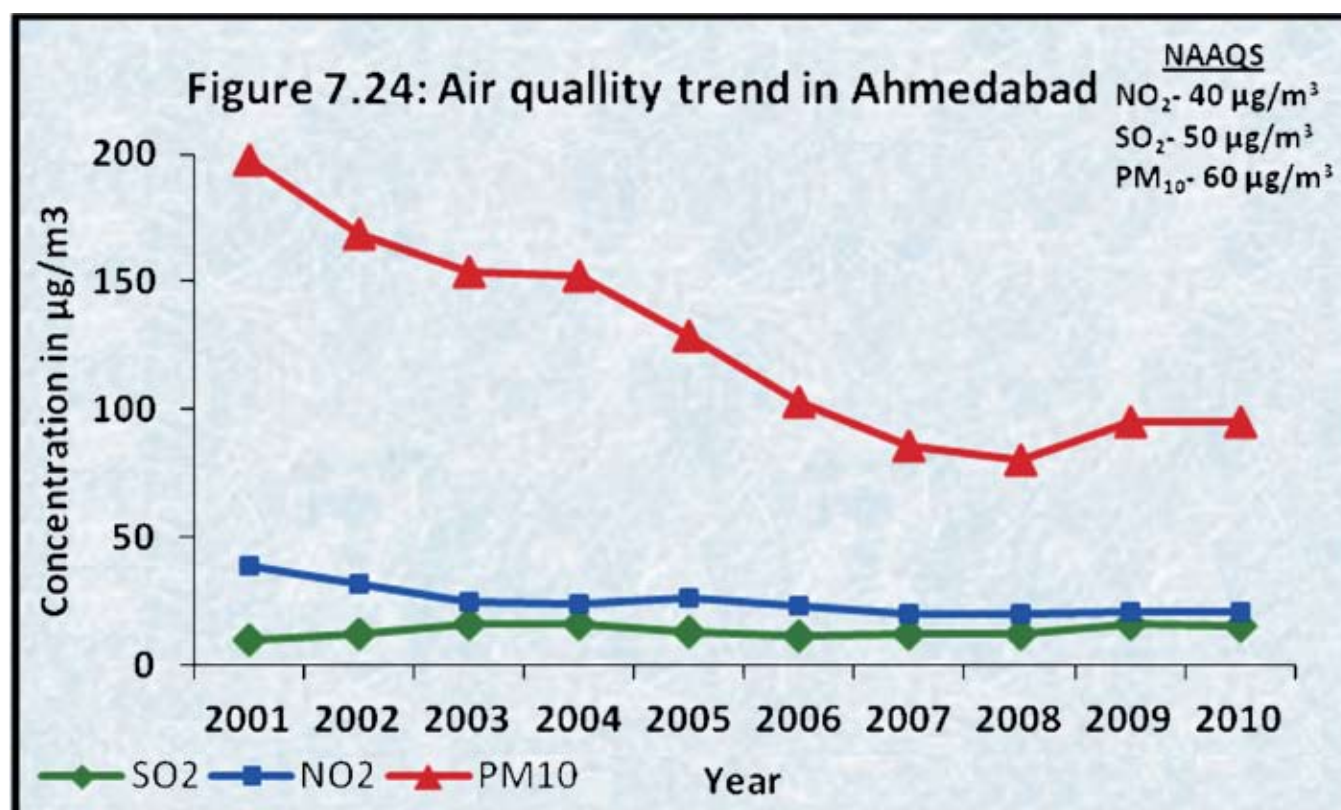
## 6.3.23 MADURAI

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Tamilnadu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Location             | 9°58' N and 78°10' E, elevation of 101 meters above mean sea level                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Area                 | 140 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 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<br>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.<br>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 <sub>10</sub> shows fluctuating trend. NO <sub>2</sub> shows a decline over the years and SO <sub>2</sub> is stable and within NAAQS (Figure 7.23).                                                                                                                                                                                                                                                                                                                                           |



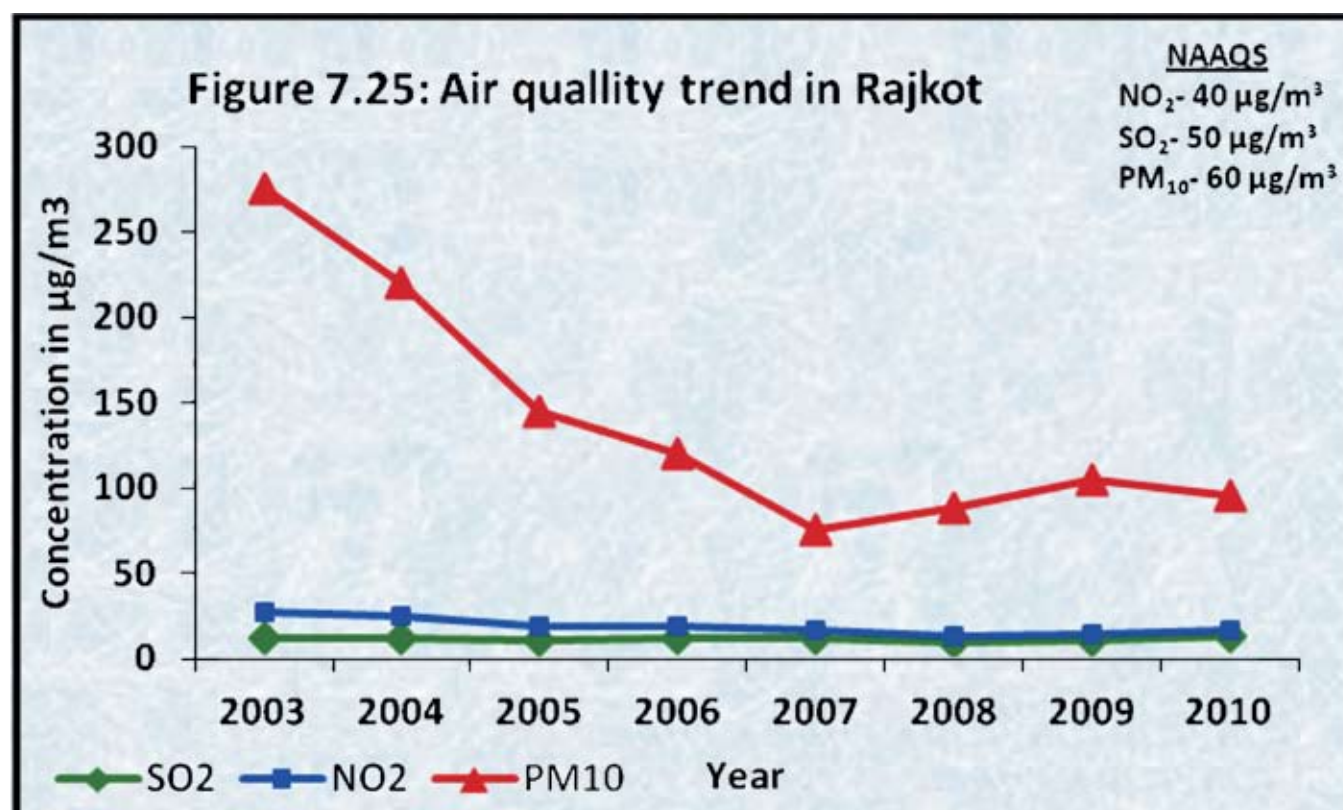
## 6.3.24 AHMEDABAD

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Gujarat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Location             | 23°02' N and 72°35' E, elevation of 53 metres                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Area                 | 300 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Population           | 35,20,085                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Climate              | <p>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.</p> <p>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.</p> <p>Rainfall: average annual rainfall for this period was 732 mm</p> |
| 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 <sub>10</sub> shows a declining trend with a slight increase during 2009. Both SO <sub>2</sub> and NO <sub>2</sub> are more or less stable (Figure 7.24).                                                                                                                                                                                                                                                                                           |



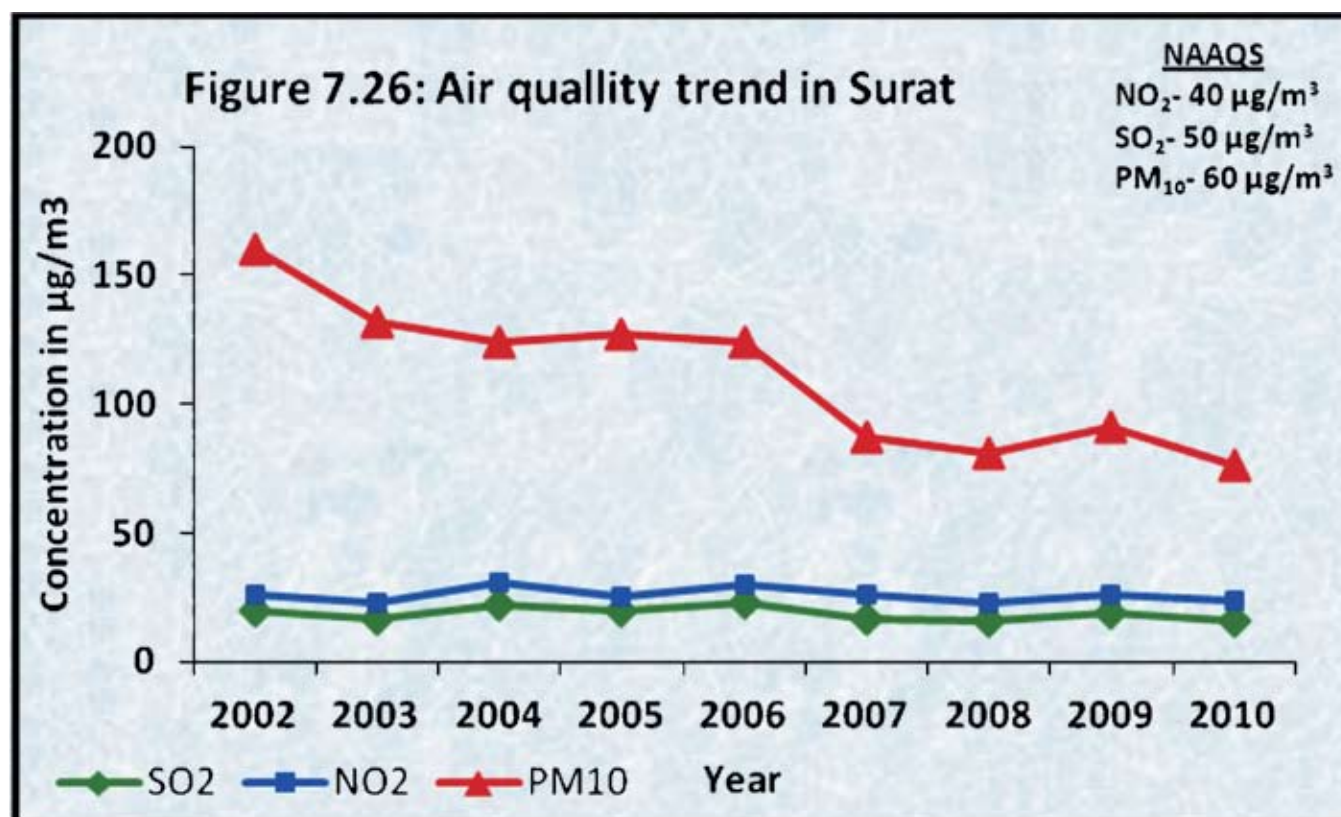
## 6.3.25 RAJKOT

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Gujarat                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Location             | 22°18' N and 70°47' E, elevation of 134 m (439 feet).                                                                                                                                                                                                                                                                                                                                                                            |
| Area                 | 104.86 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                           |
| Population           | 10,02,160                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Climate              | Semi arid 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.<br><br>Temperature: average maximum and minimum temperatures recorded over the last 40 years are 43.5 °C and 24.2 °C respectively<br><br>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), Fluvio marine 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 SO <sub>2</sub> and NO <sub>2</sub> . As for PM <sub>10</sub> upto 2007 a declining trend is seen whereas a slight increasing trend is seen after 2007 (Figure 7.25).                                                                                                                                                                               |



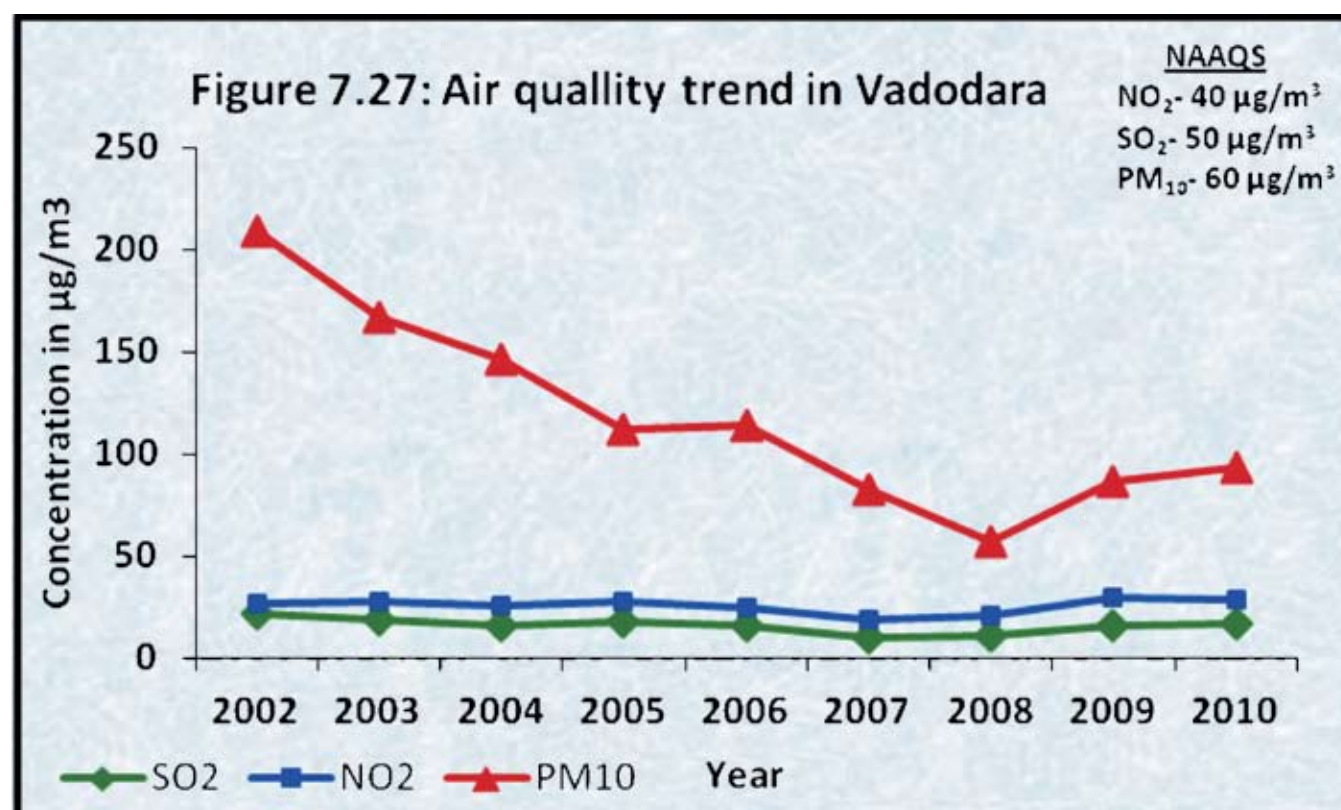
## 6.3.26 SURAT

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Gujarat                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Location             | 21°10' N and 72°50' E, average elevation of 13 meters                                                                                                                                                                                                                                                                                                                                                                              |
| Area                 | 112.27 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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.<br><br>Temperature: temperature of the city varies from 12°C to 31°C, while it varies from 24°C to 42°C<br><br>Rainfall: 931 mm |
| Geography            | Situated on the left bank of the <u>Tapti River</u> , 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 <u>synthetic fibers</u> and man-made fabrics, <u>diamond-polishing industry</u> , , 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 SO <sub>2</sub> and NO <sub>2</sub> . As for PM <sub>10</sub> upto 2007 a declining trend is seen whereas a slight increasing trend is seen after 2007 (Figure 7.26).                                                                                                                                                                                 |



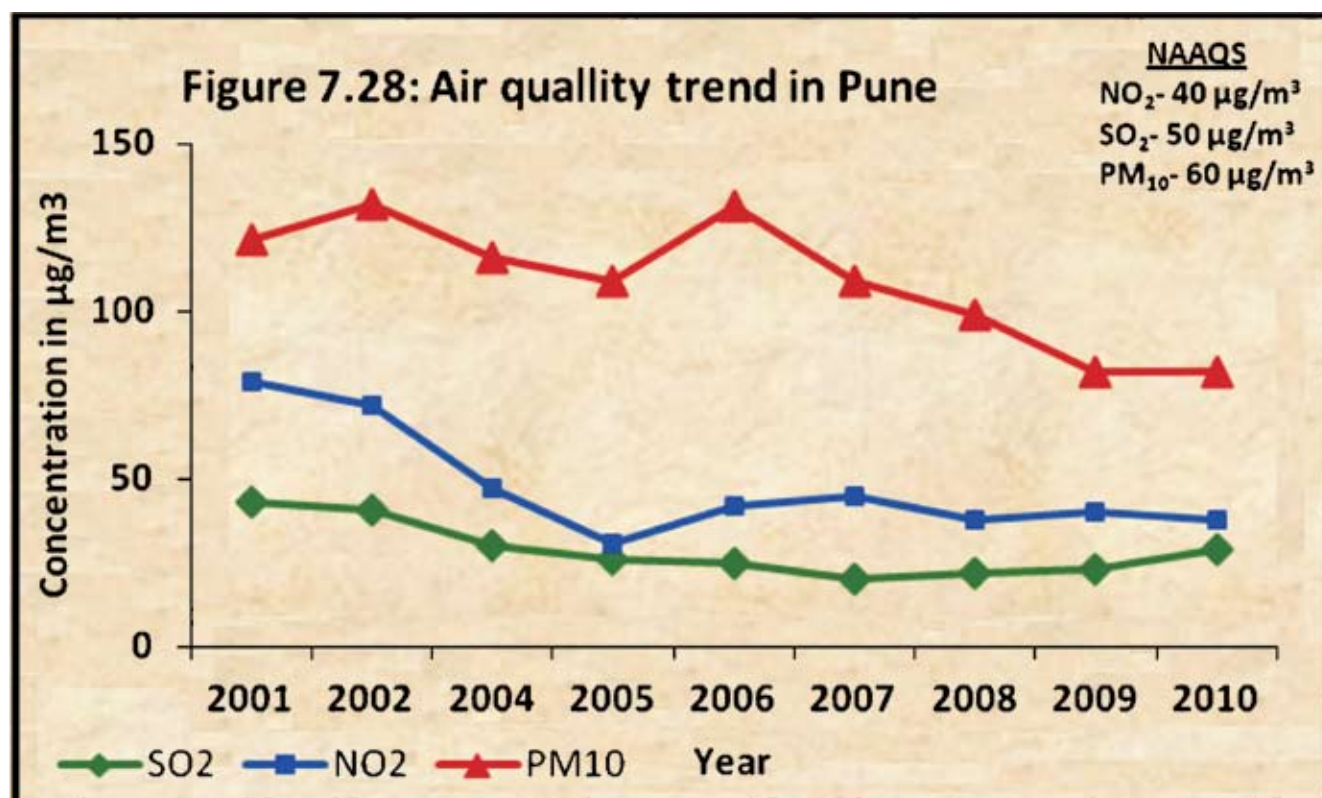
## 6.3.27 VADODARA

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Gujarat                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Location             | 22°18' N and 73°16' E, elevation of 39 metres (123 feet)                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Area                 | 140 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 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.<br>Temperature: The temperature of the city varies from 8°C to 46°C<br>Rainfall: 900 mm                                                                                                                                                                                                                                            |
| Geography            | Basement rocks, exposed in northern and eastern parts, had been controlled by the Precambrian orogenies (Arvali and Delhi cycles), and the older crystalline rocks ideally shows folds, faults and magmatism related to the two orogenies.<br>The city sits on the banks of the River <u>Vishwamitri</u> , in central Gujarat, <u>Mahi</u> & <u>Narmada</u> 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 <u>Forex</u> . 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 <sub>2</sub> and NO <sub>2</sub> . As for PM <sub>10</sub> upto 2008 a declining trend is seen whereas a slight increasing trend is seen after 2008 (Figure 7.27).                                                                                                                                                                                                                        |



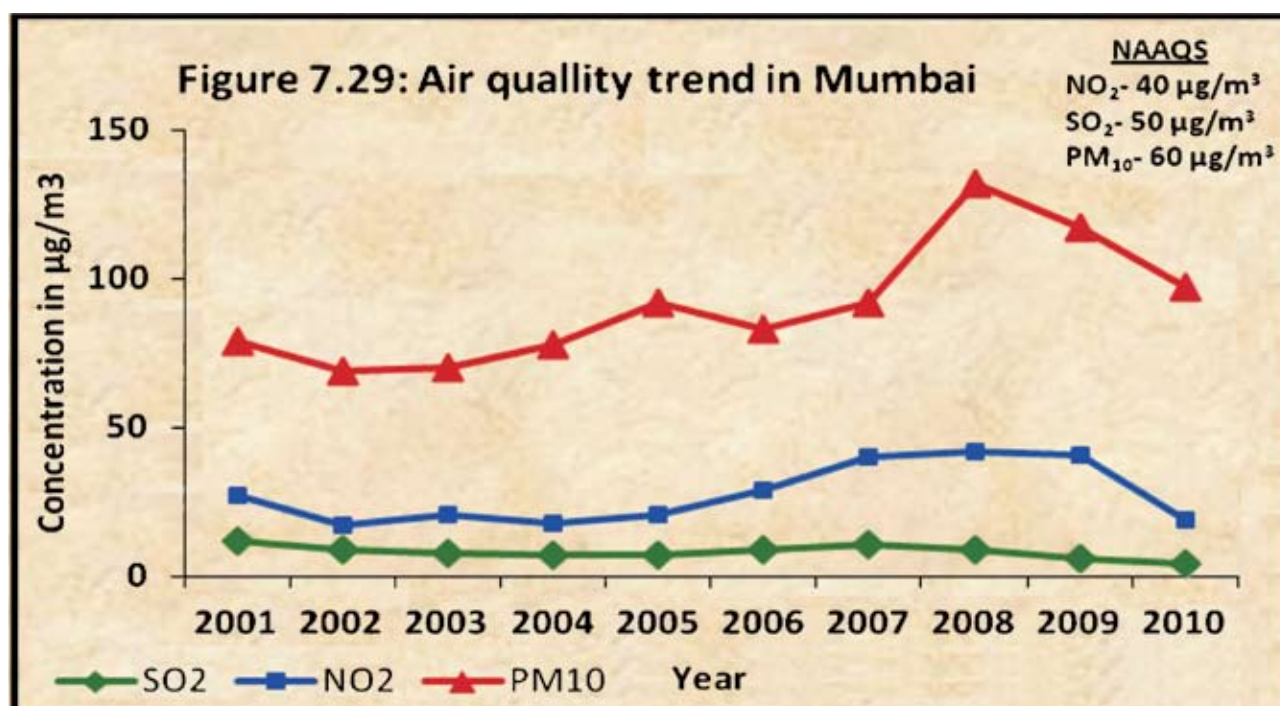
## 6.3.28 PUNE

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Maharashtra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Location             | 18°18'36" N and 73°33' E, 560 m (1,840 ft) above sea level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Area                 | 15,642 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Population           | 37,55,525                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Climate              | <u>Tropical wet and dry climate</u> . 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 <u>Sahyadri</u> mountain range, which form a barrier from the <u>Arabian sea</u> . At the confluence of the <u>Mula</u> and <u>Mutha rivers</u> . The <u>Pavana</u> and <u>Indrayani rivers</u> , tributaries of the <u>Bhima river</u> , traverse the northwestern outskirts of metropolitan Pune. Underlain by basaltic lava flows (Pahoehoe and AA) of upper cretaceous eocene 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 SO <sub>2</sub> and NO <sub>2</sub> . As for PM <sub>10</sub> , a declining trend is seen. (Figure 7.28).                                                                                                                                                                                                                                                                                                                                                                                                                                    |



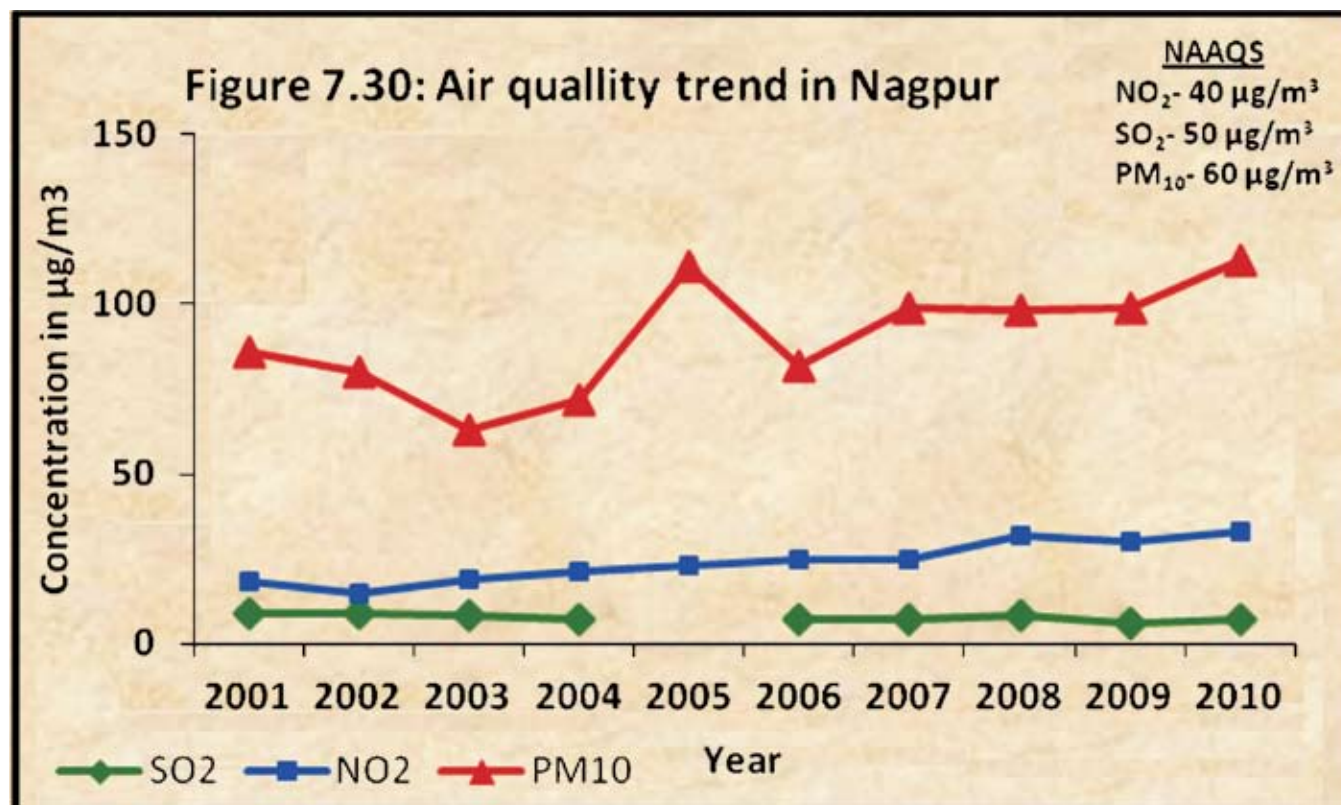
## 6.3.29 MUMBAI – commercial capital

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Maharashtra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Location             | 18°55' N and 72°54' E, elevation of 14 m (46 ft)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Area                 | 603.4 km <sup>2</sup> (233 sq mi) <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Population           | 1,40,00,000 lacs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Climate              | <p>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.</p> <p>Temperature: average maximum temperature is 31.2 °C (88.2 °F), while the average minimum temperature is 23.7 °C (74.7 °F)</p> <p>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</p>                                                                                                                                                                                                                                                                                                                                    |
| Geography            | Mumbai lies at the mouth of the Ulhas River on the western coast of India, in the coastal region known as the <u>Konkan</u> . Three small rivers, the <u>Dahisar River</u> , <u>Poinsar (or Poisar)</u> and <u>Ohiwara (or Oshiwara)</u> originate within the park, while the polluted <u>Mithi River</u> 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 in 2009. NO2 also showed an increasing trend but SO2 showed a decreasing trend. (Figure 7.29).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



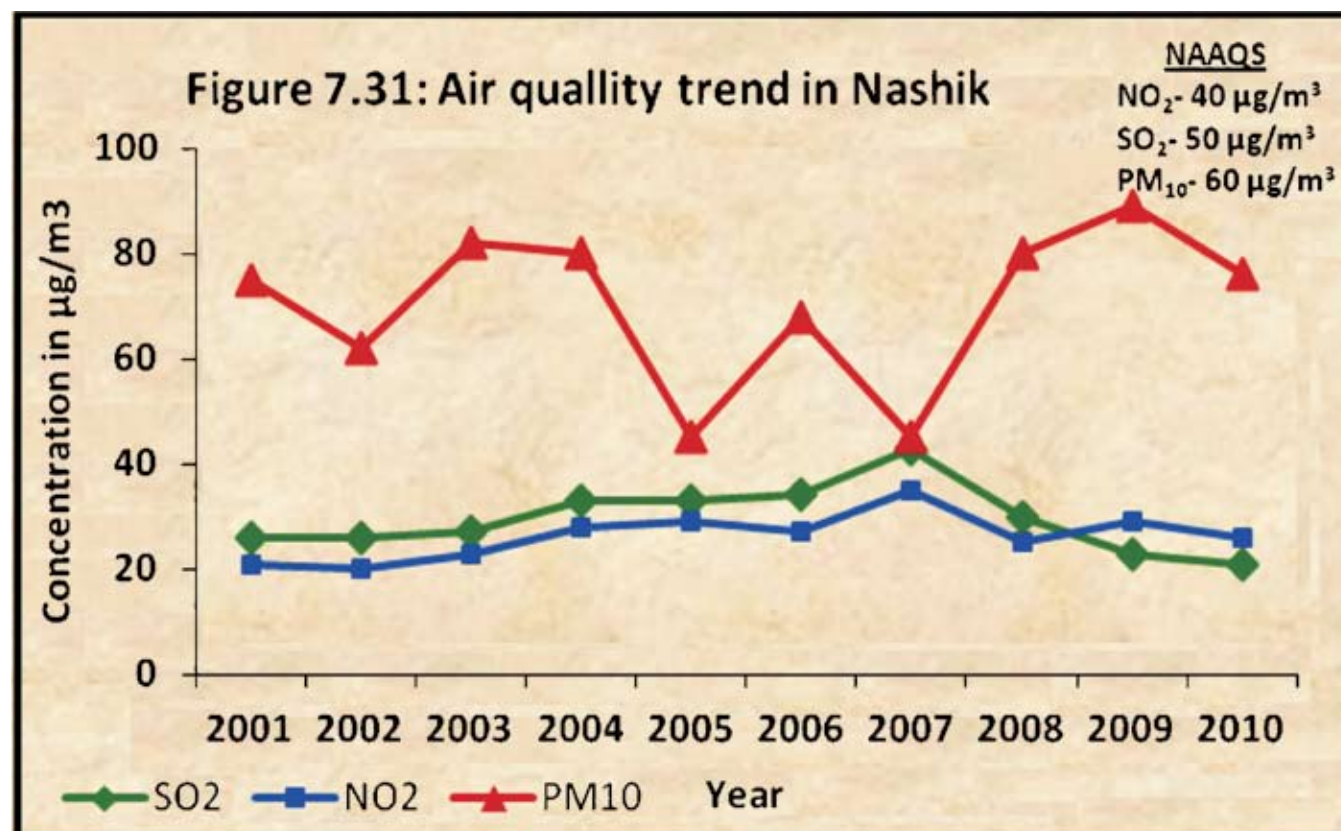
## 6.3.30 NAGPUR

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Maharashtra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Location             | 21°5'24" N and 79°5'24" E, mean altitude of 310 meters above sea level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Area                 | 218 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 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<br>Temperature: mean daily temperature at 12.1°C and daily maximum temperature being 28.7 °C.<br>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 <u>Gondwana</u> formations are found. <sup>1</sup> |
| 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 in 2009. NO <sub>2</sub> also showed an increasing trend but SO <sub>2</sub> showed a decreasing trend. (Figure 7.30).                                                                                                                                                                                                                                                                                                                                            |



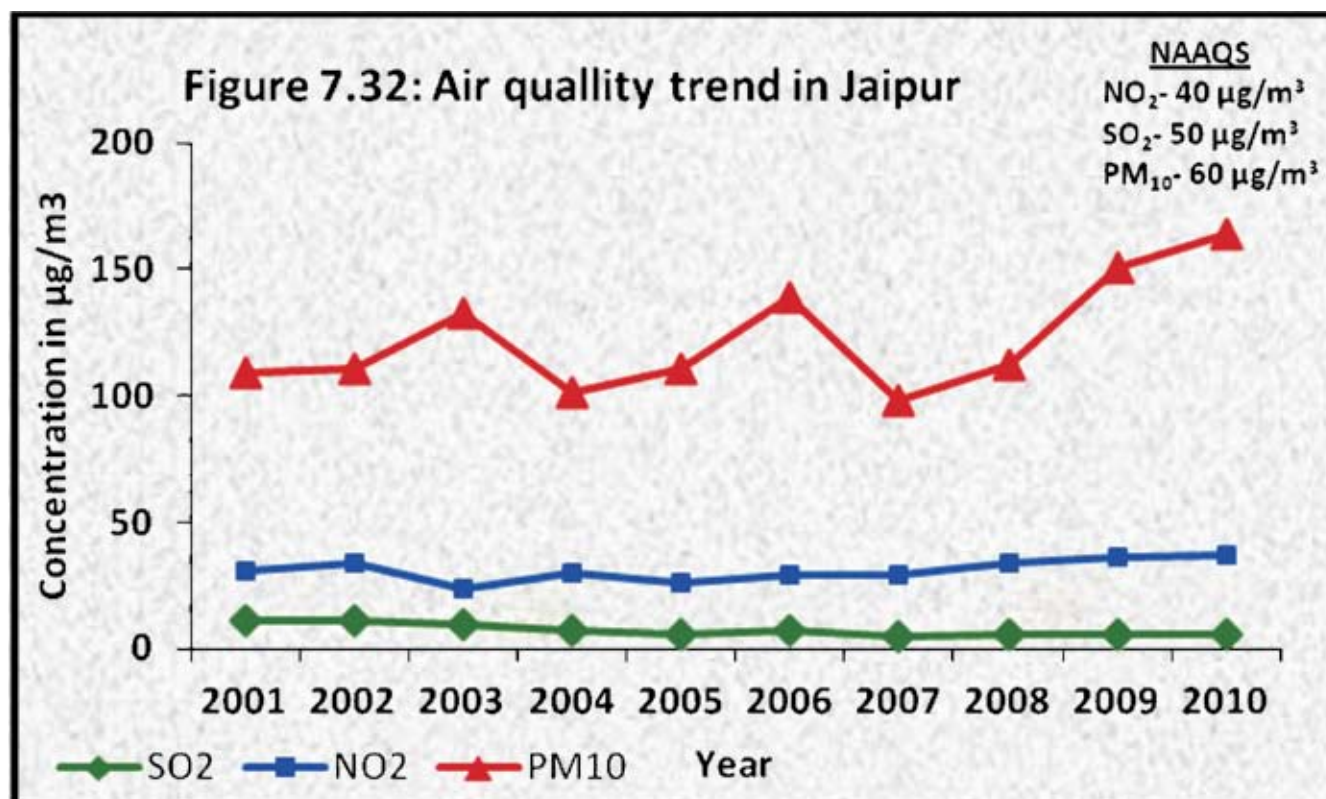
## 6.3.31 NASHIK

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Maharashtra                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Location             | 20°1'12" N and 73°30' E, 600m (1 968 ft) from the mean sea level                                                                                                                                                                                                                                                                                                                                                                 |
| Area                 | 259.13 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                           |
| 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.<br>Temperature: summer and winter temperatures ranged 22 to 43°C and 20 to 3° C respectively<br>Rainfall: average annual rainfall is about 700 mm Relative humidity is maximum 62% and minimum 43.65%. |
| Geography            | The river Godavari originates from <u>Trimbakeshwar</u> ) 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 in 2009. NO2 also showed an increasing trend but SO2 showed a decreasing trend. (Figure 7.31).                                                                                                                                                                                                               |



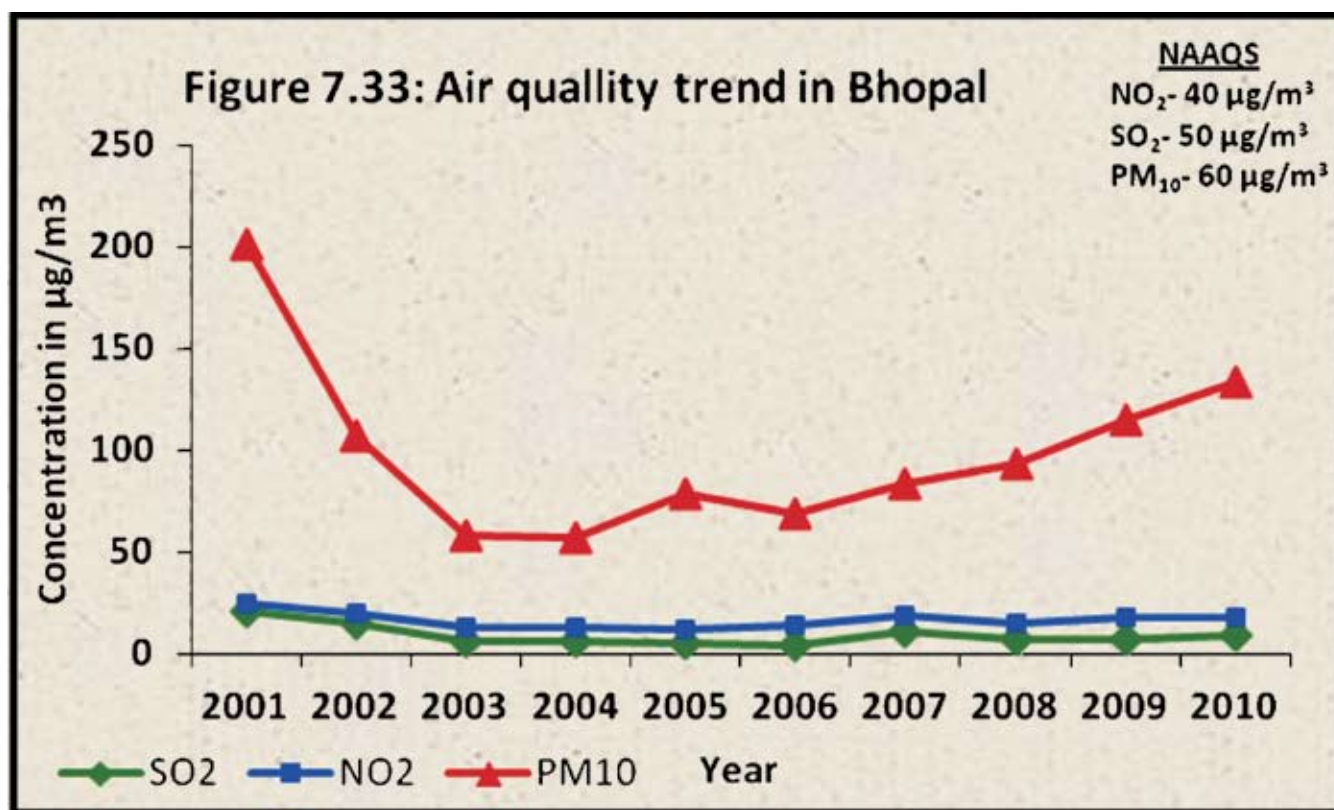
## 6.3.32 JAIPUR

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Rajasthan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Location             | 26°33' N and 75°31'12"E , average elevation of 431 metres (1417 ft)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Area                 | 230 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 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.<br>Temperature: minimum and maximum temperatures are 3°C and 45°C respectively while the mean temperature is 24°C.<br>Rainfall annual rainfall in the district is 548 mm |
| Geography            | Oldest 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 <u>Banas</u> and <u>Banganga</u> . 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 in 2009. NO2 also showed an increasing trend but SO2 showed a decreasing trend. (Figure 7.32).                                                                                                                                                                                                                                                                                                                                         |



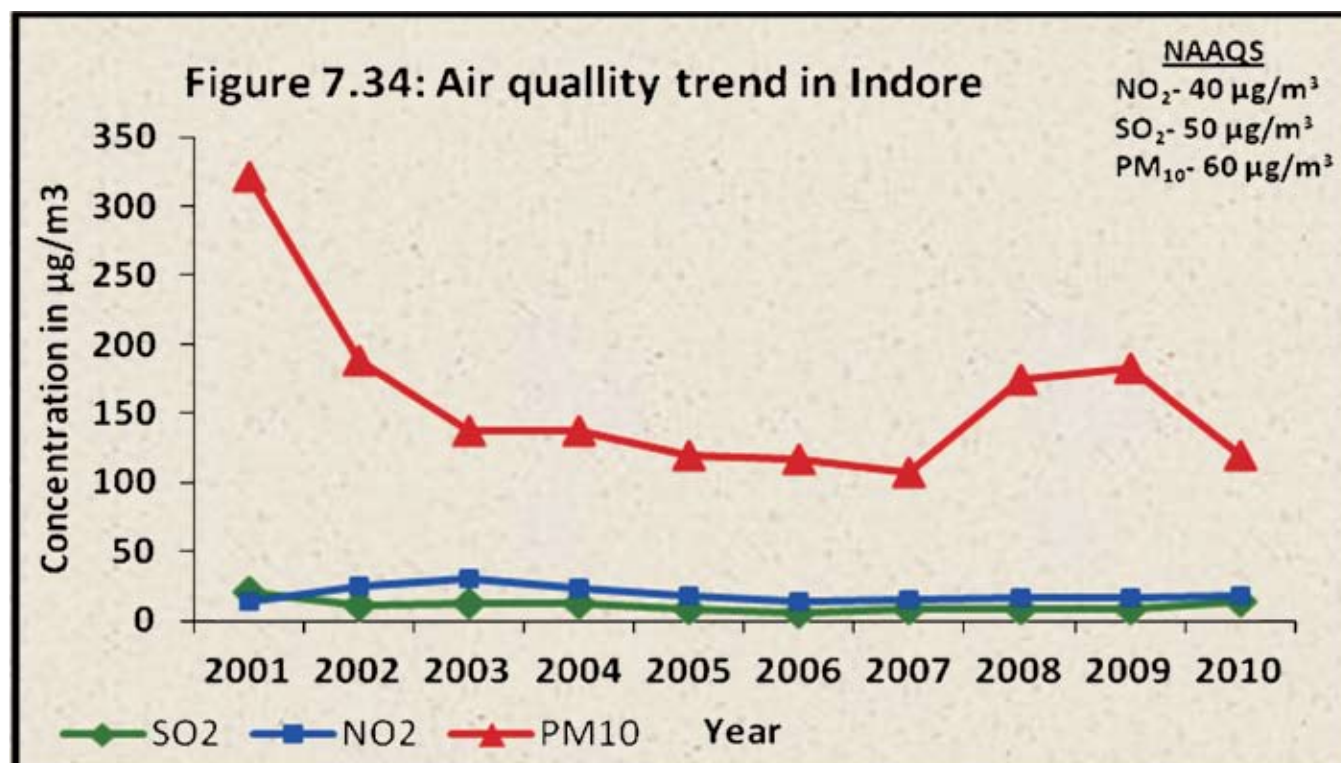
## 6.3.33 BHOPAL

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Madhya Pradesh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Location             | 23°9'36" N and 77°21'36"E, average elevation of 499 metres (1637 ft)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Area                 | 286 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 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.<br>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)<br>Rainfall The normal annual rainfall of Bhopal city is about 1260 mm |
| Geography            | Located in upper limit of the Vindhya mountain ranges, on the <u>Malwa</u> plateau. The area is occupied alluvial formations                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Industries           | Engineering Works, Bewerage, Bottling, Paints, Ancillary 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 <sub>10</sub> shows an increasing trend till 2008 and slight decrease in 2009. NO <sub>2</sub> also showed an increasing trend but SO <sub>2</sub> showed a decreasing trend. (Figure 7.33).                                                                                                                                                                                                                                                                                                                    |



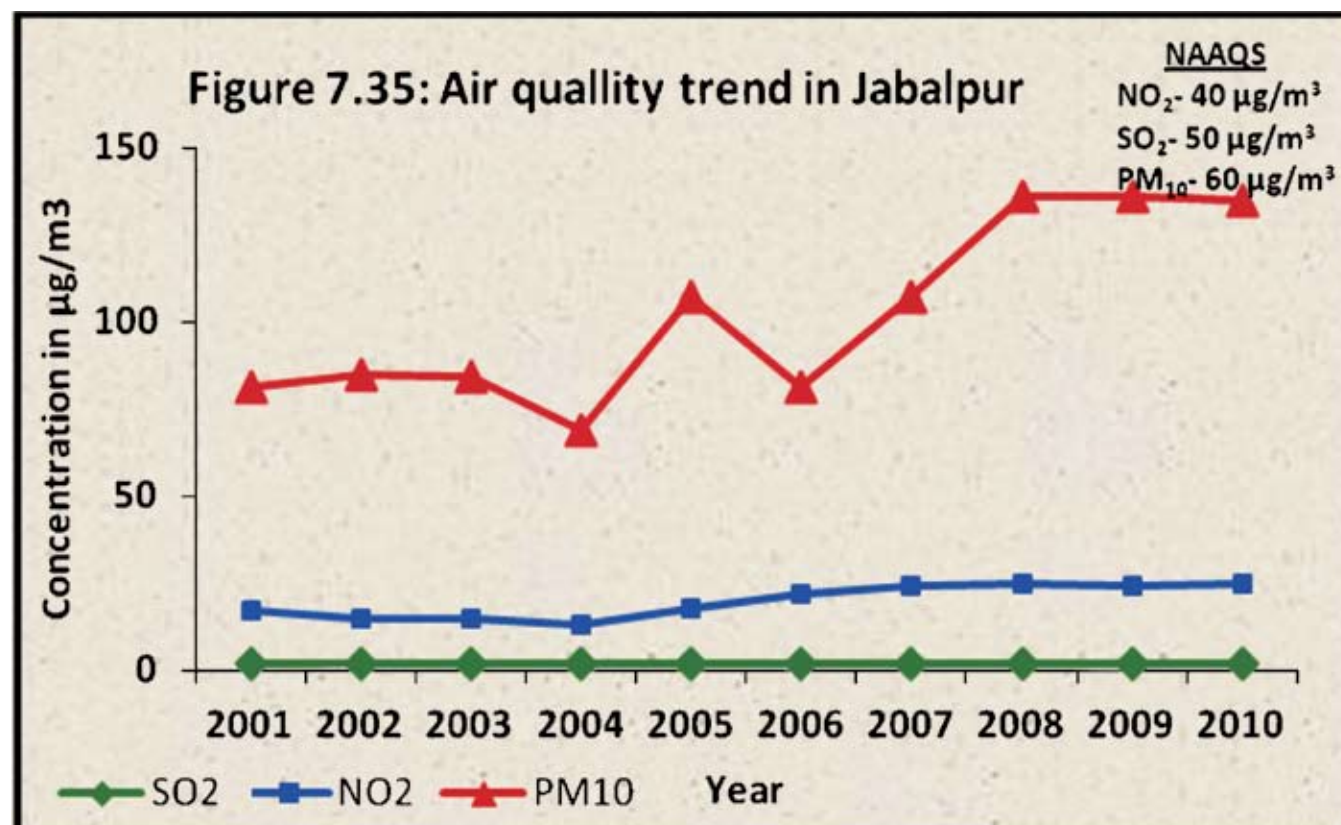
## 6.3.34 INDORE

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Madhya Pradesh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Location             | 22°26'24" N and 75°30'E, elevation of 550 metre above sea level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Area                 | 130 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Population           | 16,39,044                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Climate              | <p>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.</p> <p>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.</p> <p>Rainfall: Average rainfall of Indore district is about 980 mm</p> |
| Geography            | Located in the southern edge of the <u>Malwa</u> plateau, on the Saraswati and Khan rivers, which are tributaries of the <u>Shipra</u> 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

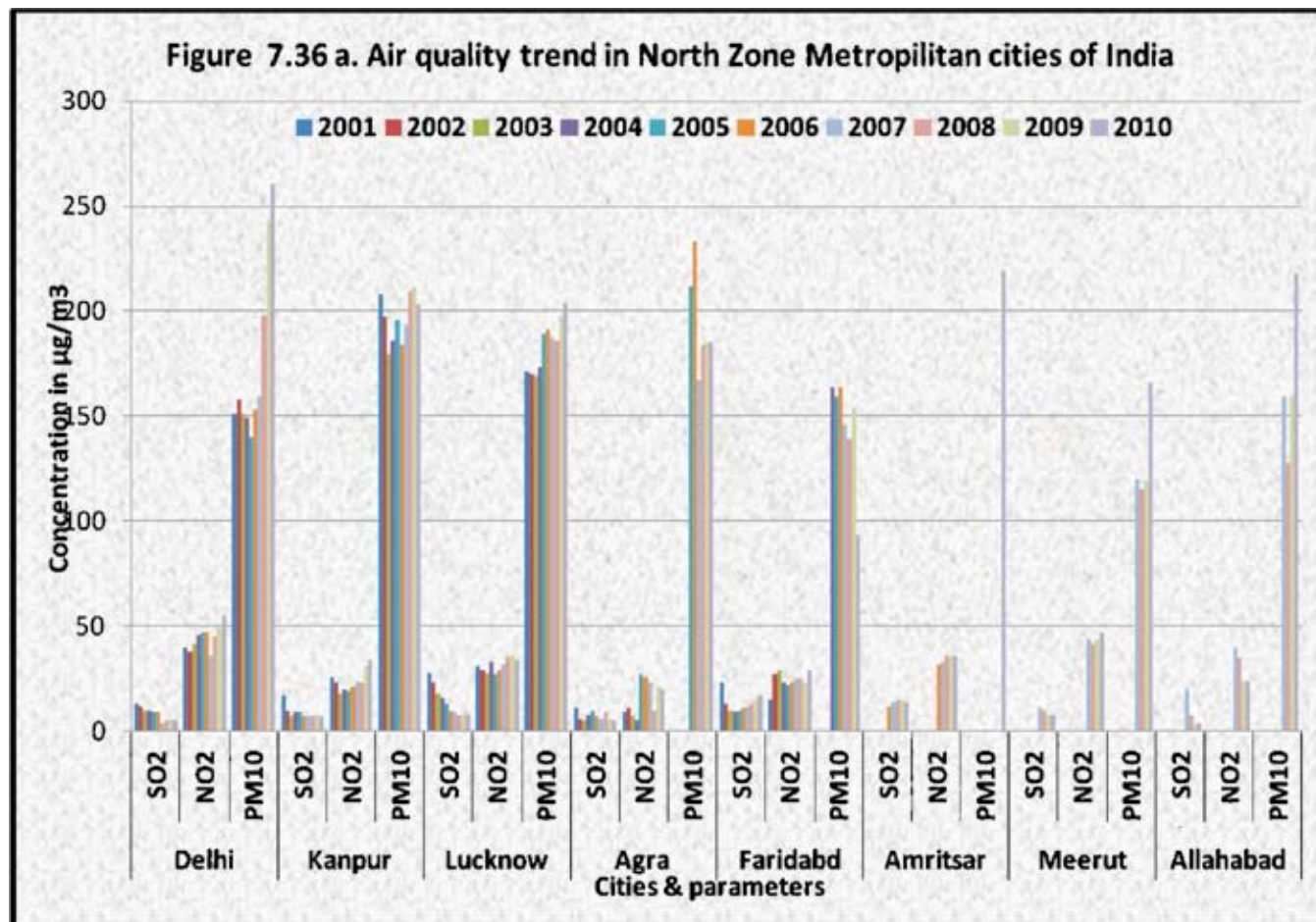
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Madhya Pradesh                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Location             | 23°6' N and 79°35'24"E, average elevation of 411 metres (1348 feet).                                                                                                                                                                                                                                                                                                                                                           |
| Area                 | 131 km <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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.<br><br>Temperature: average minimum temperature of 18.3 °C and an average maximum of 32.1 °C.<br>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 during 2009 but remaining above NAAQS. NO2 and SO2 showed a more or less stable trend. (Figure 7.35).                                                                                                                                                          |

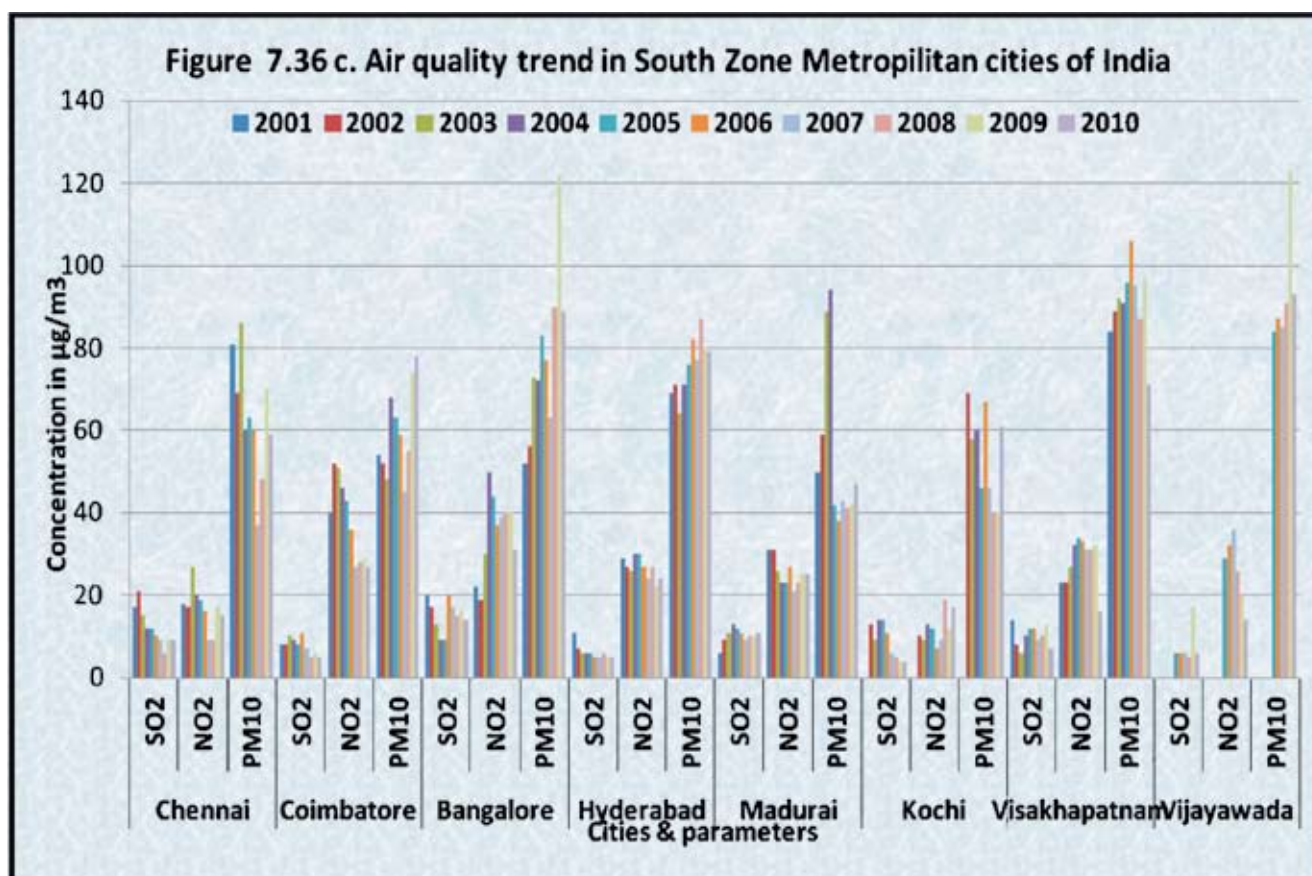
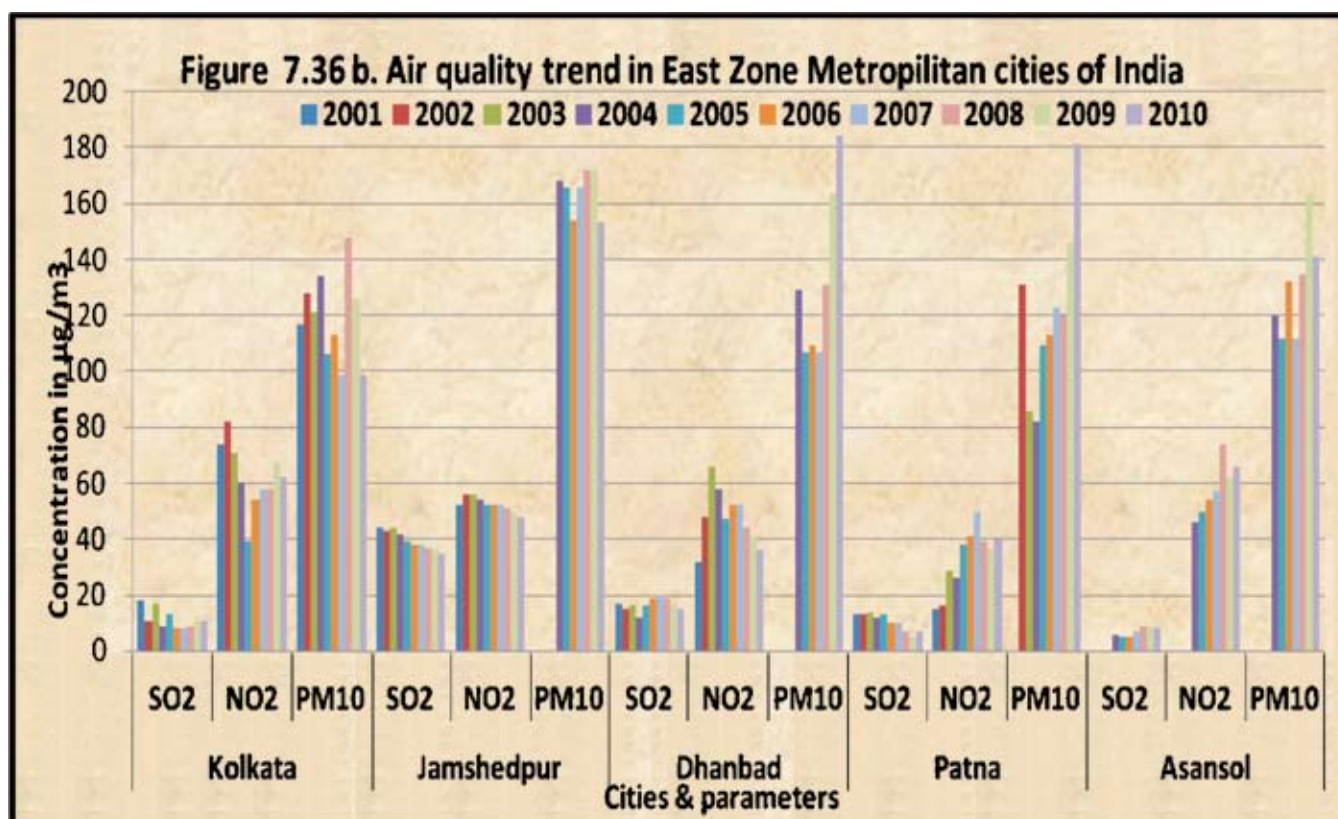


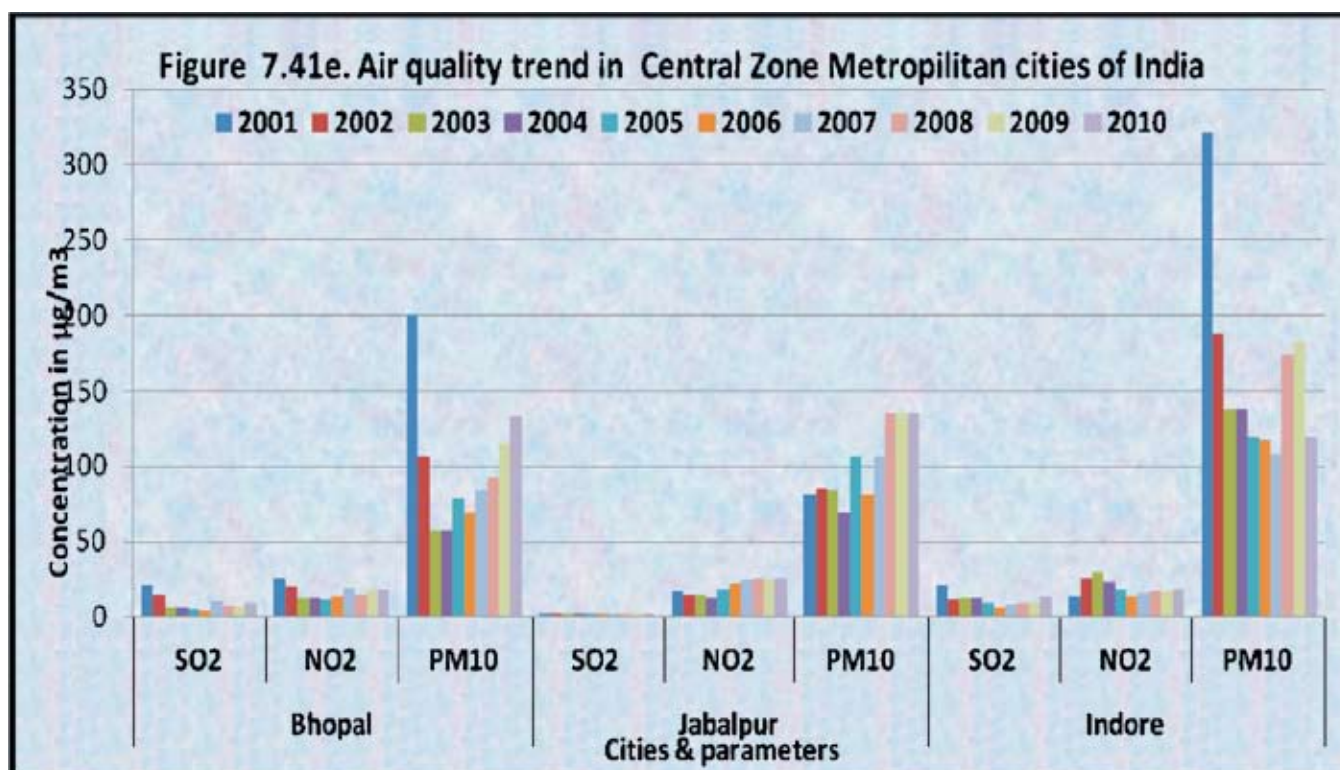
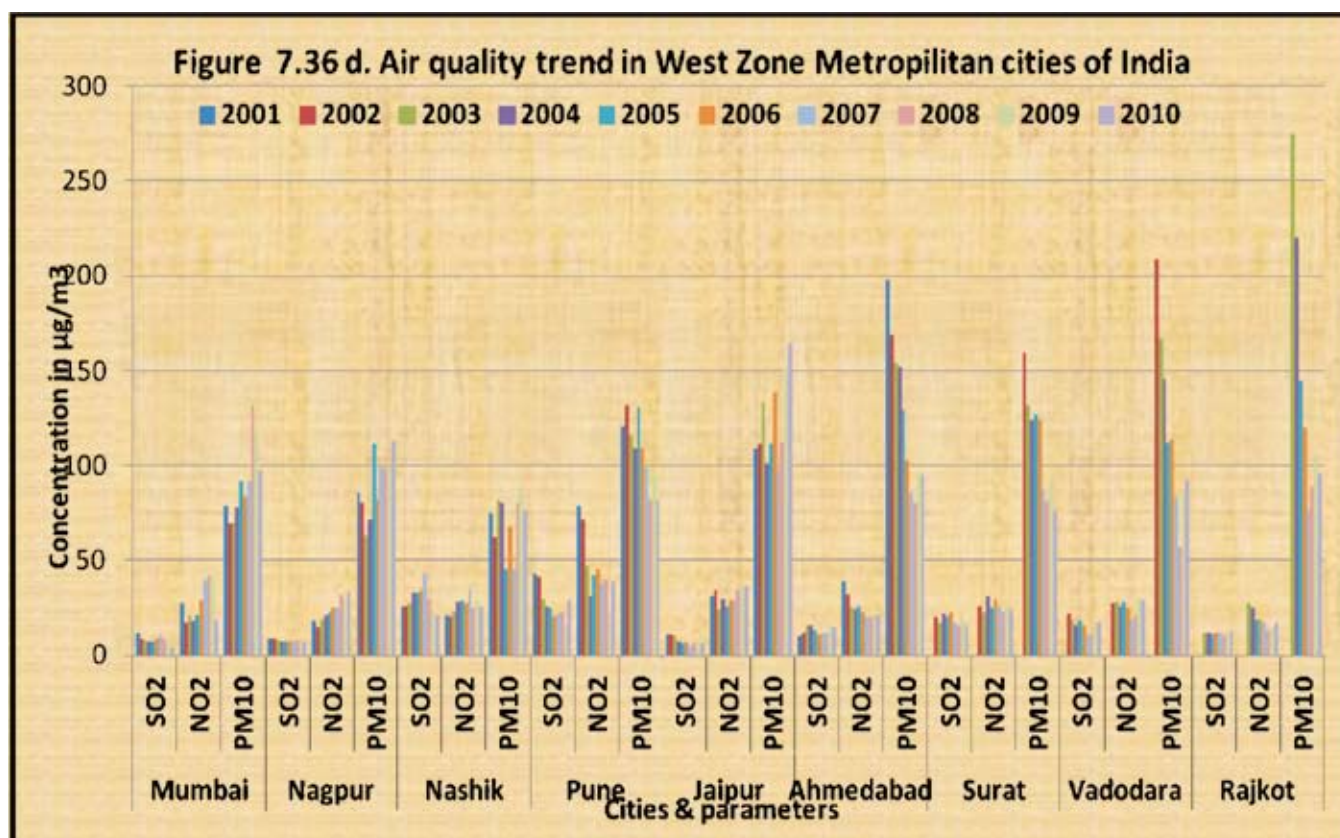
### 7.4 Air quality trend in different zones of India with respect to metropolitan cities

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**







In addition to criteria pollution like SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> Central Pollution Control board carried out four additional parameters such as Ammonia (NH<sub>3</sub>), Carbon Monoxide (CO), Ozone (O<sub>3</sub>) and Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>). NH<sub>3</sub> 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 (µg/m³) |                   |
|------------------|-----------------------------------------|-------------------|
| 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 µg/m<sup>3</sup>) during 2010.

| S.No. | State / UT     | City      | Location                       | Type of Area | No. of mon. days (n) | Min | Max | NH <sub>3</sub> Annual Average (µg/m <sup>3</sup> ) | 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           |
|       |                |           | Cossipore                      | I            | 96                   | 5   | 18  | 8                                                   | 5             | 7             | 13            | 3         | 0                           | L           |
| 5     | West Bengal    | Kolkata   | 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  $\mu\text{g}/\text{m}^3$  during 2010 and monthly average concentration varied from 1246  $\mu\text{g}/\text{m}^3$  to 3624  $\mu\text{g}/\text{m}^3$ . 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 ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|-----------------------------------------------|
| 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  $\mu\text{g}/\text{m}^3$  during 2010 and the monthly average concentration varied from 1184  $\mu\text{g}/\text{m}^3$  to 4238  $\mu\text{g}/\text{m}^3$ . High levels of CO might be attributed 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 ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|-----------------------------------------------|
| 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  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration varied from 426  $\mu\text{g}/\text{m}^3$  to 1930  $\mu\text{g}/\text{m}^3$ . 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 ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|-----------------------------------------------|
| 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  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration of ozone varied from 15  $\mu\text{g}/\text{m}^3$  to 54  $\mu\text{g}/\text{m}^3$ .

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

| Months of 2010 | Ozone Concentration ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|--------------------------------------------------|
| 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 NO<sub>x</sub> 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 µg/m<sup>3</sup> during 2010. The monthly average concentration of ozone varied from 24 µg/m<sup>3</sup> to 51 µg/m<sup>3</sup>. 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 (µg/m <sup>3</sup> ) |
|----------------|------------------------------------------|
| 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 NO<sub>x</sub> 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 µg/m<sup>3</sup> during 2010. The monthly average concentration of ozone varied from 36 µg/m<sup>3</sup> to 141 µg/m<sup>3</sup>.

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

| Months of 2010 | Ozone Concentration (µg/m <sup>3</sup> ) |
|----------------|------------------------------------------|
| 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 NO<sub>x</sub> 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 $\mu\text{m}$ (PM<sub>2.5</sub>)

#### a) Particulate matter with size less than or equal to 2.5 $\mu\text{m}$ (PM<sub>2.5</sub>) at Pritampura, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Pritampura, New Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.9. The annual average concentration of PM<sub>2.5</sub> was 72  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 30  $\mu\text{g}/\text{m}^3$  to 143  $\mu\text{g}/\text{m}^3$ . Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Pritampura, New Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|--------------------------------------------------------------|
| 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 $\mu\text{m}$ (PM<sub>2.5</sub>) at Sirifort, New Delhi

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Sirifort, New Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.10. The annual average concentration of PM<sub>2.5</sub> was 103  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 43  $\mu\text{g}/\text{m}^3$  to 235  $\mu\text{g}/\text{m}^3$ . Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Sirifort, New Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|--------------------------------------------------------------|
| 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  $\mu\text{m}$  (PM<sub>2.5</sub>) at Janakpuri, New Delhi**

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Janakpuri, New Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.11. The annual average concentration of PM<sub>2.5</sub> was 107  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 38  $\mu\text{g}/\text{m}^3$  to 197  $\mu\text{g}/\text{m}^3$ . Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Janakpuri, New Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|--------------------------------------------------------------|
| 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  $\mu\text{m}$  (PM<sub>2.5</sub>) at Nizamuddin, New Delhi**

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Nizamuddin, New Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.12. The annual average concentration of PM<sub>2.5</sub> was 79  $\mu\text{g}/\text{m}^3$  during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 22  $\mu\text{g}/\text{m}^3$  to 261  $\mu\text{g}/\text{m}^3$ . Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Nizamuddin, New Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration ( $\mu\text{g}/\text{m}^3$ ) |
|----------------|--------------------------------------------------------------|
| 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<sub>2.5</sub>) at Shahzada Bagh, New Delhi**

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Shahzada Bagh, New Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.13. The annual average concentration of PM<sub>2.5</sub> was 85 µg/m<sup>3</sup> during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 43 µg/m<sup>3</sup> to 148 µg/m<sup>3</sup>. Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Shahzada Bagh, New Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration (µg/m <sup>3</sup> ) |
|----------------|------------------------------------------------------|
| 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<sub>2.5</sub>) at Shahdara, Delhi**

Particulate matter with size less than or equal to 2.5 micrometer (PM<sub>2.5</sub>) was measured at Shahdara, Delhi using continuous analysers. Monthly average and annual average concentration of PM<sub>2.5</sub> are given in Table 8.14. The annual average concentration of PM<sub>2.5</sub> was 85 µg/m<sup>3</sup> during 2010. The monthly average concentration of PM<sub>2.5</sub> varied from 35 µg/m<sup>3</sup> to 171 µg/m<sup>3</sup>. Higher PM<sub>2.5</sub> levels were observed in winter months as mixing height is lower in winter months resulting in 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<sub>2.5</sub> at Shahdara, Delhi during 2010**

| Months of 2010 | PM <sub>2.5</sub> Concentration (µg/m <sup>3</sup> ) |
|----------------|------------------------------------------------------|
| 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<sub>3</sub>) is within NAAQS in six metro cities. With respect to Ozone (O<sub>3</sub>) the values at Delhi are within NAAQS, however in case of PM<sub>2.5</sub> 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<sub>2.5</sub> 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 (MORTH) 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 1<sup>st</sup> 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 1<sup>st</sup> 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 1<sup>st</sup> April, 2010 for the category < 37KW and on or after the 1<sup>st</sup> 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 1<sup>st</sup> 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       |
|----------------------------------------------|--------------------|
| <b>DIESEL</b>                                |                    |
| Cetane Number (CN), min                      | 51                 |
| Total Sulphur, max                           | 0.005 % (50 mg/kg) |
| Distillation , 95% vol. recovery at 0°C, max | 360 °C             |
| Polycyclic Aromatic Hydrocarbon ( PAH), max  | 11 % mass          |
| <b>GASOLINE</b>                              |                    |
| 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.
- MORTH 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 Jatropha 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, Bareilly, 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  $60 \mu\text{g}/\text{m}^3$  (annual) in residential / industrial / rural / other area and 17 locations exceeded the standard of  $60 \mu\text{g}/\text{m}^3$  (annual) in ecologically sensitive areas with respect to  $\text{PM}_{10}$
- With respect to  $\text{NO}_2$ , 67 locations exceeded the standard of  $40 \mu\text{g}/\text{m}^3$  (annual) in residential / industrial / rural / other area and 4 locations exceeded the standard of  $30 \mu\text{g}/\text{m}^3$  (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  $60 \mu\text{g}/\text{m}^3$  (annual) with respect to  $\text{PM}_{10}$ . Patna, Raipur, Delhi, Ahmedabad, Ranchi, Bhopal, Mumbai, Amritsar, Jaipur, Lucknow, and Kolkata are critical.
- With respect to  $\text{NO}_2$ , 19 cities exceeded the standard of  $40 \mu\text{g}/\text{m}^3$
- Cities like Badlapur and Ulhasnagar (Maharashtra), Asansol, Durgapur, Barrackpur, Howrah, Kolkata, Raniganj and Sankrail (West Bengal) are critical with respect to both  $\text{NO}_2$  and  $\text{PM}_{10}$

### 3. Summary of air quality scenario in different states

- Analysis of annual average concentration of ambient air revealed Jharkhand had maximum  $\text{SO}_2$ , West Bengal highest  $\text{NO}_2$  and Delhi highest  $\text{PM}_{10}$  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  $60 \mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ .
- With respect to  $\text{NO}_2$ , 5 cities exceeded the standard of  $40 \mu\text{g}/\text{m}^3$  (annual).
- No metropolitan city exceeded the standard limit of  $50 \mu\text{g}/\text{m}^3$  (annual) for  $\text{SO}_2$  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  $\text{NO}_2$  and  $\text{PM}_{10}$  exceeded NAAQS respectively
- Taking 24-hourly average data into consideration, 5%, 15% and 88% location for  $\text{SO}_2$ ,  $\text{NO}_2$  and  $\text{PM}_{10}$  exceed NAAQS respectively for residential / industrial / rural / other area.
- With respect to ecologically sensitive area, considering annual average concentration, 17% and 65% locations for  $\text{NO}_2$  and  $\text{PM}_{10}$  exceeded NAAQS respectively

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## Annexure 1

## Air Pollutants, their sources and effects

| Pollutant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Possible Sources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Anthropogenic                                                                                                                                                                                                                                                                                                                                                                                                    | Effects                                                                                                                                                  | Environment & Property                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Natural                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                  | Human / flora / fauna                                                                                                                                    |                                                                                                                                                                                                          |
| <b>Sulphur dioxide (SO<sub>2</sub>)</b><br>SO <sub>2</sub> is the chemical compound produced by volcanoes and in various industrial processes and are also a precursor to particulates in the atmosphere.                                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>Volcanos (67%)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>combustion of fossil fuel (coal, heavy fuel oil in thermal power plants, office, factories)</li> <li>paper Industry</li> <li>extravation &amp; distribution of fossil fuels</li> <li>smelting of metals (sulfide ores to produce copper, lead and zinc)</li> <li>Petroleum refining</li> <li>combustion process in diesel, petrol, natural gas driven vehicles</li> </ul> | <ul style="list-style-type: none"> <li>respiratory illness</li> <li>visibility impairment</li> <li>aggravate existing heart and lung diseases</li> </ul> | <ul style="list-style-type: none"> <li>acid rain</li> <li>aesthetic damage</li> </ul>                                                                                                                    |
| <b>Oxides of Nitrogen (NOx)</b><br>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 (NO <sub>2</sub> ) Nitrogen dioxide (NO <sub>2</sub> ) is a reddish-brown toxic gas with a characteristic sharp, biting odor and is a prominent air pollutant.                                                                                                                   | <ul style="list-style-type: none"> <li>Lightning</li> <li>Forest fires</li> <li>Bacterial activity of soil</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>High temperature combustion (internal combustion engines, fossil fuel-fired power stations, industrial)</li> <li>Burning of Bio-mass and Fossil Fuels</li> </ul>                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>irritates the nose and throat</li> <li>increase susceptibility to respiratory infections</li> </ul>               | <ul style="list-style-type: none"> <li>Precursor of ozone formed in the troposphere</li> <li>Form atmospheric fine particulate matter burden as a result of oxidation to form nitrate aerosol</li> </ul> |
| <b>Respirable Suspended Particulate Matter</b> (PM <sub>10</sub> , size $\leq 10\mu\text{m}$ , coarse fraction PM <sub>10</sub> - PM <sub>2.5</sub> ), called thoracic fraction)<br>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 | <ul style="list-style-type: none"> <li>Coarse particles are produced by the mechanical break-up of larger solid particles.</li> <li>Wind blown dust such as road dust, fly ash, soot, agricultural processes</li> <li>physical processes of crushing, grinding and abrasion of surfaces.</li> <li>photochemically produced particles, such as those found in urban haze</li> <li>Pollen grains, mould spores, and plant and insect parts</li> <li>Non-combustible materials released when burning fossil fuels.</li> </ul> | <ul style="list-style-type: none"> <li>Road traffic emissions particularly from diesel vehicles</li> <li>Industrial combustion plants some public power generation</li> <li>Commercial and residential combustion</li> <li>Non-combustion processes (e.g. quarrying)</li> <li>agricultural activities</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>cardio-pulmonary problems</li> <li>asthma, bronchitis, and pneumonia in older people</li> </ul>                   | <ul style="list-style-type: none"> <li>Visibility reduction</li> </ul>                                                                                                                                   |

| Pollutant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Possible Sources                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Effects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                          |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Natural                                                                                                                                                                                                                                                                                                                                                         | Anthropogenic                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Human / flora / fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Environment & Property                                                                                                                                                                                                                                                                                                                                                                   |
| <p><b>Particulate Matter 2.5</b> (<math>PM_{2.5}</math>, size <math>\leq 2.5\mu m</math>, fine fraction size up to <math>2.5\mu m</math>, respirable fraction)</p> <p>Airborne particles smaller than <math>2.5\mu m</math> 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, <math>PM_{2.5}</math> tend to penetrate into the gas exchange regions of the lung, and very small particles (<math>&lt; 100</math> nanometers) may pass through the lungs to affect other organs. The smallest particles, however, less than <math>100</math> nm (<u>nanoparticles</u>) can get into the bloodstream and affect the cardiovascular system</p> | <ul style="list-style-type: none"> <li>• Fine particles are largely formed from gases.</li> <li>• 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 <math>1\mu m</math> either through condensation, when additional gas condensates or coagulation</li> </ul> | <ul style="list-style-type: none"> <li>• Vehicular emission</li> <li>• Industrial combustion plants some public power generation</li> <li>• Commercial and residential combustion</li> </ul>                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• oxidative stress</li> <li>• respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing</li> <li>• decreased lung function</li> <li>• aggravated asthma</li> <li>• chronic bronchitis</li> <li>• irregular heartbeat cardio-pulmonary disorders</li> <li>• premature death in people with heart or lung disease</li> </ul>                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• aesthetic damage</li> <li>• visibility reduction</li> </ul>                                                                                                                                                                                                                                                                                     |
| <p><b>Ozone(<math>O_3</math>)</b> Ozone is a pale blue gas, soluble in water and non-polar solvents with specific sharp odor somewhat resembling chlorine bleach.</p> <p>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 <math>O_3</math> levels occur typically during the warmer times of the year.</p>                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• ozone is present in the atmosphere in the stratosphere, in a region also known as the ozone layer between about <math>10</math> km and <math>50</math> km above the surface</li> </ul>                                                                                                                                 | <ul style="list-style-type: none"> <li>• formed by the reaction of sunlight on air containing hydrocarbons and nitrogen oxides emitted by car engines, industrial operations, chemical solvents to form ozone</li> <li>• electronic equipment such as photocopiers</li> </ul>                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• lung function deficits</li> <li>• respiratory illness</li> <li>• premature death, asthma, bronchitis, heart attack, and other cardiopulmonary problems.</li> <li>• ground-level ozone and pollution which interferes with photosynthesis and stunts overall growth of some plant species</li> </ul>                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Ozone cracking in car tires, gaskets, O-rings is caused by attack of ozone on any <u>polymer</u> possessing olefinic or <u>double bonds</u> within its chain structure,</li> <li>• ozone present in the upper <u>troposphere</u> acts as a <u>greenhouse gas</u>, absorbing some of the <u>infrared energy</u> emitted by the earth.</li> </ul> |
| <p><b>Lead</b></p> <p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• food (lead is absorbed by plants)</li> </ul>                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Waste incineration</li> <li>• Metal processing</li> <li>• Paint Industry</li> <li>• 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</li> <li>• automobile exhaust,</li> </ul> | <ul style="list-style-type: none"> <li>• 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</li> <li>• causes blood disorders like anemia increase in blood pressure.</li> <li>• potent neurotoxin that accumulates both in soft tissues and the bones.</li> <li>• causes nephropathy, and colic-like abdominal pains.</li> <li>• weakness in fingers, wrists, or ankles.</li> <li>• Miscarriage and reduction of fertility in males, delayed puberty in girls</li> <li>• permanently reduce the cognitive capacity of children</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                          |

| Pollutant                                                                                                                                                                                                                                                                                                                                                                  | Possible Sources                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                          | Effects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                                                                                                                                                                                                                                                                                                                                                                            | Natural                                                                                                                                                                                                                                                                                                                                                               | Anthropogenic                                                                                                                                                                                                                                                                                                                                                                                                            | Human / flora / fauna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Environment & Property |
| <b>Carbon monoxide (CO)</b><br>. also called <b>carbonous oxide</b> , 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.                                                                                     | <ul style="list-style-type: none"> <li>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)</li> <li>volcanic activity</li> <li>forest and bushfires</li> </ul> | <ul style="list-style-type: none"> <li>Exhaust of internal combustion engines, especially of vehicles with petrol engines</li> <li>Burning of carbon fuels</li> <li>organic combustion in waste incineration</li> <li>power station processes</li> <li>Iron smelting</li> <li>burning of crop residues</li> </ul>                                                                                                        | <ul style="list-style-type: none"> <li>CO enters the bloodstream through lungs and combines with hemoglobin forms carboxyhemoglobin. This condition is known as <u>anoxemia</u>, which inhibits blood's oxygen carrying capacity to organs and tissues.</li> <li>Persons with heart disease are sensitive to CO poisoning and may experience chest pain if they breathe the gas while exercising.</li> <li>adverse effects on the fetus of a pregnant woman</li> <li>Infants, elderly persons, and individuals with respiratory diseases are also particularly sensitive.</li> <li>anti-inflammatories, vasodilators and encouragers of neovascular growth</li> </ul> |                        |
| <b>Ammonia (NH<sub>3</sub>)</b><br>A <u>compound</u> 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. | <ul style="list-style-type: none"> <li>putrefaction of nitrogenous animal and vegetable matter</li> <li>Ammonia and ammonium salts are also found in small quantities in rainwater, fertile soil and in seawater</li> <li>during volcanic eruption</li> <li>The kidneys secrete NH<sub>3</sub> to neutralize excess acid</li> </ul>                                   | <ul style="list-style-type: none"> <li>Farms</li> <li>Fertilizers Industry</li> <li>Industrial sites that store ammonia or use it as a refrigerant can release high levels if the chemical leaks or is spilled</li> </ul>                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>irritating to skin, eyes, throat, and lungs and cause coughing</li> <li>burns</li> <li>Lung damage and death may occur after exposure to very high concentrations of ammonia</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                        | Odour                  |
| <b>Benzene (C<sub>6</sub>H<sub>6</sub>)</b><br>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.                                                                                                        | <ul style="list-style-type: none"> <li>volcanoes</li> <li>forest fires</li> </ul>                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Combustion of fuel (automotive fuel, wood and stationary fossil fuel, other aromatics</li> <li>evaporation (fuel storage containers, during refueling</li> <li>Industrial emission</li> <li>Coke oven</li> <li>Perchloroethylene is emitted from some dry cleaning facilities</li> <li>tobacco smoke, wood smoke</li> <li>glues, paints, furniture wax, and detergents</li> </ul> | <ul style="list-style-type: none"> <li>Hematotoxic, neurotoxic, leukemogenic, carcinogenic effects</li> <li>Chronic exposure to benzene may cause chromosomal damage, immune suppression, aplastic anemia, myelodysplastic syndrome, leukemia, non-Hodgkins's lymphoma, and cancer of the lung and nasopharynx</li> <li>Effect the Reproductive system, developing fetus and fertility in men, low birth weights, delayed bone formation, and bone marrow damage</li> </ul>                                                                                                                                                                                           |                        |

| Pollutant                                                                                                                                                                                              | Possible Sources                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Effects                                                                                                                                                                                                                  |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                                                                                                                                                                                                        | Natural                                                                                                                                                                          | Anthropogenic                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Human / flora / fauna                                                                                                                                                                                                    | Environment & Property |
| <b>Polyaromatic hydrocarbons (BaP)</b><br>(particulate phase only)<br>is a five-ring polycyclic aromatic hydrocarbon whose metabolites are mutagenic and highly carcinogenic                           | <ul style="list-style-type: none"> <li>coal tar (after a forest fire),</li> <li>eruption of volcanoes</li> </ul>                                                                 | <ul style="list-style-type: none"> <li>Incomplete combustion of fuels (processing of coal and crude oil)</li> <li>Combustion of natural gas</li> <li>Road transport</li> <li>Industrial plant</li> <li>Tobacco smoke</li> <li>coal tar</li> <li>automobile exhaust fumes (especially diesel engines), in all smoke resulting from the combustion of organic material</li> <li>charbroiled food, burnt toast, cooked meat products, in burnt foods such as coffee</li> </ul> | <ul style="list-style-type: none"> <li>Mutagenic and highly carcinogenic (skin, lung, and bladder cancer in humans and in animals)</li> <li>skin rash or eye irritation</li> </ul> Bronchitis                            |                        |
| <b>Arsenic (As)</b><br>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) | <ul style="list-style-type: none"> <li>volcanic ash, weathering of the arsenic-containing mineral and ores as well as groundwater.</li> <li>food, water, soil and air</li> </ul> | <ul style="list-style-type: none"> <li>Smelting of metals,</li> <li>Combustion of fuels (especially of low-grade brown coal)</li> <li>Use of pesticides.</li> <li>wood preservation, glass production, nonferrous metal alloys, electronic semiconductor manufacturing.</li> <li>coke oven emissions associated with the smelter industry</li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>epigenetic changes</li> <li>multi-system organ failure</li> <li>As poisoning</li> </ul>                                                                                           |                        |
| <b>Nickel (Ni)</b><br>a silvery-white lustrous corrosion-resistant metal with a slight golden tinge                                                                                                    | <ul style="list-style-type: none"> <li>urease (an enzyme which assists in the hydrolysis of urea) contains nickel</li> </ul>                                                     | <ul style="list-style-type: none"> <li>Combustion of fossil fuels</li> <li>Nickel plating</li> <li>Metallurgical processes</li> </ul>                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Nickel sulfide fume and dust is believed to be carcinogenic</li> <li>allergy, dermatitis. Sensitivity to nickel may also be present in patients with <u>pompholyx</u>.</li> </ul> | explosive in air       |

## Methods of Measurement of twelve notified parameters in Ambient Air

### (NAAQS notified in November 2009)

#### a) Sulphur Dioxide (SO<sub>2</sub>) 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 spectrophotometer at 560 nm wavelength. The detection range of the SO<sub>2</sub> concentration is 4 – 1050 µg/m<sup>3</sup>.

Concentration of sulphur dioxide in the range of 25-1050 µg/m<sup>3</sup> can be measured under the conditions given one can measure concentration below 25 µg/m<sup>3</sup> 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 sample. 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 µg/m<sup>3</sup> in an air sample of 30 litres.

#### b) Nitrogen dioxide (NO<sub>2</sub>) in Ambient Air

In the method the NO<sub>2</sub> 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-(1-Naphthyl) 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<sub>2</sub> concentration is 9 – 750 µg/m<sup>3</sup>. The concentration of nitrite ion (NO<sub>2</sub><sup>-</sup>) produced during sampling is determined colorimetrically by reacting the nitrite ion with phosphoric acid, sulphanilamide, and N-(1-naphthyl)-ethylenediamine di-hydrochloride (NEDA) and measuring the absorbance of the highly colored azo-dye at 540 nm.

- The nominal range of the method is 9 to 750 µg NO<sub>2</sub>/m<sup>3</sup> (0.005 to 0.4 ppm)<sup>3</sup>. The range of the analysis is 0.04 to 2.0 µg NO<sub>2</sub>/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<sup>3</sup>/min for 24 hours, and a sampling efficiency of 0.82, the range of the method is, therefore, 9 to 420 µg/NO<sub>2</sub>/m<sup>3</sup> (0.005 to 0.22 ppm). Nitrogen dioxide concentrations in the range of 420 to 750 µg/m<sup>3</sup> (0.22 to 0.4 ppm) are accurately measured by 1:1 dilution of the collected sample.
- Based on results from a collaborative study, the within laboratory standard deviation is 8 µg/m<sup>3</sup> (0.004 ppm) and the between laboratory standard deviation is 11 µg/m<sup>3</sup> (0.006 ppm) over the range of 50 to 300 µg NO<sub>2</sub>/m<sup>3</sup> (0.027 to 1.16 ppm)<sup>4</sup>.
- Based on results from a collaborative study, the method has an average bias of -3% over the range of 50 to 300 µg NO<sub>2</sub>/m<sup>3</sup> (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  $10\ \mu\text{m}$  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,  $\text{NO}_x$ ,  $\text{SO}_x$ , 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  $1.1\ \text{m}^3/\text{min}$  through a size-selective inlet wherein the particulate matter is fractionated in two aerodynamic diameter size ranges, 0-10 micro meter called RSPM of  $PM_{10}$  and above 10 micro meter called coarse fraction. The  $PM_{10}$  is collected on a  $20.3 \times 25.4\ \text{cm}$  ( $8 \times 10\ \text{in}$ ) 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  $100\ \mu\text{m}$  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  $20.3 \times 25.4\ \text{cm}$  ( $8 \times 10\ \text{in}$ ) 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 ( $29\ \text{cm} \times 36\ \text{cm}$ ) and must be provided with a gable roof having  $45^\circ$  to the horizontal so that the filter is protected from precipitation and particles less than  $100\ \mu\text{m}$  size are only collected on the filter surface. Particles within the size range of 100 to  $0.1\ \mu\text{m}$  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 ( $1\ \text{m}^3/\text{h}$ ) 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  $PM_{2.5}$  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  $\mu\text{g}/\text{m}^3$ .

**f) Ammonia ( $\text{NH}_3$ ) in Ambient Air**

The Ammonia ( $\text{NH}_3$ ) 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  $25^\circ\ \text{C}$ . 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  $10\ \mu\text{m}$  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,  $\text{NO}_x$ ,  $\text{SO}_x$ , organics) and from incomplete combustion of any fuel. Monitoring of RSPM/ $PM_{10}$  is carried out for 24 hours with 8-hourly sampling. RSPM is measured gravimetrically with EPM 2000 filter paper using respirable dust sampler.

The  $PM_{10}$  is collected on a  $20.3 \times 25.4\text{ cm}$  ( $8 \times 10\text{ in}$ ) 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 ( $20\text{--}25\ ^\circ\text{C}$ ). 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  $30^\circ\text{C}$  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  $\mu\text{g/L}$  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  $10\ \mu\text{m}$  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,  $\text{NO}_x$ ,  $\text{SO}_x$ , organics) and from incomplete combustion of any fuel. Monitoring of RSPM/ $PM_{10}$  is carried out for 24 hours with 8-hourly sampling. RSPM is measured gravimetrically with EPM 2000 filter paper using respirable dust sampler. The  $PM_{10}$  is collected on a  $20.3 \times 25.4\text{ cm}$  ( $8 \times 10\text{ in}$ ) 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 three 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 samples cannot be taken back to a laboratory for analysis. Three measurement methods are prescribed in NAAQS- 2009.

- UV photometric
- Chemiluminescence
- Chemical method

#### **The UV photometric method**

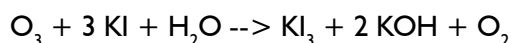
This is based on the attenuation of ultraviolet (UV) radiation by ozone. Ozone exhibits a strong absorption band in the ultraviolet region at 254 nm. This feature is the basis of the photometric measurement method for ozone. Other species present in the atmosphere such as aromatic hydrocarbons also absorb 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 (O<sub>2</sub>); 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 liberation 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:



### PROCEDURE

- Assemble a train consisting of a rotameter, U-tube with chromium trioxide paper (optional), midget impinger, needle valve or critical orifice (I) 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  $\mu l$  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  $\mu l$  to 10  $\mu l$  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  $\mu l/10$  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  $\mu\text{l}$  of  $\text{O}_3$ /10 ml of reagent are read from the calibration curve.
- The concentration of  $\text{O}_3$  in the gas phase in  $\mu\text{l/l}$  or ppm is calculated by Total  $\mu\text{l}$  ozone per 10 ml divided by Volume of air sample, L and the concentration of  $\text{O}_3$  in terms of  $\mu\text{g/m}^3$  at 101.3 kPa and 25°C is obtained when desired from the value of  $\mu\text{l/l}$  by dividing  $\text{ppm} \times 48.00 \times 10^3 / 24.47 = 1962 \times \text{ppm}$ .

### 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  $4.7 \mu\text{m}$ . 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/](http://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.