AIR POCALYPSE II

ASSESSMENT OF
AIR POLLUTION
IN INDIAN CITIES

GREENPEACE
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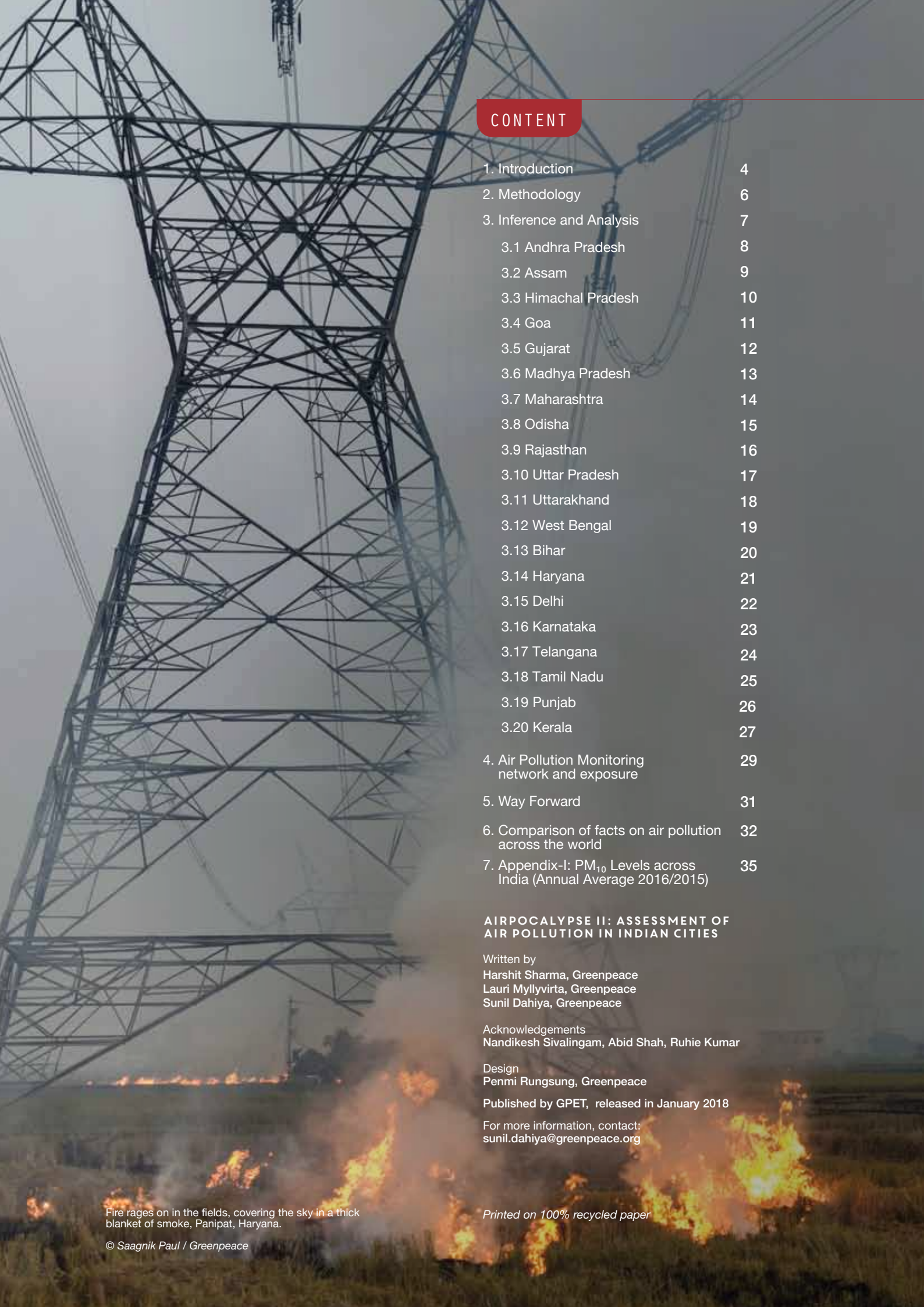
CLEANAIR NATION



CONTENT

AIRPOCALYPSE II: ASSESSMENT OF AIR POLLUTION IN INDIAN CITIES

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Fire rages on in the fields, covering the sky in a thick blanket of smoke, Panipat, Haryana.

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The PM_{10} OR PARTICULATE MATTER

DATA FOR THESE CITIES IS BEING MADE AVAILABLE HERE UPTO AS LATE AS THE YEAR 2016 AND IN SOME CASES UNTIL 2015.

SUMMARY

The report now in your hands brings together and highlights data vis-à-vis air quality for no less than 280 Indian cities spread across the country. Sadly, in many cases this is going from bad to worse, and without much sign of a let up in near future unless the Government and people join hands to fight this fast approaching airpocalypse.

The PM_{10}, or particulate matter, data for these cities is available here up to the year 2016 and in some cases until 2015. The data shows 228 (more than 80% of the cities/town where Air Quality Monitoring data was available) cities, have not been complying with the annual permissible concentration of 60µg/m³ which is prescribed by Central Pollution Control Board (CPCB) under the National Ambient Air Quality Standards (NAAQS). And none of the cities have been found to adhere to the standard set by the World Health Organization (WHO) at 20 µg/m³. Thus, all these cities without a single exception are going beyond the permissible limit supposed to be followed internationally to stay within the safe limits for the sake of human health as well as the environment.

Even if we assume that the present number of manual air quality monitoring stations represents the air quality for the entire population in the district, the data in the report covered 280 cities with a population of 630 million, or 53% of the total population, leaving out only 20 districts where air quality was monitored under NAMP, but we could not get access to the data.

Out of the 630 million Indians covered by the data, 550 million live in areas exceeding national standard for PM_{10}, and 180 million live in areas where the air pollution levels are more than twice the stipulated standards. This includes 47 million children under 5 years of age, living in areas where the standard is exceeded and 17 million in areas where the air pollution levels are more than twice the stipulated standards. Apart from this, 580 million Indians live in districts with no air quality data available, including 59 million children under 5 years of age.

Thick smog and haze have been hovering across northern India indicating that bad air is not confined to big cities alone. It's not seasonal, toxic air is engulfing our spaces - urban and rural equally, the urgency on deteriorating air quality cannot be stressed enough.

The report like its previous counterpart - released a year ago - shows once again that deadly air quality due to pollution is not a problem confined to Delhi-NCR (National Capital Region) alone. Other metropolises too are hardly any better off, though this fact was also highlighted in the last report on air quality. Thus, it would be safe to say that pollution levels remained high in most cities with some fluctuations, increases or decreases, in the case of a few cities when compared from 2015 levels. In the absence of any measurable target-driven approach on the part of state and central government agencies, it is difficult to say that the improvement in air quality in a few cities is actually due to weather or behavioural changes in local sources of pollution, or due to action initiated under the clean air policy that the government is supposed to enforce.

Delhi still remains the top-most polluted city followed by many more towns like nearby Faridabad and Bhiwadi and far off Dehradun, Varanasi, and Patna. These towns are strewn along the fertile and heavily populated Indo-Gangetic basin. Together these critically polluted cities point to not just the need for long-term action plans but also cry for a strict emergency response in an immediate, short-term and time-bound manner to bring pollution levels down drastically and ward off an impending health and economic emergency. Though a graded response action plan (GRAP) for Delhi-NCR region has been notified, the implementation of it remains disappointingly poor. The long-term action plan for Delhi-NCR is still being discussed, leaving the rest of the country virtually in the cold. This is despite the fact that the CPCB has sent notices to many states to come up with action plans to bring pollution levels down. As we will see in the following pages of this report, most pollution control boards lack the capacity and understanding of how to even draft meaningful policies to curb air pollution.

Unlike in the North many cities in the southern part of the country may not need emergency response plans but most of them do need long term action plans to bring pollution levels down below NAAQS limits and aim to meet WHO standards for air quality.

What is palpably clear is that none of the cities/states have measurable targets aimed at reducing pollution levels. Most actions suggested untill now are just initiatives on paper that have no monitoring mechanism to achieve their estimated benefit through the implementation of targeted policies. The good news is that the central government has formulated a National Clean Air Programme (NCAP). This is supposed to seek and ensure source-wise solutions in a time-bound manner for the entire country. Though the government has almost doubled the number of real-time monitoring stations spread across the country it has a long way to go to ensure clean and safe air to ward off the hazards faced by the country and its people.

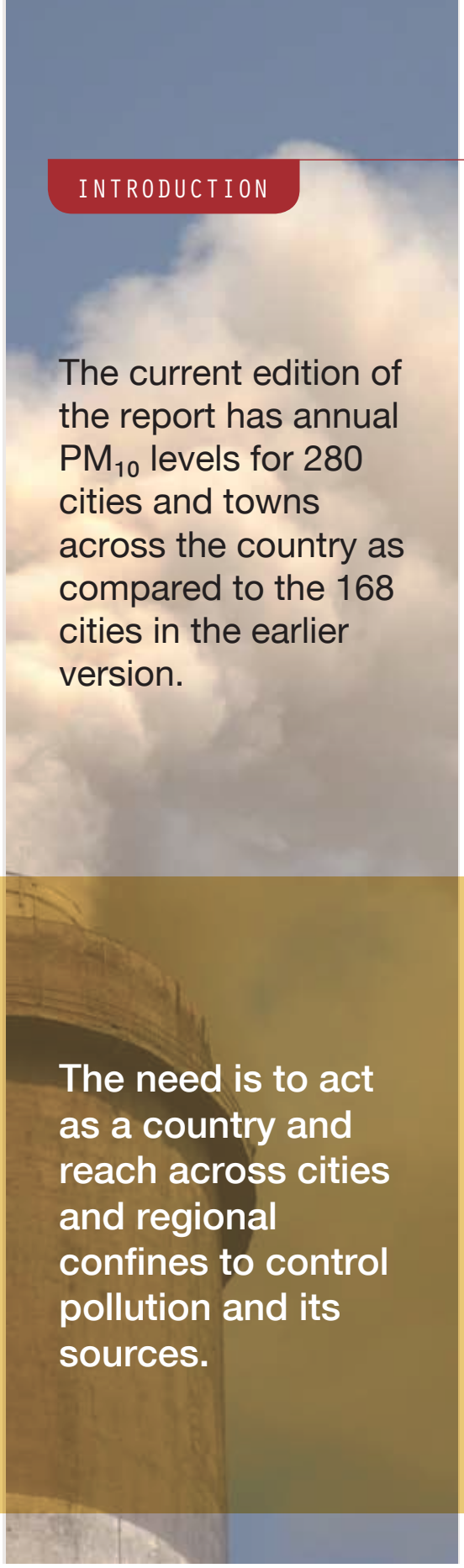
An action plan should have the following components:

1. **Institute robust monitoring of air quality across the country** and make the data publicly available in real time. This should be coupled with a health advisory and ‘red alerts’ for bad-air days so that the public is able to take steps to protect their health and the environment. Measures like shutting down schools, reduction of traffic, shutting down power plants and industries etc should automatically come into force as soon as air quality deteriorates beyond a level and takes alarming proportions.

2. **Use the data as a basis tofine-tune pollution reduction strategies** that must, inter alia seek to improve public transport and reduce petrol/diesel vehicle use, strengthen enforcement to take polluting vehicles off the roads, introduce higher fuel standards (Bharat VI), enforce stricter emission regulations and improved efficiency for thermal power plants and industries, move from diesel generators to rooftop solar power backup, increase use of clean, renewable energy, offer incentives for electric vehicles, dust removal from roads, regulate construction activities and stop burning of biomass and waste.

These strategies should be formalised into a time-bound action plan with clearly defined targets and penalties to ensure accountability. While some actions might need to be city or region-specific, these are going to be under a broad range of actions that will be universally applicable.

Public participation is critical in reducing air pollution along with centralised actions and policies rolled out by the Government at national and regional levels.



INTRODUCTION

The current edition of the report has annual PM_{10} levels for 280 cities and towns across the country as compared to the 168 cities in the earlier version.

The need is to act as a country and reach across cities and regional confines to control pollution and its sources.

A year ago, in January 2017 to be precise, Greenpeace India released the report Airpocalypse: Assessment of Air Pollution in Indian Cities. The main purpose of this report was to show that air pollution is a growing national problem and it needs to be addressed with equal and utmost seriousness at a countrywide level and not only in Delhi or the National Capital Region as mostly has so far been the case. The report also tried to identify major sources of pollution in different parts of the country based on past research and available data. While trying to show a way forward for the nation through applicability of our long-term goals to solve the air pollution crisis at the all-India level, an emphasis on the short-term solutions based on the extent, degree and levels of pollution afflicting specific regions in acute form were provided in the report.

This year the second version of the "Airpocalypse" report has updated data for the year 2016 for approximately 158 cities. And wherever data was not available for 2016, older data from 2015 is used for the purpose of assessing where our cities stand in terms of air quality.

Severe air pollution has been disrupting everyday life in India. This is more so in big cities during the winter though smaller cities and the villages forming the periphery of many cities can hardly be said to be any better off. In 2015 air pollution ($PM_{2.5}$) levels in India increased so rapidly that they overtook those in China. This was one of the highlights of our report last year and this continues to be so this year. Pollution levels are increasing across the country and it is more worrying in north India where its impact on health is feared to be rampant. Notwithstanding the alarming air pollution levels across the country the emphasis so far has more been on the Delhi-NCR region. This is despite the acceptance of the fact that the major part of Delhi's pollution is coming from outside its borders, meaning neighbouring states cannot said to be in the safe zone. So much so that pollution levels in other states like Uttar Pradesh, Bihar, West Bengal, Karnataka, Tamil Nadu and Maharashtra are also increasing quite a bit.

The recent submission by the Honorable Minister for Environment, Forest and Climate Change, Dr Harshvardhan, in the Rajya Sabha that the MOEF&CC has prepared a National Clean Air Programme, strengthens the argument and the fact that air pollution is posing a national health emergency today. However, the country is yet to come to terms with the fact that air pollution is a national problem. Our actions outside Delhi-NCR still seem to be to city boundary specific and missing the regional nature and proportions of pollution. Such a selective approach cannot be effective in tackling the health emergency that rampant air pollution has come to pose. We as a country today have to understand air pollution comprehensively and have to win the fight against it.

The extent of air pollution in India is turning into a public health and economic crisis. There are increasing numbers of people who die a premature death every year due to increasing levels of pollution. Deaths due to air pollution are only a fraction less than the number of deaths caused by tobacco usage. The Global Burden of Disease (GBD), a comprehensive regional and global research programme with 500 researchers representing over 300 institutions and 50 countries, has estimated that 3,283 Indians died every single day due to outdoor air pollution in India in 2015. This brings the number of deaths due to air pollution in the country in 2015 to 11.98 lakh. On the economic front, loss of productivity and the forced closures of schools and industries have already started impacting the economy. The World Bank estimates that India loses around 3% of its GDP due to air pollution. This makes air pollution one of the biggest issues to fight if we are to protect peoples' lives, ensure public health and save the economy.

Air pollution is a complex issue, requiring an array of solutions. There are many sources that contribute to pollution across the country. Depending on region and climatic conditions, the contribution of different sources of pollution add up to the overall scourge of pollution. This stretches over vast parts of the country though it is quite clear that irrespective of where you live, burning of fossil fuels (coal and oil) contributes majorly to air pollution levels across regions.

Brick kilns, also a major source of pollution. Western Uttar Pradesh.

© Saagnik Paul / Greenpeace

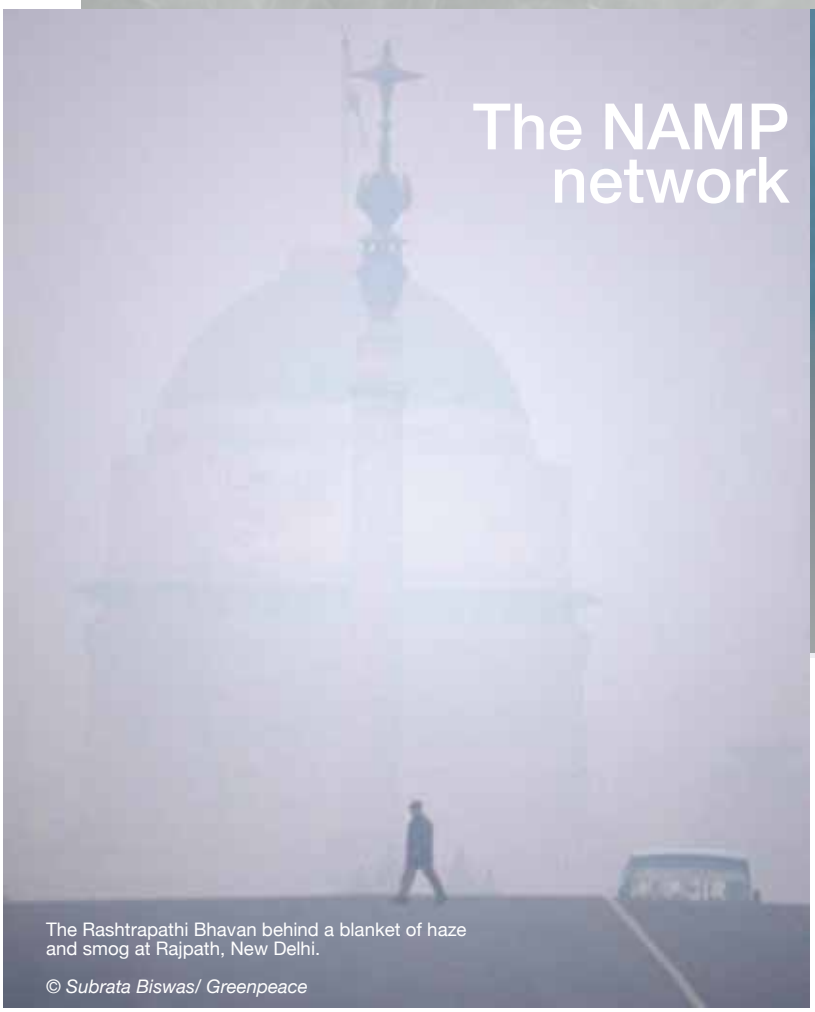
METHODOLOGY

The Central Pollution Control Board has instituted the National Air Quality Monitoring Programme (NAMP). Under the NAMP, three air pollutants viz., Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and Particulate Matter size equal to or less than 10 micron (PM_{10}), have been identified for regular monitoring at all the locations. The NAMP network presently comprises 683 operating monitoring stations located in 300 cities/towns in 29 states and 6 union territories across the country.

Greenpeace India tried to collect data on PM_{10} levels for these NAMP stations spread across the country (because the data for $PM_{2.5}$ was limited to very few cities and places which would not have been enough to see the extent of the spread of pollution levels across much of the country) through various sources such as Right to Information (RTI) applications filed with the SPCB (State Pollution Control Boards) to gather data, SPCBs' websites and annual reports of SPCBs and from ENVIS Centre on Control of Pollution Water, Air and Noise etc.

There are lots of challenges with respect to relying on government data on air quality due to various factors. The primary one being the majority of the measurements are taken manually making the data quality very subjective. The other factors are the location of monitoring stations and data collection from them in the case of far flung and remote areas. These often become dysfunctional for long periods of time making the average values somewhat skewed. Industrial clusters like Korba in Chhattisgah and Cuddalore in Tamil Nadu show PM_{10} levels below NAAQS possibly because of such factors.

The data is definitely useful to prove that air quality is poor across the country in almost all states by the government's own readings and to prove the need to expand real time air quality monitoring to standardise the reading across the country.



The Rashtrapathi Bhavan behind a blanket of haze and smog at Rajpath, New Delhi.

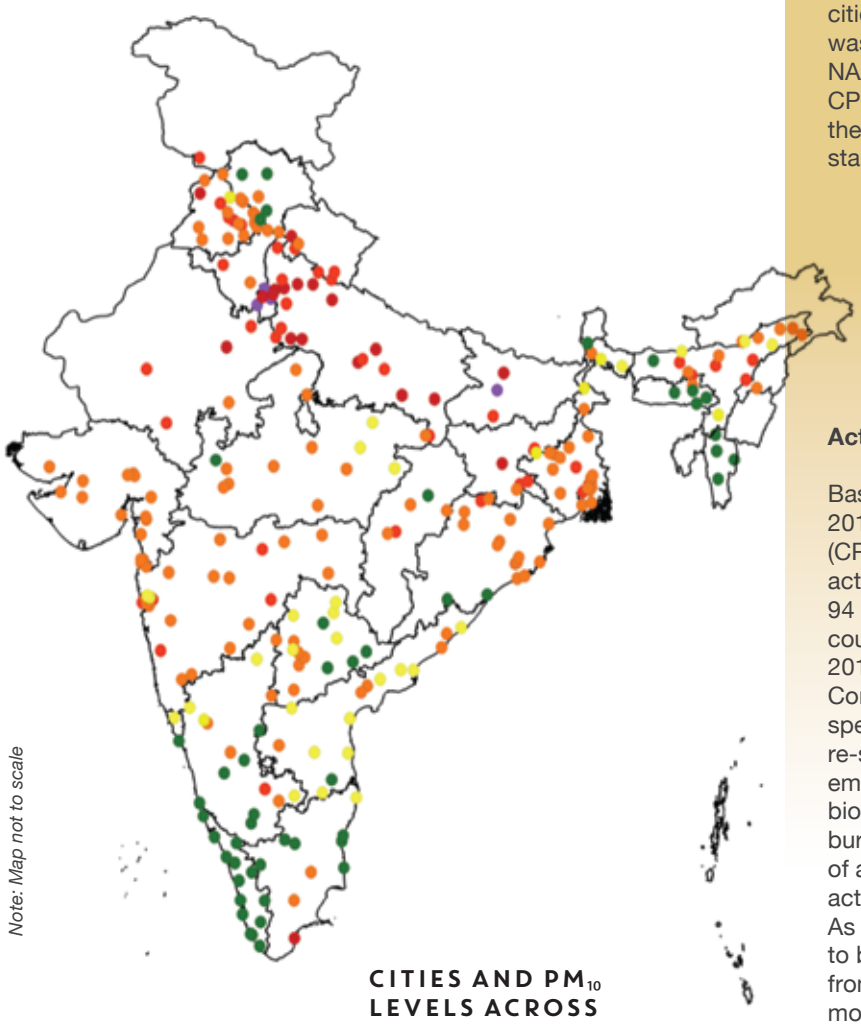
© Subrata Biswas/ Greenpeace

The NAMP network

PRESENTLY COMPRISES 683 OPERATING MONITORING STATIONS LOCATED IN 300 CITIES/TOWNS IN 29 STATES AND 6 UNION TERRITORIES ACROSS THE COUNTRY.

INFERENCE AND ANALYSIS

Out of 280 cities for which the PM_{10} data was available for 2015 or 2016, 228 (> 80 % of the cities/towns where Air Quality Monitoring data was available) cities were not complying to the NAAQS standard of 60 µg/m³ as prescribed by CPCB for annual permissible levels and none of the cities were complying to the WHO set annual standard of 20 µg/m³.



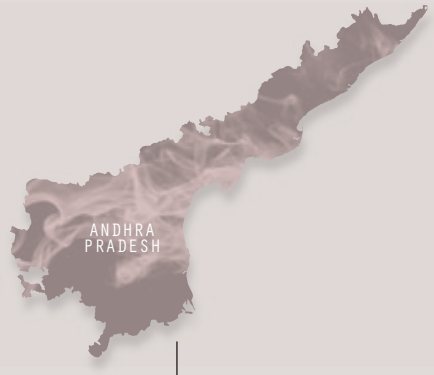
Note: Map not to scale

CITIES AND PM_{10} LEVELS ACROSS INDIA

- WHO Guideline
- NAAQS Guideline
- 1-1.25 times NAAQS
- 1.25-2 times NAAQS
- 2-3 times NAAQS
- 3-4 times NAAQS
- > 4 times NAAQS

Action Plan to reduce Air Pollution Levels:

Based on the pollution levels for years between 2011 and 2015 Central Pollution Control Board (CPCB) issued direction to states to formulate action plans to reduce air pollution levels across 94 non-attainment cities spread across the country. These plans were to be made during 2016 by the SPCBs/Pollution Control Committees (PCCs). The direction included specific actions for Vehicular emission control; re-suspension of road dust and other fugitive emission control; control of emissions from biomass/crop residue/garbage/municipal waste burning; control of industrial emissions; control of air pollution from construction and demolition activities and other steps to control air pollution. As per the directions the actions were required to be taken within a specific timeline, ranging from action on the directions within a week to six months. As per the update with us most of the pollution control boards forwarded the letter to the relevant departments for further actions. Apart from Delhi-NCR where a Graded Response Action Plan (GRAP) has come into force and in Lucknow where the same plan has been copied for Lucknow city (on paper only - its implementation still seems to be a distant dream), no other city seems to be taking any action of any worth against the polluters. During 2017 Maharashtra Pollution Control Board (MPCB) also ordered preparation of action plans for multiple cities reeling under pollution in the state. These are reported to be currently under preparation. So no real progress could be achieved vis-à-vis reducing the pollution levels in the cities of Maharashtra and the plan formulated thus far does not have a regional and comprehensive nature to control air pollution dogging many cities and regions of the state. None of the plans untill now seem to have time-bound targets or specified a percentage for the reduction in air pollution levels in a scheduled manner, say in two, three, or five years under the watch of a competent authority assigned to be responsible for the onerous task.

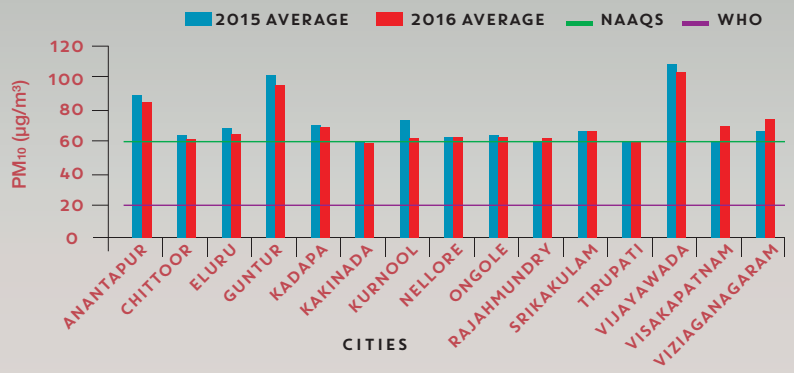


EXCEPT KURNOOL AND TIRUPATI (BETWEEN JUNE TO SEPTEMBER) ALL OTHER CITIES RECORDED PM_{10} LEVELS ABOVE 60 µg/m³ (ANNUAL NAAQS STANDARD FOR PM_{10}) FOR ALMOST EVERY MONTH MEANING CONSISTENT HIGH LEVELS OF AIR POLLUTION AROUND THE YEAR.

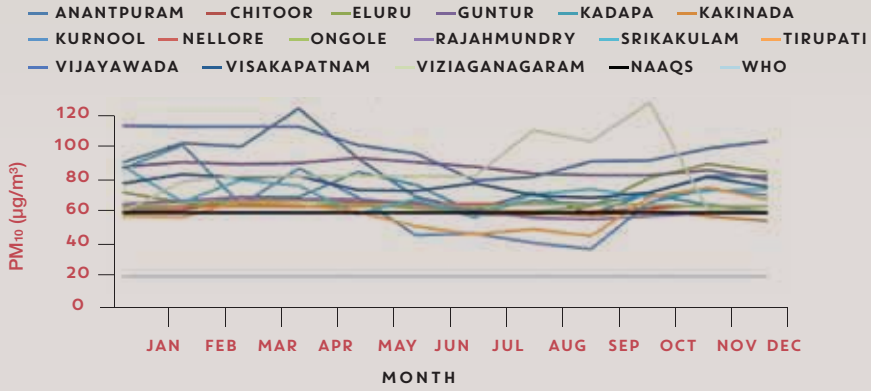
Monthly average PM_{10} data for the year 2016 was obtained from 25 ambient air quality-monitoring stations installed across 15 cities and towns in Andhra Pradesh.

The data indicates that all the 15 cities had higher concentrations of PM_{10} than the annual average levels prescribed by CPCB (60 µg/m³) and all of them had at least three times more polluted air compared to the WHO annual standard for PM_{10}. The pollution level seems to be consistent between 2015 and 2016 with small increases for Visakhapatnam and Vizinagaram along with a slight decrease for Guntur, Kurnool, Vijayawada and Eluru but the decrease is insignificant compared to what is required to bring pollution levels down to breathable air quality as per the Indian standards levels, leaving aside the WHO standards.

▼ PM_{10} LEVELS ACROSS ANDHRA PRADESH DURING 2015 & 2016



▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS ANDHRA PRADESH DURING 2016



Three cities i.e. Anantapur, Vijaywada and Vizianagram recorded PM_{10} levels above the daily standard of 100 µg/m³ for about three months consecutively. Monthly patterns also show variation in months with peak pollution levels in different cities. Vizianagram had peak PM_{10} levels between July and October, while Anantpur and Vijayawada had peak levels between April and November. Similarly PM_{10} levels were consistently ranging between 70 µg/m³ to 90 µg/m³ throughout the year for Guntur and Visakhapatnam.

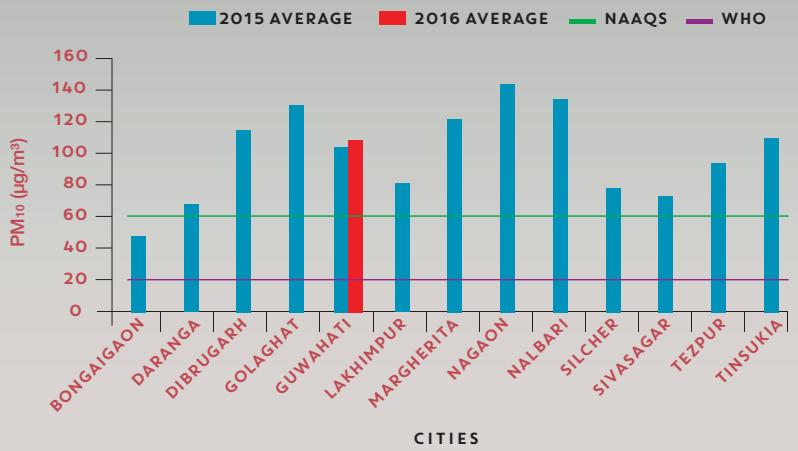
Vizianagaram recorded the highest PM_{10} levels for a given month in the state with values breaching the 130 µg/m³ level in October 2016, while Vijayawada had the highest annual average for PM_{10} where annual PM_{10} levels were about 1.7 times the NAAQS prescribed annual standard and 5 times the WHO annual Standard. Annual PM_{10} average for 2016 for Vijayawada, Guntur, Vizianagaram, Anantapur, and Visakhapatnam were 101, 88, 86, 85 and 77 respectively.

NAGAON RECORDED THE HIGHEST ANNUAL AVERAGE PM_{10} LEVELS IN THE STATE WITH VALUES BREACHING 142 µg/m³ IN 2015 WHILE GOLAGHAT, NALBARI, TINSUKIA, MARGHERITA AND DIBRUGARH FOLLOWING WITH ANNUAL AVERAGE PM_{10} LEVELS AT 124, 121, 119, 114 AND 110 RESPECTIVELY.

Monthly average PM_{10} data for the year 2016 was obtained from 5 ambient air quality-monitoring stations installed across Guwahati and data for 13 towns/cities was also available for year 2015 across Assam.

The data indicates that 12 cities except Bongaigaon had higher concentrations of PM_{10} than the annual average levels prescribed by CPCB (60 µg/m³) and all of them had at-least three times more polluted air as compared to the WHO annual standard for PM_{10}. The pollution level seems to be on the higher side between 2015 and 2016 for Guwahati where data for 2015 and 2016 was available.

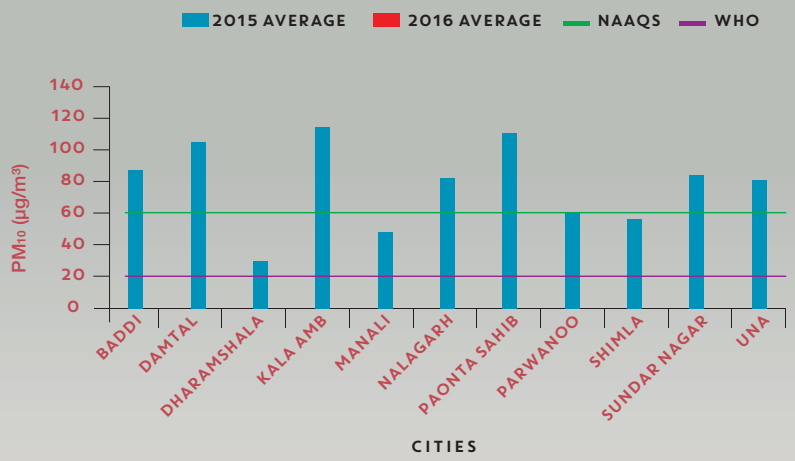
▼ PM_{10} LEVELS ACROSS ASSAM DURING 2015 & 2016



Monthly average PM_{10} data for the year 2015 was available for 11 cities and towns of Himachal Pradesh. The data indicates that 7 cities out of 11 had higher concentrations of PM_{10} than the annual average levels prescribed by CPCB (60 µg/m³).

KALA AMB RECORDED THE HIGHEST ANNUAL AVERAGE PM_{10} LEVELS IN THE STATE WITH VALUES BREACHING 118 µg/m³ IN 2015 WHILE PAONTA SAHIB, DAMTAL, BADDI AND SUNDER NAGAR FOLLOWED WITH PM_{10} LEVELS AT 116, 104, 88 AND 82 RESPECTIVELY.

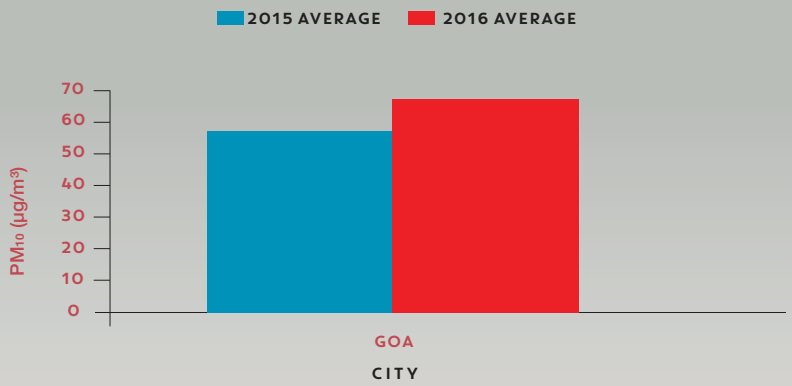
▼ PM_{10} LEVELS ACROSS HIMACHAL PRADESH DURING 2015 & 2016



SIX STATIONS INSTALLED AT AMONA, BICHOLIN, CODLI, HONDA, PONDA AND USGAO HAD AVERAGE PM10 LEVELS ABOVE 100 µg/m³ FOR A CONTINUOUS STRETCH OF THREE TO FOUR MONTHS IN 2016-17.

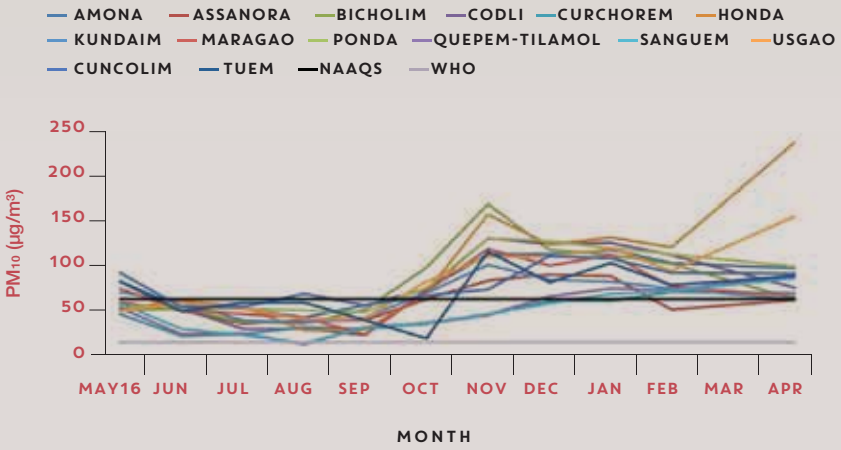
The data from 14 manual monitoring stations installed across Goa shows that 10 out of 14 stations were breaching the annual average PM_{10} level (60 µg/m³) prescribed by CPCB. The annual average PM_{10} for Goa between May 2016 to April 2017 was more than three times the annual standard prescribed by the WHO and it showed increasing pollution levels compared to 2015 annual average.

▼ PM_{10} LEVELS ACROSS GOA DURING 2015 & 2016-17 (MAY 2016-APRIL 2017)



Honda and Usgao with their respective average monthly PM_{10} levels measured during the month of April 2017 as 205 and 136 registered the highest amongst other stations during this period.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS GOA BETWEEN MAY 2016 TO APRIL 2017

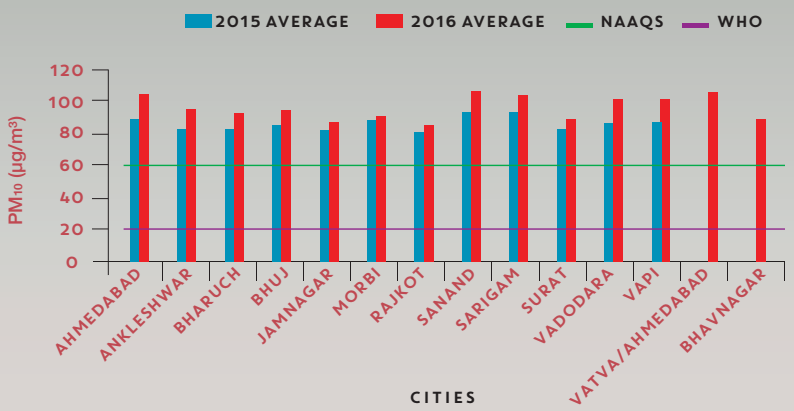


THE POLLUTION LEVEL SEEMS TO BE ON AN INCREASING TREND BETWEEN 2015 AND 2016 WITH ALL CITIES RECORDING HIGHER POLLUTION LEVELS IN 2016 COMPARED TO 2015.

Monthly PM_{10} data for 14 cities and towns in Gujarat, for the period of December 2015 to November 2016, was obtained from 61 manual monitoring stations run by state pollution control board under various programmes.

Assessment of air pollution levels from this data indicates higher PM_{10} levels than the 60 µg/m³ annual standard, prescribed under NAAQS, for all 14 cities and towns while nine of these fourteen had annual average PM_{10} levels higher than the daily standard of 100µg/m³, staying above the prescribed limit particularly between the months of August and February.

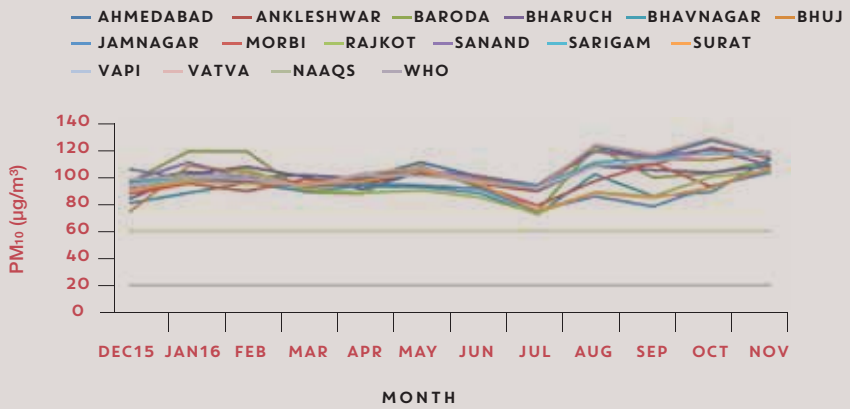
▼ PM_{10} LEVELS ACROSS GUJARAT DURING 2015 & 2016



A general observation of the data spread across 61 locations in 14 cities and towns indicates a lower spatial variation with average PM_{10} values for the 12-month period ranging between 90 µg/m³ to 110 µg/m³.

Ahmedabad had the highest PM_{10} levels, both annual and peak levels, with annual average at 107 µg/m³ and peak levels reaching 127 µg/m³ during October 2016. PM10 levels for some major cities such as Ahmedabad, Vadodara, Bharuch, Bhavnagar, Bhuj, Jamnagar, Rajkot, Surat and Vapi are 107, 102, 100, 91, 103, 93, 92, 93 and 102 µg/m³ respectively.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS GUJARAT FOR 2016

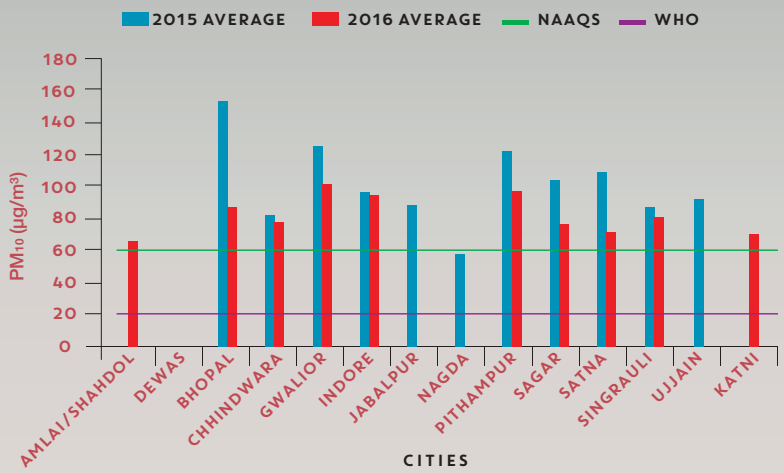


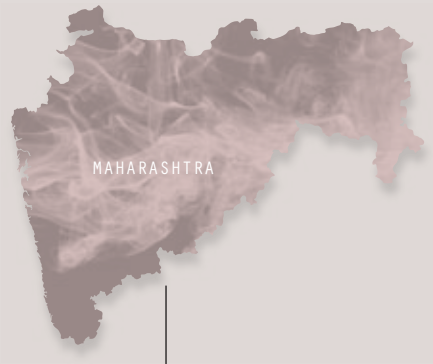
THE POLLUTION LEVEL SEEMS TO BE CONSISTENT BETWEEN 2015 AND 2016 WITH A SLIGHT DECREASE FOR CHINDWARA, GAWALIOR, INDORE, PITHAMPUR, SINGRAULI ETC. BUT THE DECREASE IS INSIGNIFICANT COMPARED TO WHAT IS REQUIRED TO BRING POLLUTION LEVELS DOWN TO BREATHABLE AIR QUALITY ACCORDING TO INDIAN STANDARDS LEVELS LET ALONE THE WHO STANDARDS.

PM_{10} data for 2016/2015 was obtained from 37 manual monitoring stations of regional pollution control boards covering 13 cities and towns of Madhya Pradesh, of which monthly values were available for nine cities and the annual average was made available for the rest.

Assessment of data obtained from these stations shows annual PM_{10} levels to be above the annual average limit of 60 µg/m^3, prescribed under NAAQS, for all the thirteen cities, of which two cities had an average annual PM_{10} level above the daily limit of 100µg/m^3. Bhopal, Indore, Gwalior and Pithampur (Dhar District) had PM_{10} levels above the daily limit, prescribed under NAAQS, consecutively from January to May during 2016.

▼ PM_{10} LEVELS ACROSS MADHYA PRADESH DURING 2015 & 2016



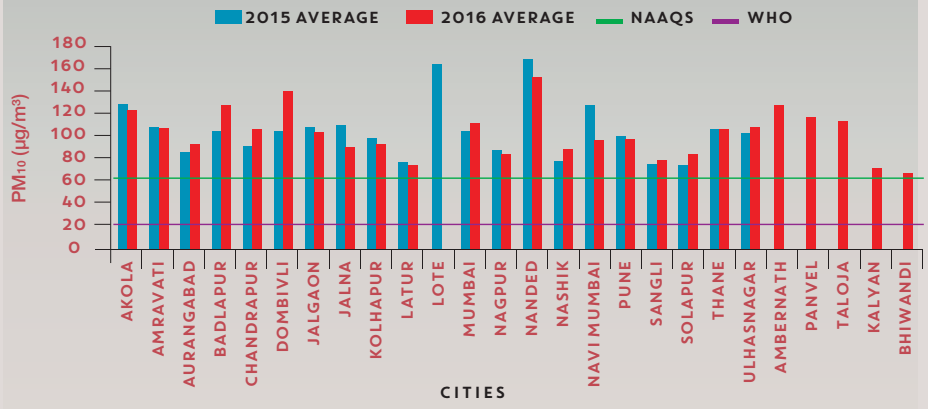


ASSESSMENT OF DATA FROM THESE STATIONS SHOWS ANNUAL PM10 LEVELS WERE ABOVE THE ANNUAL AVERAGE LIMIT OF 60 µg/m³, PRESCRIBED UNDER NAAQS, FOR ALL THE 24 CITIES WHILE 14 CITIES HAD ANNUAL AVERAGE PM10 LEVELS ABOVE THE DAILY LIMIT OF 100 µg/m³.

Month-wise PM_{10} data for 2016, provided by the state pollution control board, was taken from 65 manual as well as continuous monitoring stations covering 24 cities and towns in Maharashtra. Most of the cities that recorded PM_{10} levels above daily limits showed higher trends between the months of January and May and again rising during October to December indicating a seasonal variation with a dip in pollution levels during monsoon season and again reaching peak levels during October to December for many cities.

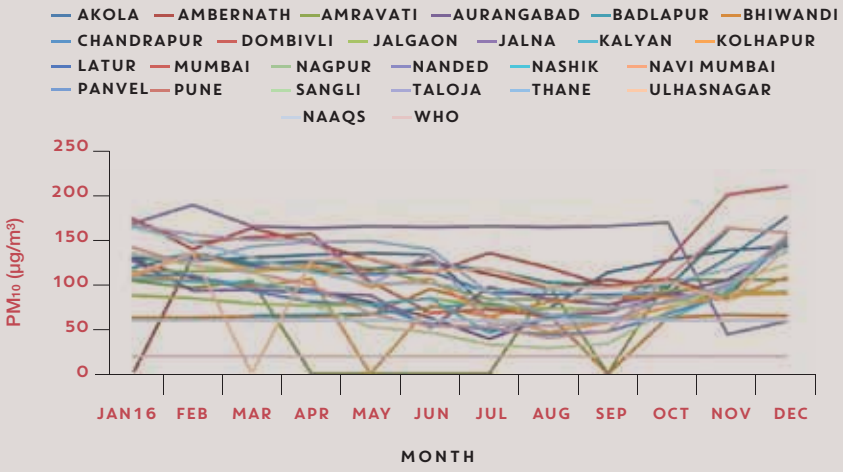
Nanded had the highest annual average PM_{10} levels for the year with 151 µg/m³ while Mumbai recorded the highest monthly average in Maharashtra with PM_{10} values remaining more than three times above the annual limit during December 2016.

▼ PM_{10} LEVELS ACROSS MAHARASHTRA DURING 2015 & 2016



Annual PM_{10} levels for some of the major cities of Maharashtra such as Mumbai, Thane, Pune, Nashik, Nagpur, Navi Mumbai, Panvel are 130, 117, 99, 86, 82, 93, 118 respectively.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS MAHARASHTRA FOR 2016



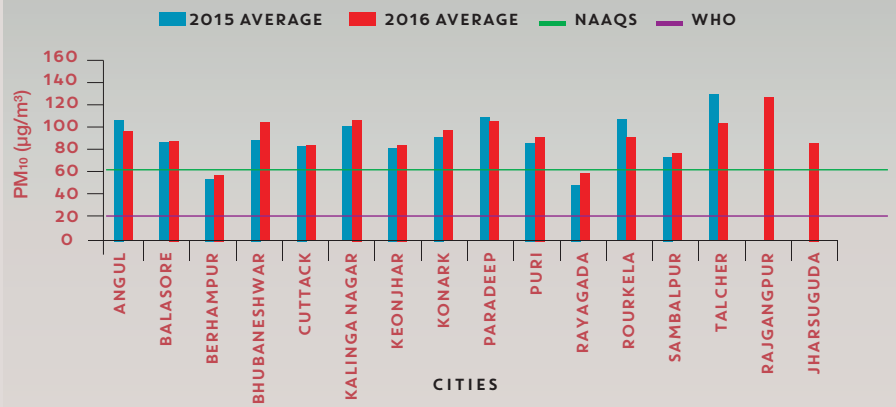
The Pollution level seems to be consistent between 2015 and 2016 with small increases for Badlapur, Chandrapur, Dombivali, Mumbai and Ullasnagar along with a slight decrease for Akola, Amravati, Nanded and Kolhapur etc. Yet, the decrease is insignificant compared to what is required to bring pollution levels down to breathable air quality according to Indian standards levels, let alone the WHO standards.

A GENERAL OBSERVATION OF MONTHLY DATA INDICATES HIGHER AIR POLLUTION TRENDS DURING FIRST AND LAST QUARTER OF THE YEAR ACROSS THE STATE WITH A VERY SIGNIFICANT INCREASE DURING OCTOBER TO DECEMBER IN MANY CITIES SUCH AS BHUBANESHWAR, PURI, PARADEEP, KONARK, KALINGNAGAR AND RAJGANGPUR WHEREAS RELATIVELY HIGHER VALUES AS COMPARED TO OTHERS WERE OBSERVED IN ANGUL AND TALCHER DURING JANUARY TO APRIL.

Ambient air quality data regarding monthly PM_{10} levels for Odisha during 2016 was obtained from 34 manual operating stations covering sixteen cities and towns across the state, operating under the state pollution control board. The assessment of data obtained from these stations shows annual PM_{10} levels were above the annual standard of 60µg/m^3 in 14 cities, while five cities had an annual average above the daily limit of 100 µg/m^3 prescribed under NAAQS.

The pollution level seems to be consistent between 2015 and 2016 with small increases for Bhubaneswar, Kalinga Nagar, Konark and Puri along with a slight decrease for Angul, Rouekela and Talcher but the decrease is insignificant compared to what is required to bring pollution levels down to breathable air quality according to Indian standards levels, let alone the WHO standards.

▼ PM_{10} LEVELS ACROSS ODISHA DURING 2015 & 2016



Rajgangpur had the highest annual PM_{10} level in the state where it was more than twice the annual standard, whereas Konark recorded the highest monthly average in Odisha during 2016 with values reaching 191 µg/m^3 which is almost twice the daily standard prescribed in India. Some of the places with the highest annual PM_{10} levels are Rajgangpur, Kalinga Nagar, Paradeep, Talcher, Bhubaneshwar, Puri with values 133, 113, 109, 105, 101, 94.

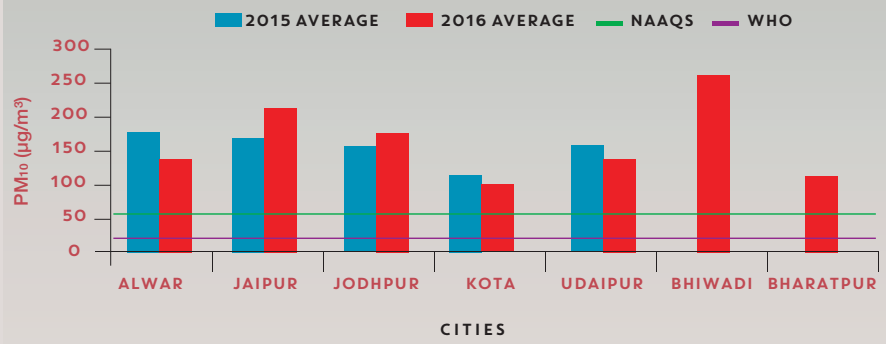
ANNUAL PM_{10} LEVELS FOR 2016 FOR ALWAR, BHARATPUR BHIWADI, JAIPUR, JODHPUR, KOTA AND UDAIPUR WERE 144, 126, 262, 218, 169, 106, 142.

Data on monthly air pollution trends regarding PM_{10} levels during 2016 for Rajasthan was obtained from 30 manual monitoring station covering 7 cities that are operated by the state pollution control board under National Air Monitoring Programme.

An assessment of data obtained from these stations shows the annual PM_{10} levels were not only above the annual average standard of 60 µg/m^3 but also remained above the daily standard of 100 µg/m^3, prescribed under NAAQS, for all of the cities in Rajasthan for which the data was available. These values were between two to four times above the prescribed annual standard, numbers varying from city to city. Except for Kota where we observed a dip in PM_{10} levels below the prescribed annual standard during July to September, the values remained above the standard throughout the year for the rest of the six cities. Although observation of the monthly trends also indicates a general dip in PM_{10} throughout the state during July to September while it remains high in other seasons reaching peak levels during the winter and the months around the cold season.

Bhiwadi recorded the highest PM_{10} levels both in terms of annual average and peak value with an annual average PM_{10} value of 249 µg/m^3 and a peak value recorded at 376 µg/m^3 for the year 2016.

▼ PM_{10} LEVELS ACROSS RAJASTHAN DURING 2015 & 2016

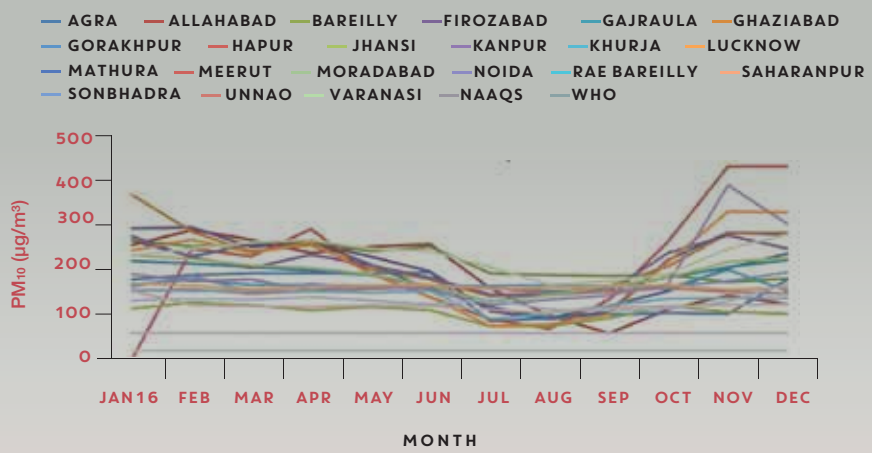


The Pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Jaipur and Jodhpur along with slight decrease for Alwar, Kota and Udaipur but the decrease being really insignificant to bring pollution levels down to breathable air quality according to Indian standards levels, leave aside the WHO standards.

A GENERAL OBSERVATION OF MONTHLY DATA INDICATES HIGHER AIR POLLUTION TRENDS DURING FIRST AND LAST QUARTER OF THE YEAR ACROSS THE STATE WITH A VERY SIGNIFICANT INCREASE DURING OCTOBER TO DECEMBER IN MANY CITIES SUCH AS HAPUR, NOIDA, LUCKNOW, GHAZIABAD AND VARANASI ETC.

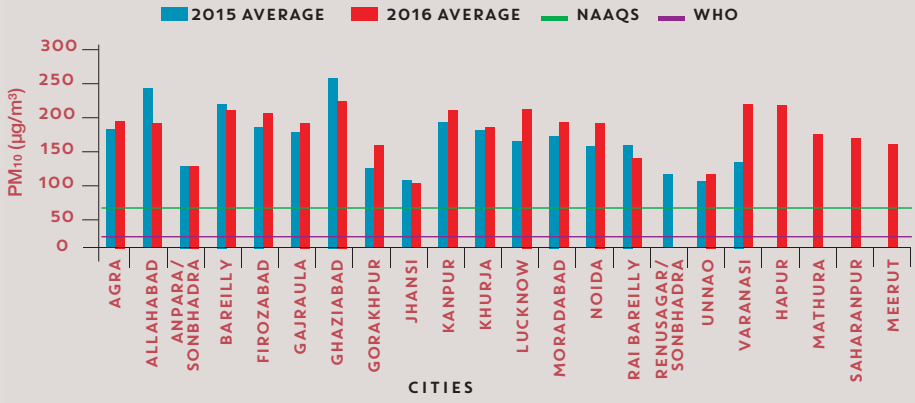
Ambient air quality data regarding monthly PM_{10} levels for Uttar Pradesh during 2016 was obtained from 61 operating stations covering 21 cities and towns strewn across the state and operating under the state pollution control board. Assessment of data obtained from these stations shows annual PM_{10} levels for all the cities/towns were far above the daily limit of 100 µg/m^3 prescribed under NAAQS, leave aside the WHO limits.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS UTTAR PRADESH FOR 2016



Ghaziabad and Varanasi had the highest annual PM_{10} level in the state where it was more than twice the annual standard, whereas Hapur recorded highest monthly average in Uttar Pradesh during 2016 with values reaching 443 µg/m^3 in November and December 2016 which is almost 4.5 times the daily standard prescribed in India. Some of the places with highest annual PM_{10} levels are Ghaziabad, Varanasi, Hapur, Bareilly, Firozabad, Kanpur and Lucknow with values 236, 236, 235, 226, 223, 217 and 211 respectively.

▼ PM_{10} LEVELS ACROSS UTTAR PRADESH DURING 2015 & 2016



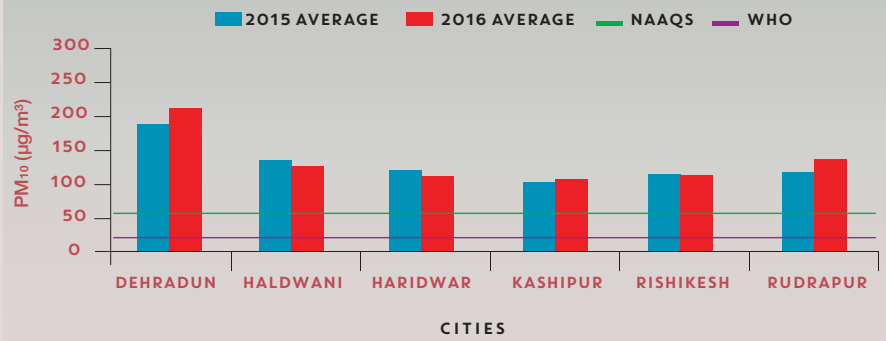
The pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Firozabad, Kanpur, Lucknow, Moradabad, Noida and Varanasi along with slight decrease for Allahabad, Ghaziabad, Jhansi and Rai Bareilly, the decrease being really insignificant to bring pollution levels down to breathable air quality according to Indian standards levels, leave aside the WHO standards.

THERE IS AN INCREASING TREND IN THE POLLUTION LEVEL BETWEEN 2015 AND 2016, ALMOST FOR ALL THE CITIES/TOWNS WHERE DATA WAS RECORDED ACROSS UTTRAKHAND; WITH DEHARADUN LEADING THE REST WITH HIGHEST INCREASE.

Data on monthly PM_{10} levels in Uttarakhand during 2016 was provided by the state pollution control board from eight manual monitoring stations installed across six cities operated by the state pollution control under the National Air Quality Monitoring Programme.

Assessment of data from these stations shows that the annual average PM_{10} levels for all the six cities remained above both the prescribed annual standard of 60 µg/m^3 and the daily standard of 100 µg/m^3 as well. These figures were between two to four times higher than the annual standard varying from city to city. A general observation of the data indicates a slight variation in the monthly trends of PM_{10} levels with a dip in levels around the monsoon season in some of the cities whereas very less variation is seen in others.

▼ PM_{10} LEVELS ACROSS UTTARAKHAND DURING 2015 & 2016



Dehradun had the highest PM_{10} levels in the state with annual average levels going four times above the annual standard and almost two and a half times above the daily standard prescribed under the National Ambient Air Quality Standard. Dehradun was also amongst the most polluted cities in the country in terms of PM_{10} levels. Annual PM_{10} levels during 2016 in the six cities of Dehradun, Rudrapur, Haldwani, Haridwar, Kashipur, Rishikesh were 238, 142, 130, 128, 121 and 118 µg/m^3 respectively.

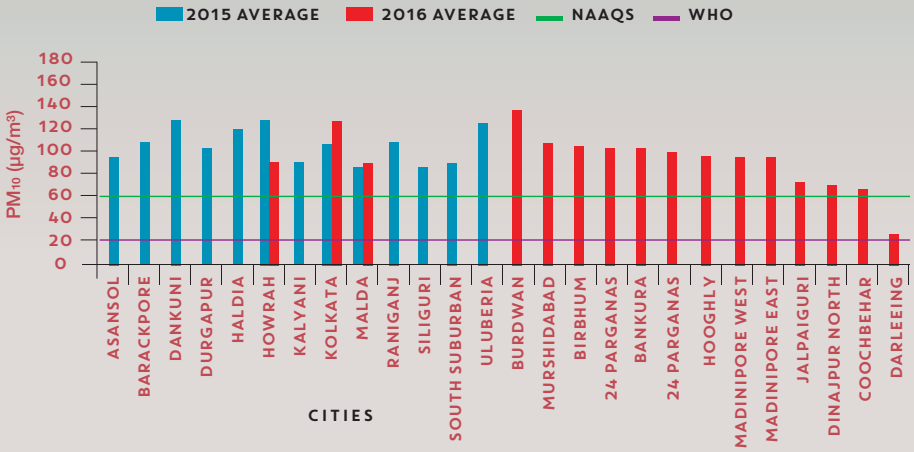
THE ANNUAL AVERAGE POLLUTION LEVELS FOR 2015 AND 2016 ACROSS KOLKATA SHOWS AN INCREASING TREND FOR POLLUTION LEVELS, WHICH IS WORRYING AND NEEDS TO BE CHECKED.

PM_{10} data for the year 2016 for West Bengal was obtained from manual ambient air quality monitoring stations operated by the state pollution control board installed across 16 cities and districts of West Bengal. Assessment of this data indicates that annual average PM_{10} levels for 15 cities were above the annual average standard of 60 µg/m³, prescribed under NAAQS, while for six cities the annual average values were above the daily prescribed standard of 100 µg/m³. A spatial variation in data is visible across the state with cities where annual PM_{10} values were recorded above the daily standard had also been found to be around two times higher than the annual standard, while for the rest of the cities the annual average values varied between 60 µg/m³ to 100 µg/m³.

A general observation of the monthly data shows a similar pattern in seasonal variation in particulate levels as seen in most parts of the country, with a drop in PM_{10} values during the monsoon while increased levels during other seasons and particularly during winter season. But in many cities of West Bengal the deviation between the lower and the higher values are much more significant. This could be due to very high presence of PM_{10} particulates recorded during winter and the months around and relatively lower levels of PM_{10} particulates sustained for longer period because of both advancing and retreating monsoon seen in this part of the country.

Burdwan had the highest annual average PM_{10} levels in the state during 2016 at 140 µg/m³ which is more than twice the annual standard, while Kolkata had the highest monthly average in the state at 264 µg/m³ which is more than four times higher than the prescribed annual standard. The annual average PM_{10} levels in 2016 for some of the most polluted places in the state such as Burdwan, Kolkata, Murshidabad, Birbhum, 24 Parganas South and Bankura were 140, 124, 116, 113, 112 and 106 µg/m³ respectively.

▼ PM_{10} LEVELS ACROSS WEST BENGAL DURING 2015 & 2016



THE MONTHLY AIR POLLUTION TRENDS CLEARLY SHOW A SEASONAL VARIATION IN $PM_{2.5}$ LEVELS THROUGH THE YEAR, WHICH IS COMMON IN ALL THE THREE CITIES WITH RELATIVELY LOWER LEVELS DURING SUMMER AND MONSOON SEASON AND HIGHER LEVELS DURING REST OF THE YEAR AND REACHING PEAK LEVELS DURING THE MONTHS OF JANUARY, NOVEMBER AND DECEMBER.

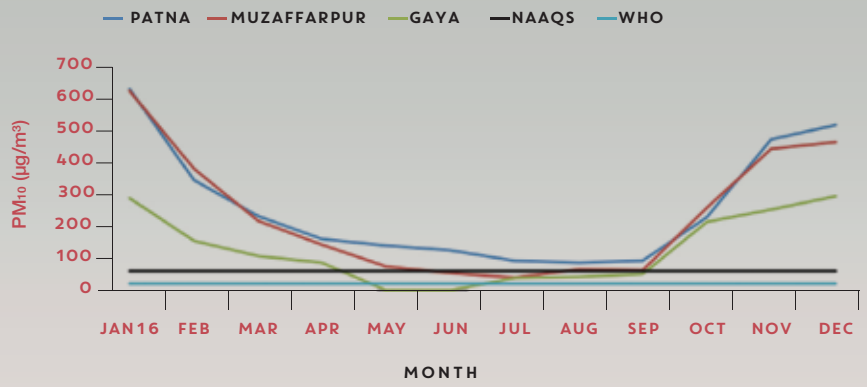
Month-wise $PM_{2.5}$ data was available from Bihar Pollution Control Board but to keep the consistency for the data across the country we have converted $PM_{2.5}$ to PM_{10} using a factor of 47% of Total PM_{10} being $PM_{2.5}$ [1]and used that in the compiled table at the end of the report.

Data from January to December 2016, was obtained from three air pollution monitoring stations installed in three cities of Bihar under the state pollution control board. Assessment of air pollution levels from this data indicates that all the three cities had annual $PM_{2.5}$ levels above both annual and daily standards prescribed under NAAQS. The annual $PM_{2.5}$ values for all the three cities were between 72 to 123 µg/m^3, which are between two to four times higher than the prescribed annual standard of 40 µg/m^3.

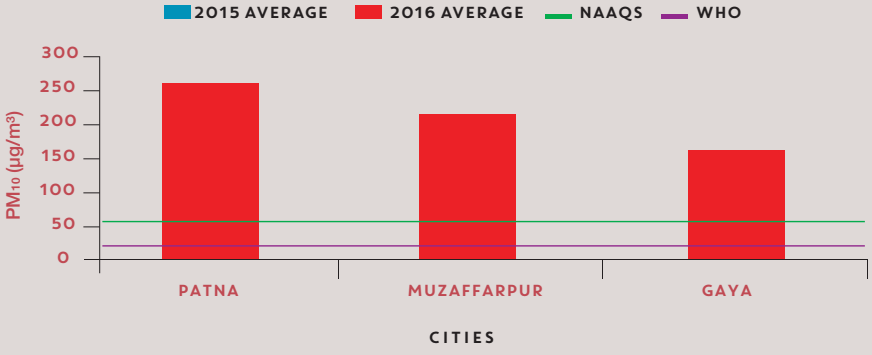
The deviation in $PM_{2.5}$ levels is significantly high, particularly in case of Patna and Muzaffarpur, as $PM_{2.5}$ levels during peak months reach very high levels as compared to the levels during monsoon months. In Patna and Muzaffarpur $PM_{2.5}$ reached alarming levels during January 2016 with values remaining five times above the daily-prescribed standard.

Patna had the highest annual $PM_{2.5}$ level and also the highest peak levels of the three cities during 2016. The annual levels for Patna, Muzaffarpur and Gaya in 2016 were 123, 111 and 72 µg/m^3 respectively.

▼ PM_{10} LEVELS ACROSS BIHAR DURING 2016



▼ PM_{10} LEVELS ACROSS BIHAR DURING 2015 & 2016



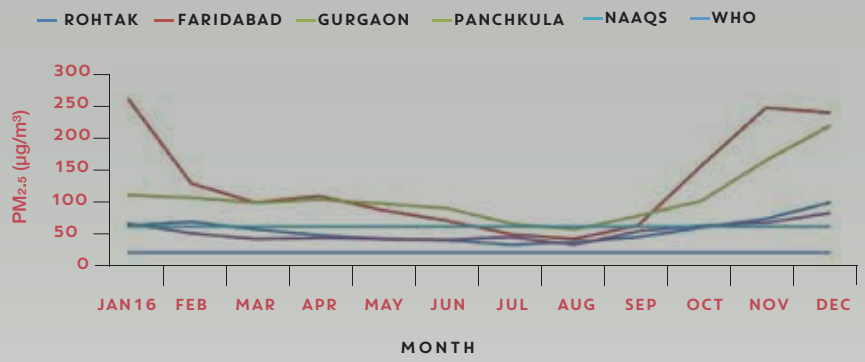
[1] *http://www.thehindu.com/sci-tech/energy-and-environment/global-studies-on-indias-air-quality-flawed-cpcb/article17379615.ece*

ANNUAL $PM_{2.5}$ LEVEL FOR THE OTHER THREE CITIES I.E. GURGAON, ROHTAK AND PANCHKULA WERE 107, 55 AND 52 µg/m³ RESPECTIVELY.

Monthly $PM_{2.5}$ data for 2016 was obtained from air quality monitoring stations installed in four cities and operating under the state pollution control board, but to keep the consistency for the data across the country we have converted $PM_{2.5}$ to PM_{10} using a factor of 47% of total PM_{10} being $PM_{2.5}$ [2]and used that in the compiled table at the end of the report. Assessment of air quality from this data indicates that annual $PM_{2.5}$ levels for all the four cities were above the annual limit of 40 µg/m³, prescribed under NAAQS, while two cities had this annual level above the daily prescribed standard of 60 µg/m³. Two of these four cities neighbouring the national capital namely Gurgaon and Faridabad, had excessively high $PM_{2.5}$ levels as the annual average value were around three times higher than the annual standard.

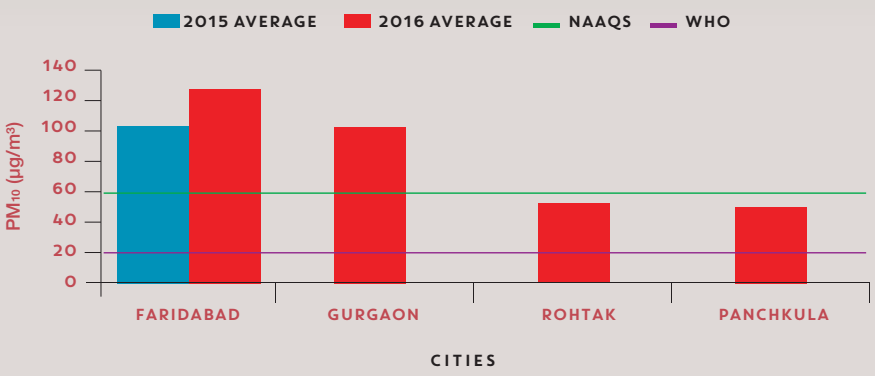
Observing the monthly pattern we can infer that relatively lower levels are observed during monsoon while higher levels can be seen during winters and the months around. But in case of Gurgaon and Faridabad we see a drastic increase in $PM_{2.5}$ levels during winters, thus extremely deteriorating air quality.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS HARYANA FOR 2016



Faridabad had both highest annual levels and highest peak levels for $PM_{2.5}$ during 2016, with annual level at 128 µg/m³, while peak levels were critically high during January 2016 at 258 µg/m³, which is more than four times the prescribed daily standard.

▼ PM_{10} LEVELS ACROSS HARYANA DURING 2015 & 2016



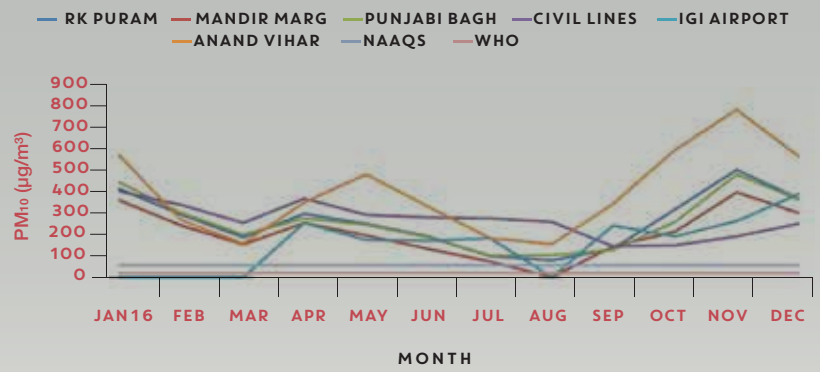
[2] *http://www.thehindu.com/sci-tech/energy-and-environment/global-studies-on-indias-air-quality-flawed-cpcb/article17379615.ece*

THE ANNUAL AVERAGE POLLUTION LEVELS FOR 2015 AND 2016 ACROSS DELHI SHOWS AN INCREASING TREND FOR POLLUTION LEVELS, DISPLAYING ALARMING LEVELS OF POLLUTION AND REQUIRES A CHECK.

Data on monthly PM_{10} levels during 2016 in Delhi was obtained from 6 manually operated air quality monitoring stations installed across Delhi, operating under the Delhi Pollution Control Committee. Assessment of air quality from this data indicates that annual PM_{10} levels were between four to seven times higher than the annual standard prescribed under NAAQS at all the six locations. Not only were the annual values above the annual standard, but they were also way above the daily standard. Except for a couple of months at two stations we do not see any of the months having PM_{10} below the daily standard of 100 $\mu g/m^3$.

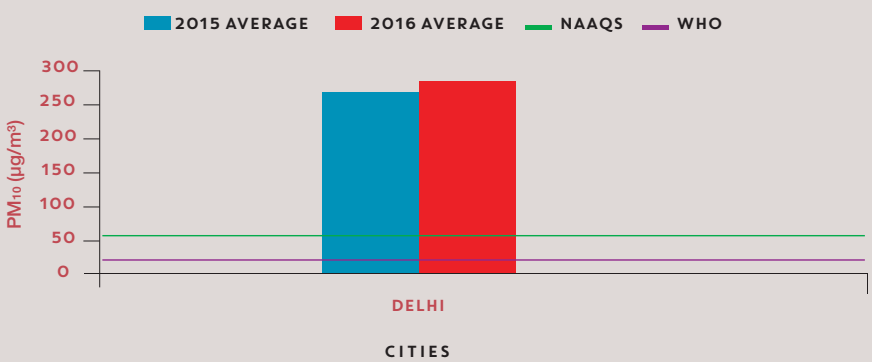
Observing the monthly trends we clearly see a significant seasonal variation in PM_{10} values. This seasonal pattern is common across most of the other parts of the country, i.e. a dip in PM_{10} level during monsoon and higher level during winter and the months around the cold season. But in case of Delhi this variation was most significant as the overall PM_{10} levels during November 2016 deteriorated to 464 $\mu g/m^3$ (average of all the six stations), which is highest in the country. At Anand Vihar PM_{10} level during November 2016 were 833 $\mu g/m^3$, which is eight times the daily standard and again highest in the country for a given station.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS DELHI FOR 2016



Anand Vihar had both the highest peak levels and annual levels during 2016 with annual levels remaining four times above daily standard. Annual PM_{10} levels during 2016 for RK Puram, Mandir Marg, Punjabi Bagh, Civil Lines, IGI Airport and Anand Vihar were 276, 238, 274, 282, 247 and 423 $\mu g/m^3$ respectively. Overall annual PM_{10} level for Delhi during 2016 was at 290 $\mu g/m^3$, thus exposing its over 2 million inhabitants to extreme levels of air pollution.

▼ PM_{10} LEVELS ACROSS DELHI DURING 2015 & 2016



KARNATAKA

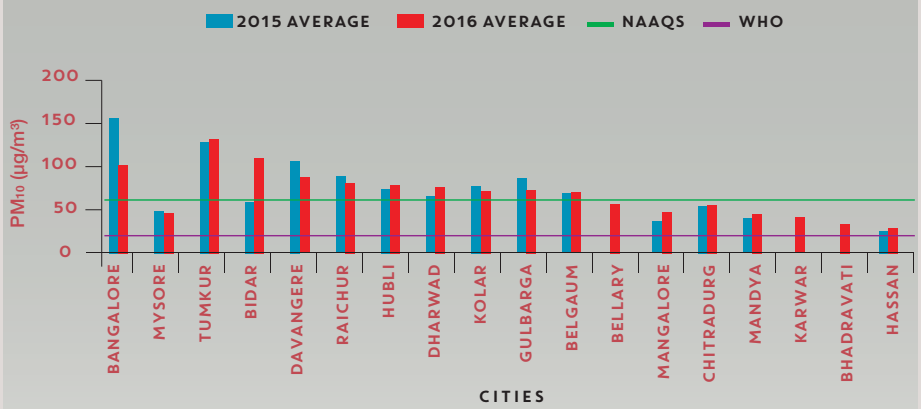
IN 2016, BENGALURU HAD EIGHT MONTHS OF BEING ABOVE THE DAILY PRESCRIBED STANDARD OF 100 µg/m³. TUMKUR HAD THE HIGHEST ANNUAL PM_{10} VALUES IN 2016 IN THE STATE (ALTHOUGH THE DATA FOR TUMKUR IS FOR SIX MONTHS ONLY). ANNUAL PM10 LEVELS FOR TUMKUR, BIDAR, BANGALORE, DAVANGERE, RAICHUR AND HUBLI ARE 144, 113, 106, 84, 88, AND 87 RESPECTIVELY.

Monthly PM_{10} data for 2016 was obtained from 31 manual as well as continuous ambient air quality monitoring stations installed under the state pollution control board covering Bengaluru and 17 other major cities and towns of Karnataka.

Assessment of air quality from this data indicates that annual PM_{10} levels in ten cities were above the annual PM_{10} standard of 60µg/m³ prescribed under the NAAQS, while four cities had annual levels above the daily standard, which is 100 µg/m³. Annual PM_{10} levels also indicate a sporadic distribution in pollution levels as places with higher PM_{10} levels are spread throughout the state in no particular pattern.

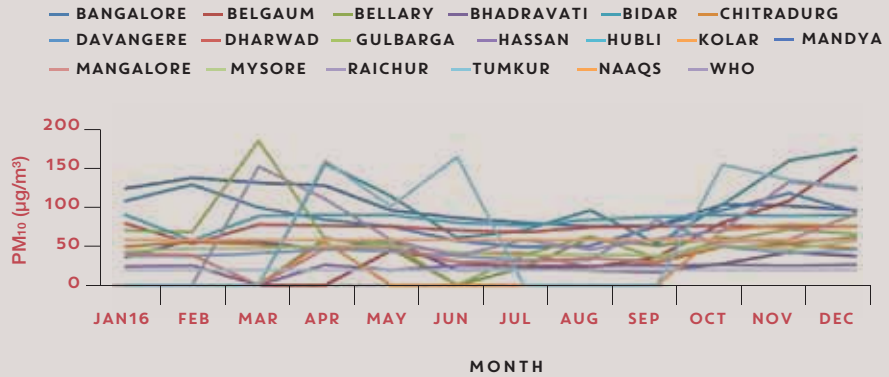
A general observation of the monthly trends shows that although there is a general trend in monthly pollution levels with higher PM_{10} levels during and around winters and a dip in levels during monsoon, but the degree of seasonal variation in PM_{10} levels is not the same for all the places. PM_{10} levels had remained almost two times higher than the daily PM_{10} standard during peak months in cities where higher seasonal variation is seen.

▼ PM_{10} LEVELS ACROSS KARNATAKA DURING 2015 & 2016



The pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Tumkuru, Bidar, Hubli and Dharwad along with slight decrease for Bangalore, Davanagere, Kolar and Gulbarga etc. but the decrease being really insignificant to bring pollution levels down to breathable air quality according to Indian standards levels, leave aside the WHO standards.

▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS KARNATAKA FOR 2016



ANNUAL PM10 LEVELS FOR HYDERABAD, MEDAK, MAHBOOBNAGAR, RAMAGUNDAM AND WARANGAL ARE 93, 77, 77, 68 AND 67 µg/m³ RESPECTIVELY.

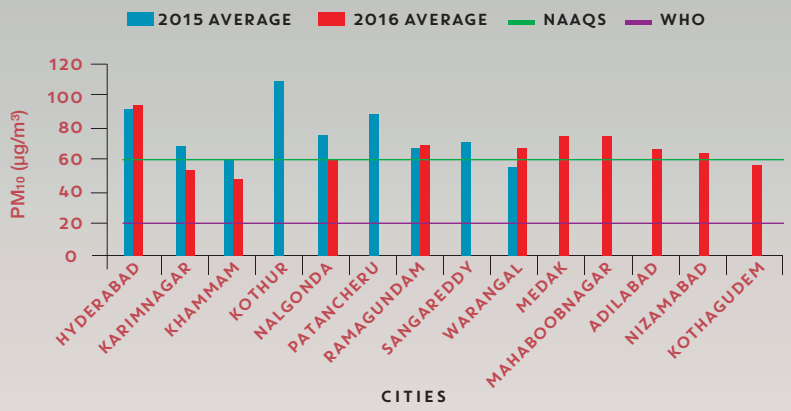
Monthly PM_{10} data for 2016 was obtained form 39 air quality monitoring stations operated by the state pollution control under various programmes of the state and central government. These stations cover a total of 11 cities and districts of Telangana, but a majority those are installed in Hyderabad.

Assessment of air quality from this data indicates that of the eleven cities and districts, seven had annual PM_{10} level above the annual standard of 60 µg/m³ prescribed under NAAQS. While at some places these levels were marginally above the annual standard, at rest of the places PM_{10} levels were between 10 to 50 percent above the annual standard.

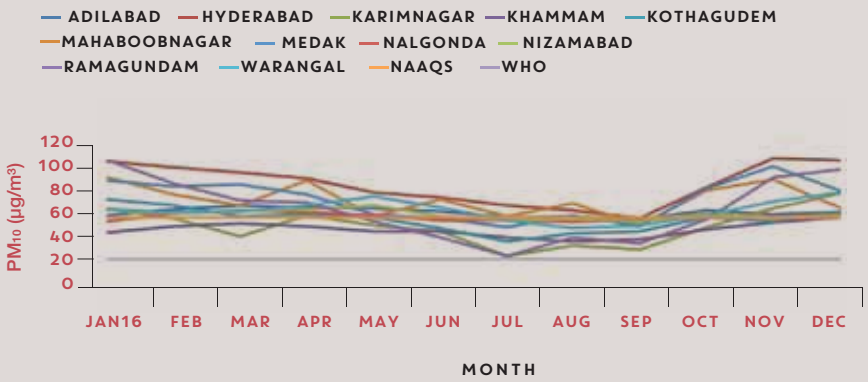
Observing the monthly patterns indicates higher air pollution trends during the months of January to February and then between October to December. But the degree of variation is not the same for the entire place; as for some places this variation is significant while at others the variation is very low. At Hyderabad and Medak the variation is quiet high as there is clear spike in PM_{10} levels in October, which is sustained in the consecutive months.

Hyderabad had the highest annual PM levels and also recorded highest peak levels during November 2016 with PM_{10} levels recorded at 117 µg/m³, which is 17% higher than the daily standard and almost twice as high as the annual standard. In 2016 Hyderabad had five months during which its PM_{10} levels were recorded above the daily standard of 100 µg/m³.

▼ PM_{10} LEVELS ACROSS TELANGANA DURING 2015 & 2016



▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS TELANGANA FOR 2016

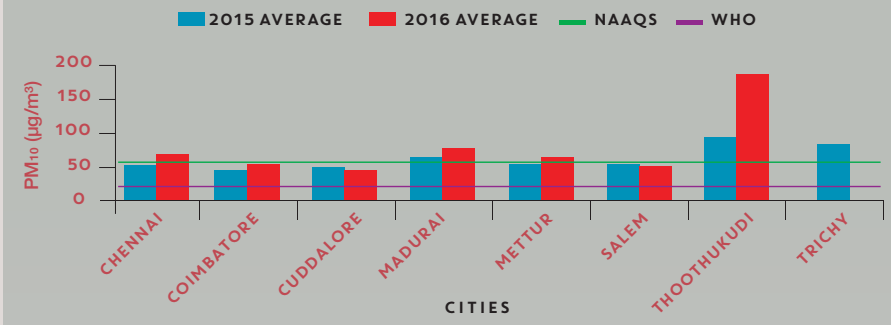


THOOTHUKUDI RECORDED HIGHEST PM10 LEVELS WITH VALUES BREACHING 182 µg/m³ LEVEL IN 2016 WHILE MADURAI AND CHENNAI FOLLOWING WITH 82 AND 71 RESPECTIVELY.

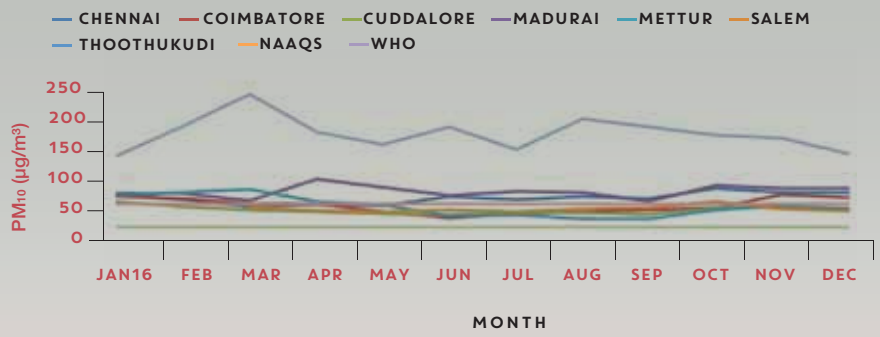
Monthly average PM_{10} data for year 2016 was obtained from 23 ambient air quality-monitoring stations installed across 7 cities and towns of Tamil Nadu.

The data indicates that three out of seven cities had higher concentrations of PM_{10} than the annual average levels prescribed by CPCB (60 µg/m³). The pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Chennai, Madurai, Coimbatore, Metur and Thoothukudi along with slight decrease for Cuddalore and Salem.

▼ PM_{10} LEVELS ACROSS TAMIL NADU DURING 2015 & 2016



▼ MONTHLY AVERAGE PM_{10} LEVELS ACROSS TAMIL NADU FOR 2016

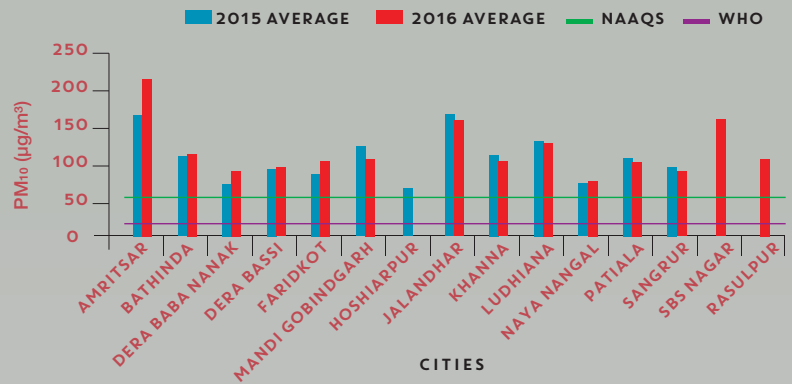


THE DATA INDICATES THAT ALL THE 14 CITIES HAD HIGHER CONCENTRATIONS OF PM10 THAN THE ANNUAL AVERAGE LEVELS PRESCRIBED BY CPCB (60 µg/m³) AND ALL OF THEM HAD AT-LEAST FOUR TIMES MORE POLLUTED AIR AS COMPARED TO WHO ANNUAL STANDARD FOR PM_{10}.

Monthly average PM_{10} data for year 2016 was obtained from 26 ambient air quality-monitoring stations installed across 14 cities and towns across Punjab.

The pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Amritsar, Bhatinda, Faridkot and Dera Baba Nanak along with slight decrease for Khanna, Jalandhar, Patiala and Sangrur but the decrease being really insignificant to bring pollution levels down to breathable air quality according to Indian standards levels aside the WHO standards.

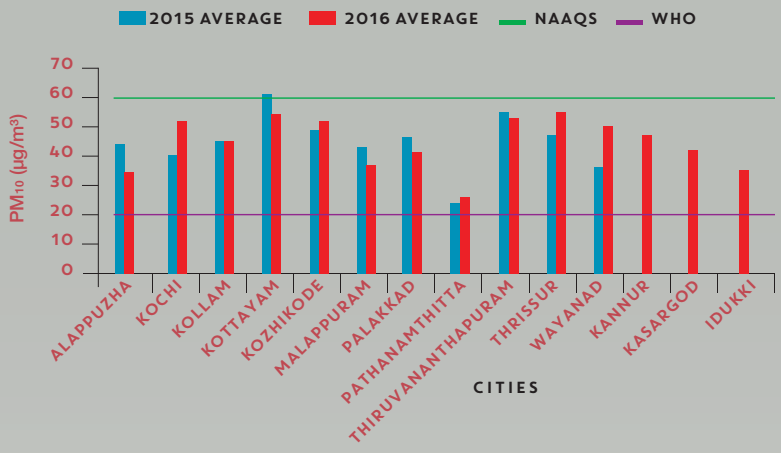
PM_{10} LEVELS ACROSS PUNJAB DURING 2015 & 2016



KERALA IS THE ONLY STATE WHERE ALL THE CITIES/TOWNS WHERE AMBIENT AIR QUALITY IS BEING MONITORED ARE SHOWING ANNUAL AVERAGE VALUES WITHIN THE PRESCRIBED LIMITS BY CPCB THROUGH NAAQS.

Monthly average PM_{10} data for year 2016 was obtained for 14 cities and towns across Kerala. The data indicates that all the 14 cities had lower concentrations of PM_{10} than the annual average levels prescribed by CPCB (60 µg/m³). Yet, all of them reported polluted air when compared with WHO annual standard for PM_{10}. The Pollution level seems to be consistent between 2015 and 2016 with little variations on upside for Kochi, Thrissur, Wayanad and Kozhikode along with slight decrease for Alappuzha, Kottayam, Malappuram and Palakkad.

▼ PM_{10} LEVELS ACROSS KERALA DURING 2015 & 2016



Young Student with an N95 Respirator. Purenakhar village, Korba district, Chhattisgarh, India.

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AIR POLLUTION MONITORING NETWORK AND EXPOSURE

The data compiled in the report is a comprehensive set of data on air quality in India. It covers 280 cities with a population of 630 million or 53% of the total population (assuming a district with even one manual station covers the entire population of the said district):

1.Out of the 630 million Indians covered by the data, 550 million live in areas exceeding national standard for PM10, and 180 million live in areas where the air pollution levels are more than twice the stipulated standards. This includes 47 million children under 5 years of age, living in areas where the standard is exceeded and 17 million in areas where the air pollution levels are more than twice the stipulated standards.

2. The largest numbers of people in areas with more than twice the stipulated levels of pollution are in Uttar Pradesh (64 million), followed by Rajasthan (20 million), Maharashtra (19 million), Delhi (17 million) and Bihar (15 million).

3. The most are children under 5 years of age, living in areas where the standard is exceeded more than twice are also in Uttar Pradesh (6.3 million) and Rajasthan (2.1 million), followed by Bihar (1.7 million), Maharashtra (1.4 million) and Delhi (1.4 million).

4. 580 million Indians live in districts with no air quality data available, including 59 million children under 5 years of age.

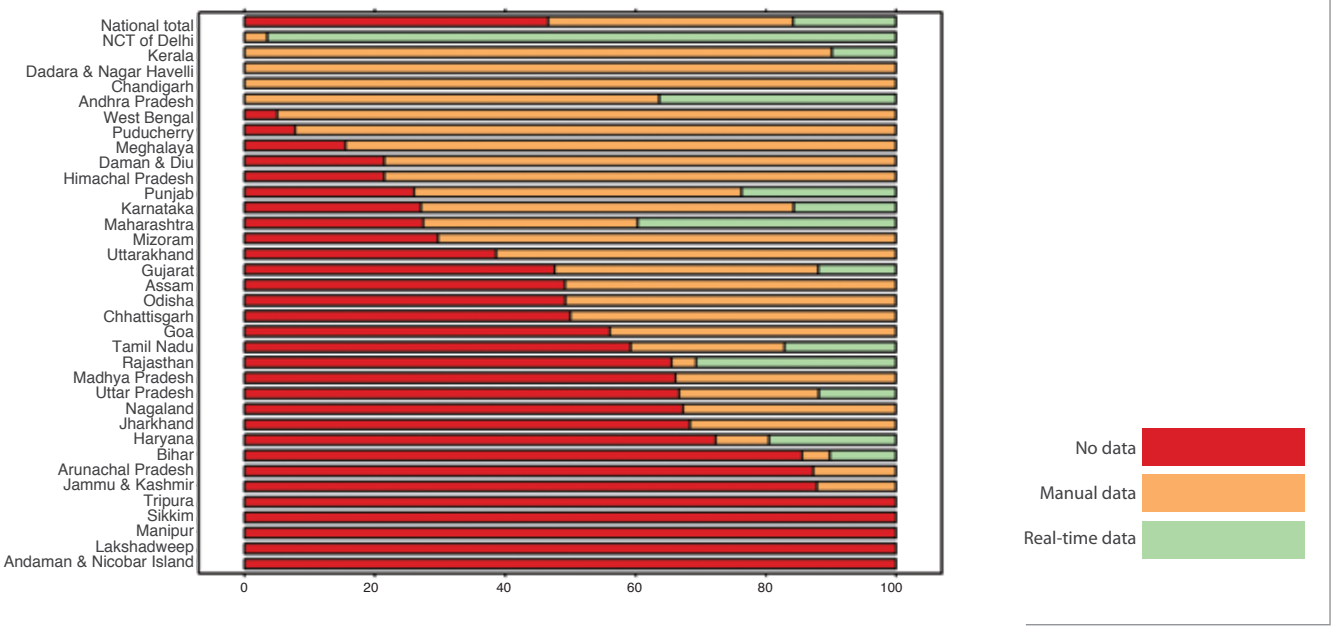
5. Real time data is available for only 190 million Indians, or 16% of the population.

6. After Delhi, Maharashtra and Andhra Pradesh have the highest coverage of real-time data, while 23 states have no real time data available to public.

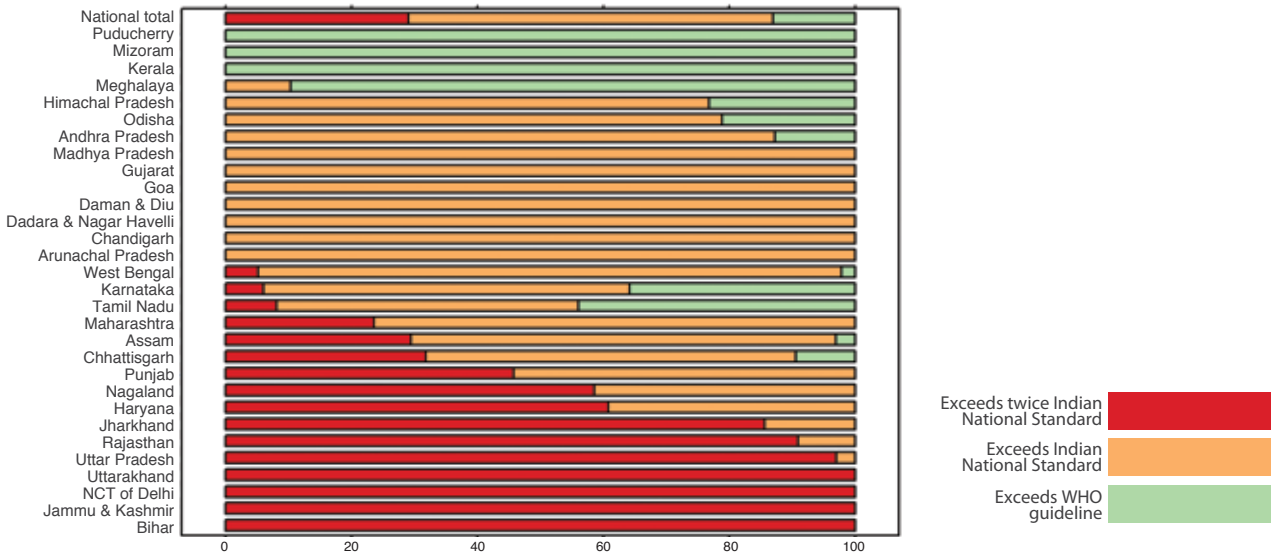
7. The largest number of people living in areas with no data is Uttar Pradesh (133 million), followed by Bihar (89 million), Madhya Pradesh (48 million) and Rajasthan (45 million).

These estimates are extremely conservative because of the assumption that the present air quality-monitoring network for respective districts covers the entire population of the mentioned districts. Whereas, in reality most of these stations are only centered around few towns, hence the actual number of people with complete absence of air quality data would be much higher.

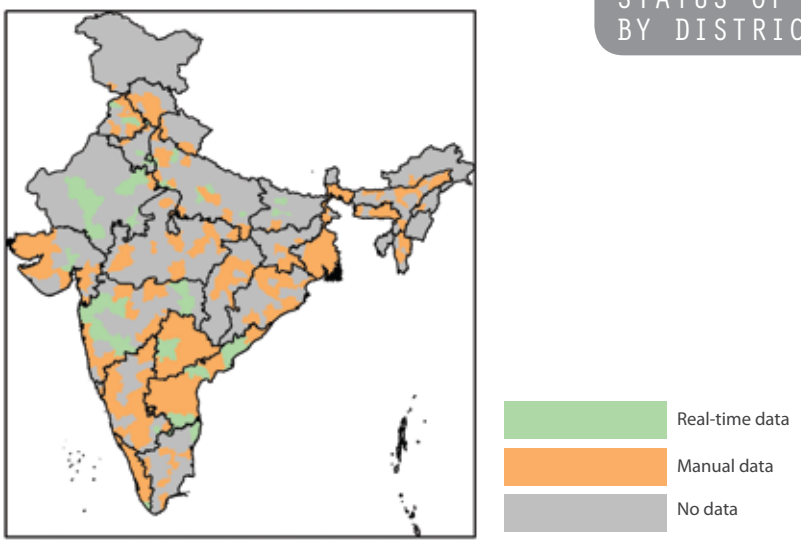
AIR QUALITY DATA COVERAGE BY STATE



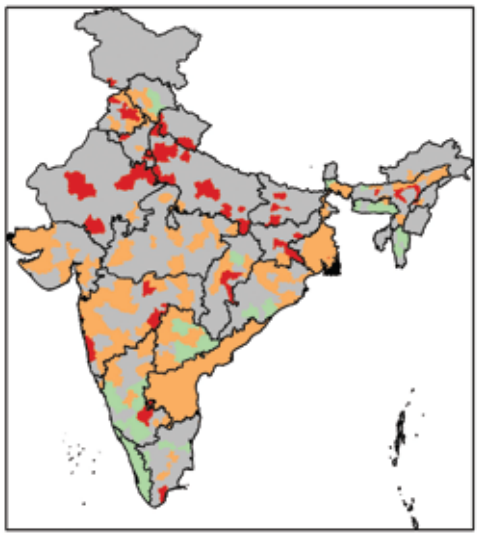
PM_{10} AIR QUALITY BY STATE FOR DISTRICTS WITH DATA



STATUS OF AIR QUALITY BY DISTRICT



PM_{10} AIR QUALITY BY DISTRICT



GOVERNMENT INITIATIVE

It requires a system , which approaches, understands and assesses pollution levels regularly while initiating action to tackle and control it effectively. The first step in this direction is to have a robust monitoring of air quality through a mechanism installed across the country. This is necessary to bring information about pollution levels in real time and through use of data resulting into collected strategies evolved to reduce pollution levels and protect public health. The strategies to reduce pollution should synthesize into a concrete action plan, which should be implemented in a time bound manner with specific targets and penalties.

ACTION PLAN

Government of India should adopt time-bound national and regional action plans, which have clear targets for regions and penalties in case of non-compliance. This should include providing transparent data to the public on air quality, besides short and long term measures to reduce air pollution.

TRANSPARENT DATA

Improving NAQI monitoring systems and providing access to data to the public on a real time basis for the whole country is absolutely necessary, given the rising levels of air pollution through most parts of the country. This should be coupled with a timely health advisory in order to enable the public to take suitable decisions and steps to protect their health and the environment.

SHORT TERM MEASURES

Issuing red alert and health advisories during bad air-days, shutting down schools, taking polluting vehicles off the roads through odd-even registration number as also other schemes and shutting down power plants and industries etc are some of the short term steps that the central and state governments can undertake in case of air pollution levels reaching alarming levels.

LONG TERM MEASURES

Improving public transport, limiting the number of polluting vehicles on the road, introducing less polluting fuel (Bharat VI), strict emission regulations and improved efficiency for thermal power plants and industries, moving from diesel generators to rooftop solar power systems, increased use of clean renewable energy, electric vehicles, removing dust from roads, regulating construction activities, stopping biomass burning etc. can be the long term measures.

PEOPLE'S INITIATIVE

Public participation is critical in reducing air pollution. Our choices for electricity and transportation could play a major role in managing pollution levels in many parts of the country. Efforts should be made in some of the key areas such as:

1. MOVING TOWARDS ROOFTOP SOLAR AND OTHER FORMS OF DECENTRALISED RENEWABLE ENERGY SOLUTIONS
2. INCREASED USAGE OF PUBLIC TRANSPORT, CYCLING AND WALKING
3. USING ENERGY EFFICIENT APPLIANCES AND REDUCING HOUSEHOLD ENERGY USAGE
4. WASTE MINIMISATION, SEGREGATION AND RECYCLING, WHICH WILL REDUCE BURNING OF WASTE IN STREETS AS WELL AS AT THE LANDFILLS ALONG WITH ENERGY REDUCTIONS AND SAVING IN TRANSPORTING HUGE QUANTITIES OF WASTE

COMPARISON OF FACTS ON AIR POLLUTION AROUND THE WORLD

	CHINA	INDIA	US	EU	TAIWAN	S KOREA
Change in satellite-based $PM_{2.5}$ levels from 2010 to 2015	-17%	13%	-15%	-20% (from 2005 to 2013)		
$PM_{2.5}$ trend	Falling since 2011; 2015 was the best on record	Increasing steadily for past 10 years; 2015 was the worst year on record	Falling since measurements started	Falling since measurements started	Falling since measurements started	Stable since measurements started
$PM_{2.5}$ in capital city, annual ($\mu g/m^3$)	81	128	12	18	16.1 and 18.1 (depending on the location within the capital city)	26
$PM_{2.5}$ air quality standard, annual ($\mu g/m^3$)	35	40	15	25 (from 2020, 20)	15	26
Deaths per day from air pollution in 2013	2,700	1,800	250	640		
Online $PM_{2.5}$ monitoring	1,500 stations in 900 cities & towns	87 station in 52 cities	770 stations in 540 cities & towns	1,000 stations in 400 cities & towns	76 stations	35 stations in 28 cities (2016. 12)
Share of thermal power plants with basic pollution controls (desulphurisation, particle controls)	95%	10%	60%	75%		
Target for $PM_{2.5}$ or deadline for meeting national air quality standards	2030; most key cities have an interim target for 2017	None	2012; violating areas are currently implementing new plans	25 by 2015, 20 by 2020	20 by 2016 15 by 2020	18 by 2022
Key policy measures: power sector	Strict emission norms for existing and new power plants, ramped-up enforcement, renewable electricity targets included in national air action plan, elimination of old plants	Strict emissions norms notified in 2015	Updated emission norms	Updated Best Available Technology requirements by 2022	Establish targets for electricity from renewable in national. energy transition (20% from RE, 50% from gas, and 30% from coal by 2025). Phase out of old and high pollution power units. Decrease/adjust power outputs during air pollution seasons. Update pollution control technology for power units. Establish air pollution rate based on seasonal difference	22% reduction by 2022. The top of the line emission facilities & strict standards for 5 units of new coal plants. LNG transition for 4 units of new coal plants. Early shut down for 10 units of over 30 years old coal plants. Strict emissions regulations for 39 units of operating coal plants. Strict management for SRF plant 20% RE by 2030

	CHINA	INDIA	US	EU	TAIWAN	S KOREA
Key policy measures: industry	Ramped-up enforcement of industrial emission norms and monitoring. Absolute coal consumption cuts and a ban on increasing coal-fired boilers in key regions.	Government is in the process of setting up standards for 35 different polluting industries, especially with SO^2 and NOx emissions.	Emissions standards for 174 major source categories, representing 90 percent of emissions of 30 priority pollutants.	Best Available Technology requirements for all polluting industries. Emission ceilings for air pollutants for each member state that fall over time.	Stricter emission standards for boilers. Phase out of old boilers. Transit of 6,000 boiler that are currently using oil as fuel to gas.	43% reduction by 2022 Emissions charge on NO^2 Strict VOC management.
Key policy measures: transport	Controlling number of cars EURO4/5/6 Electric vehicle mandate.	Bharat VI standards will come into place by 2020. 100% new electric vehicle policy by 2030. 100% electrification of railways by 2020.	Emission standards comparable to EURO6; mandatory emission measurements.	EURO6 emission standards for cars and trucks; mandatory emission measurements. CO2 emission standards that encourage electrification.	Phase out 80,000 old diesel cars by 2019. Phase out 1,000,000 old scooters by 2019. Promote filter installation for diesel cars. Promote use of electrical vehicles.	43% reduction by 2022 for Vehicles Low pollution measures for diesel vehicle & support EV, Hydrogen Vehicles.
Key policy measures: other sectors	Replacing household coal use with gas and electricity.	Replacing biomass based cooking stoves with LPG to reduce indoor air pollution. Working with farmers to reduce air pollution due to open crop burning. Banning garbage burning.	Emissions from agriculture, waste burning etc. are regulated on State and local level; areas that violate air quality standards are subject to more restrictions	National emissions ceilings and national air pollution control programmes cover agriculture, domestic heating and non-road mobile machinery and solvents etc.	Strengthen standards for air pollution control equipment at construction sites. Establish regulation on air pollution control equipment for restaurants.	24% reduction by 2022 for off road emissions Measures for Ships and Construction machinery
Consequences for missing targets	Promotion of province governors depends on meeting targets	None but courts time to time impose penalties for non-compliance	States must adopt emission reduction measures into law that are demonstrated to enable meeting targets; must account for pollution transport into downwind states; periodic review.	Cities & countries face legal action for not meeting standards.	No legal action for the government but will surely receive pressure and condemn from the society (since air pollution is one of the most discussed and concerned issue in the whole society. For that industry which will have to be in compliance with related regulations, there will be fine if they failed to meet the standards	15% reduction by 2022 for fugitive dust. Diplomatic efforts with other countries for trans boundary air pollution.

	CHINA	INDIA	US	EU	TAIWAN	S KOREA
Coverage of government measures	National, regional and city-level action plans with measurable 5-year targets National emission standards for power plants, industrial sectors and vehicles	Mainly action in individual cities with no measurable targets Recently introduced India-wide emission standards for thermal power plants; Introduction of Bharat VI vehicle emission norms are proposed by April 2020. Only Delhi NCR region has an emergency response plan and the courts have asked the government to notify long term action plan for Delhi NCR	National air quality targets; implementation plans approved on federal level and executed on state level National emission standards for power plants, industrial sectors and vehicles	"Clean Air For Europe" action plan Europe-wide emission standards for power plants, industry and cars Most countries and key cities have own plans	"Air Pollution Control Strategy", which national and city level government agencies should established relevant regulations and plans accordingly. National emission standards for power plants and industrial sectors. "Air Pollution Control Act", which is in modification process right now, and the main modification elements are to establish regulations/guide lines for air pollution emission cut, transportation and authorization city government to take action according to local air quality.	All the government administration will take roles for $PM_{2.5}$ reduction in their responsible sector by 2022 and government department of the policy coordination will review, evaluate, improve the plan when the target years come.

APPENDIX-I

PM_{10} Levels across India (Annual Average 2016/2015)

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Delhi	Delhi	268	290	290	60	20
Haryana {converted from $PM_{2.5}$ (47% of PM_{10})}	Faridabad	240	272	272	60	20
Rajasthan	Bhiwadi	NA	262	262	60	20
Bihar {converted from $PM_{2.5}$ (47% of PM_{10})}	Patna	NA	261	261	60	20
Uttarakhand	Dehradun	190	238	238	60	20
Uttar Pradesh	Varanasi	145	236	236	60	20
Uttar Pradesh	Ghaziabad	259	236	236	60	20
Bihar {converted from $PM_{2.5}$ (47% of PM_{10})}	Muzaffarpur	NA	235	235	60	20
Uttar Pradesh	Hapur	NA	235	235	60	20
Punjab	Amritsar	184	232	232	60	20
Jharkhand	Jharia	230	NA	230	60	20
Haryana converted from $PM_{2.5}$ (47% of PM_{10})}	Gurgaon	129	227	227	60	20
Uttar Pradesh	Bareilly	240	226	226	60	20
Uttar Pradesh	Firozabad	194	223	223	60	20
Jharkhand	Ranchi	220	NA	220	60	20
Rajasthan	Jaipur	170	218	218	60	20
Uttar Pradesh	Kanpur	195	217	217	60	20
Uttar Pradesh	Lucknow	169	211	211	60	20
Uttar Pradesh	Agra	183	197	197	60	20
Uttar Pradesh	Moradabad	168	195	195	60	20
Uttar Pradesh	Noida	154	195	195	60	20
Uttar Pradesh	Allahabad	249	192	192	60	20
Uttar Pradesh	Gajraula	176	191	191	60	20
Tamil Nadu	Thoothukudi/ Tuticorin	91	182	182	60	20
Uttar Pradesh	Mathura	NA	172	172	60	20
Uttar Pradesh	Khurja	167	170	170	60	20
Rajasthan	Jodhpur	151	169	169	60	20
Jharkhand	Dhanbad	168	NA	168	60	20
Uttar Pradesh	Saharanpur	NA	167	167	60	20
Maharashtra	Lote	163	NA	163	60	20
Punjab	SBS Nagar	NA	160	160	60	20
Punjab	Jalandhar	151	159	159	60	20

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Uttar Pradesh	Meerut	NA	157	157	60	20
Uttar Pradesh	Gorakhpur	162	154	154	60	20
Bihar {converted from $PM_{2.5}$ (47% of PM_{10})}	Gaya	NA	153	153	60	20
Maharashtra	Nanded	167	151	151	60	20
Karnataka	Tumkur	118	144	144	60	20
Rajasthan	Alwar	227	144	144	60	20
Jharkhand	Saraikela Kharsawan	144	NA	144	60	20
Assam	Nagaon	142	NA	142	60	20
Uttarakhand	Rudrapur	125	142	142	60	20
Rajasthan	Udaipur	156	142	142	60	20
Uttar Pradesh	Rai Bareilly	157	140	140	60	20
West Bengal	Burdwan	NA	140	140	60	20
Maharashtra	Dombivli	103	140	140	60	20
Punjab	Ludhiana	140	139	139	60	20
Uttar Pradesh	Renusagar/Sonbhadra	139	NA	139	60	20
Jharkhand	Jamshedpur	135	NA	135	60	20
Odisha	Rajgangpur	NA	133	133	60	20
Uttar Pradesh	Anpara/ Sonbhadra	133	133	133	60	20
Maharashtra	Mumbai	103	130	130	60	20
Uttarakhand	Haldwani	139	130	130	60	20
Uttarakhand	Haridwar	123	128	128	60	20
West Bengal	Dankuni	127	NA	127	60	20
Punjab	Mandi Gobindgarh	130	126	126	60	20
Nagaland	Dimapur	126	NA	126	60	20
Rajasthan	Bharatpur	NA	126	126	60	20
Jammu & Kashmir	Jammu	125	NA	125	60	20
West Bengal	Uluberia	125	NA	125	60	20
Assam	Golaghat	124	NA	124	60	20
West Bengal	Kolkata	109	124	124	60	20
Uttar Pradesh	Unnao	118	124	124	60	20
Maharashtra	Akola	127	123	123	60	20
Meghalaya	Byrnihat	123	NA	123	60	20
Maharashtra	Badlapur	103	122	122	60	20
Uttarakhand	Kashipur	108	121	121	60	20

APPENDIX-I

PM_{10} Levels across India (Annual Average 2016/2015)

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Maharashtra	Ambernath	NA	121	121	60	20
Assam	Nalbari	121	NA	121	60	20
Chhattisgarh	Raipur	138	121	121	60	20
West Bengal	Haldia	120	NA	120	60	20
Assam	Tinsukia	119	NA	119	60	20
Maharashtra	Panvel	NA	118	118	60	20
Uttarakhand	Rishikesh	119	118	118	60	20
Himachal Pradesh	Kala Amb	118	NA	118	60	20
Punjab	Bathinda	111	117	117	60	20
Maharashtra	Thane	117	117	117	60	20
Haryana converted from $PM_{2.5}$ (47% of PM_{10})}	Rohtak	92	116	116	60	20
West Bengal	Murshidabad	NA	116	116	60	20
Himachal Pradesh	Paonta Sahib	116	NA	116	60	20
Maharashtra	Ulhasnagar	101	116	116	60	20
Maharashtra	Taloja	NA	115	115	60	20
Maharashtra	Chandrapur	94	115	115	60	20
Assam	Margherita	114	NA	114	60	20
West Bengal	Raniganj	114	NA	114	60	20
Punjab	Khanna	122	114	114	60	20
West Bengal	Birbhum	NA	113	113	60	20
Odisha	Kalinga Nagar	100	113	113	60	20
Karnataka	Bidar	59	113	113	60	20
West Bengal	Barrackpore	113	NA	113	60	20
West Bengal	24 Parganas South	NA	112	112	60	20
Punjab	Rasulpur	NA	112	112	60	20
Jharkhand	West Singhbhum	111	NA	111	60	20
Assam	Dibrugarh	110	NA	110	60	20
Haryana converted from $PM_{2.5}$ (47% of PM_{10})}	Panchkula	92	110	110	60	20
Odisha	Paradeep	110	109	109	60	20
Chhattisgarh	Raigarh	NA	109	109	60	20
Uttar Pradesh	Jhansi	119	108	108	60	20
Chhattisgarh	Bhilai	107	NA	107	60	20
Punjab	Patiala	110	107	107	60	20
Telangana	Kothur	107	NA	107	60	20

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Gujarat	Ahmedabad	91	107	107	60	20
Gujarat	Vatva/ Ahemdabad	NA	106	106	60	20
Rajasthan	Kota	133	106	106	60	20
West Bengal	Bankura	NA	106	106	60	20
Karnataka	Bangalore	119	106	106	60	20
Punjab	Faridkot	90	106	106	60	20
Gujarat	Sanand	93	105	105	60	20
Odisha	Talcher	136	105	105	60	20
Himachal Pradesh	Damtal	104	NA	104	60	20
Maharashtra	Amravati	108	104	104	60	20
Chandigarh	Chandigarh	85	104	104	60	20
Gujarat	Sarigam	88	104	104	60	20
Gujarat	Bhuj	86	103	103	60	20
Assam	Guwahati	98	103	103	60	20
Odisha	Bhubaneswar	85	103	103	60	20
Gujarat	Vapi	86	102	102	60	20
Gujarat	Vadodara	86	102	102	60	20
Maharashtra	Jalgaon	107	102	102	60	20
Gujarat	Ankleshwar	84	102	102	60	20
Andhra Pradesh	Vijayawada	109	101	101	60	20
West Bengal	Durgapur	101	NA	101	60	20
Madhya Pradesh	Gwalior	125	100	100	60	20
Gujarat	Bharuch	83	100	100	60	20
Maharashtra	Pune	77	99	99	60	20
West Bengal	24 Parganas North	NA	98	98	60	20
Chhattisgarh	Bilaspur	99	98	98	60	20
Punjab	Dera Bassi	96	97	97	60	20
West Bengal	Asansol	97	NA	97	60	20
Odisha	Angul	102	97	97	60	20
Gujarat	Morbi	93	97	97	60	20
Madhya Pradesh	Indore	97	96	96	60	20
Punjab	Dera Baba Nanak	79	95	95	60	20
Madhya Pradesh	Ujjain	95	NA	95	60	20
Nagaland	Kohima	95	NA	95	60	20
Madhya Pradesh	Pithampur	121	95	95	60	20

APPENDIX-I

PM_{10} Levels across India (Annual Average 2016/2015)

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
West Bengal	Hooghly	NA	94	94	60	20
Odisha	Puri	87	94	94	60	20
Odisha	Konark	88	94	94	60	20
Gujarat	Surat	89	93	93	60	20
Maharashtra	Navi Mumbai	126	93	93	60	20
Telangana	Hyderabad	92	93	93	60	20
Gujarat	Jamnagar	85	93	93	60	20
Maharashtra	Kolhapur	97	92	92	60	20
Arunachal Pradesh	Itanagar	92	NA	92	60	20
Punjab	Sangrur	100	92	92	60	20
Gujarat	Rajkot	83	92	92	60	20
West Bengal	Madinipore West	NA	92	92	60	20
Maharashtra	Aurangabad	83	91	91	60	20
Gujarat	Bhavnagar	NA	91	91	60	20
Punjab	Naya Nangal	82	90	90	60	20
West Bengal	South Suburban/Kolkata	90	NA	90	60	20
Madhya Pradesh	Jabalpur	90	NA	90	60	20
Assam	Tezpur	90	NA	90	60	20
Maharashtra	Jalna	115	90	90	60	20
West Bengal	Siliguri	89	NA	89	60	20
Dadra and Nagar Haveli	Khadoli	89	NA	89	60	20
Himachal Pradesh	Nalagarh	89	NA	89	60	20
Andhra Pradesh	Guntur	100	88	88	60	20
Himachal Pradesh	Baddi	88	NA	88	60	20
West Bengal	Howrah	124	88	88	60	20
Karnataka	Raichur	92	88	88	60	20
Madhya Pradesh	Bhopal	155	87	87	60	20
West Bengal	Kalyani	87	NA	87	60	20
Odisha	Jharsuguda	NA	87	87	60	20
Odisha	Rourkela	104	87	87	60	20
Karnataka	Hubli	81	87	87	60	20
West Bengal	Malda	82	86	86	60	20
Maharashtra	Nashik	77	86	86	60	20
Andhra Pradesh	Vizianagaram	84	86	86	60	20
Tamil Nadu	Trichy	85	NA	85	60	20

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Andhra Pradesh	Anantapur	88	85	85	60	20
Telangana	Patancheru	85	NA	85	60	20
Meghalaya	Umsning	84	NA	84	60	20
Karnataka	Davangere	109	84	84	60	20
Odisha	Balasore	82	83	83	60	20
Daman and Diu	Daman	83	NA	83	60	20
Maharashtra	Solapur	74	82	82	60	20
Tamil Nadu	Madurai	64	82	82	60	20
Maharashtra	Nagpur	83	82	82	60	20
Odisha	Keonjhar	80	82	82	60	20
Himachal Pradesh	Sunder Nagar	82	NA	82	60	20
Madhya Pradesh	Singrauli	90	81	81	60	20
Odisha	Cuttack	81	81	81	60	20
Himachal Pradesh	Una	80	NA	80	60	20
Maharashtra	Sangli	77	79	79	60	20
Assam	Lakhimpur	79	NA	79	60	20
Madhya Pradesh	Chhindwara	84	78	78	60	20
West Bengal	Madinipore East	NA	78	78	60	20
Odisha	Sambalpur	77	78	78	60	20
Andhra Pradesh	Visakhapatnam	61	77	77	60	20
Telangana	Medak	NA	77	77	60	20
Madhya Pradesh	Sagar	102	77	77	60	20
Telangana	Mahaboobnagar	NA	77	77	60	20
Maharashtra	Latur	78	76	76	60	20
Karnataka	Dharwad	69	75	75	60	20
Jharkhand	Sindri	75	NA	75	60	20
West Bengal	Jalpaiguri	NA	75	75	60	20
West Bengal	Dinajpur North	NA	73	73	60	20
Punjab	Hoshiarpur	73	NA	73	60	20
Assam	Silcher	72	NA	72	60	20
Madhya Pradesh	Katni	NA	72	72	60	20
Andhra Pradesh	Srikakulam	72	72	72	60	20
Karnataka	Kolar	63	72	72	60	20
Karnataka	Gulbarga	95	72	72	60	20
Tamil Nadu	Chennai	81	71	71	60	20

APPENDIX-I PM_{10} Levels across India (Annual Average 2016/2015)

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Andhra Pradesh	Eluru	77	70	70	60	20
Assam	Sivasagar	70	NA	70	60	20
Madhya Pradesh	Satna	88	70	70	60	20
Maharashtra	Kalyan	NA	70	70	60	20
Telangana	Sangareddy	70	NA	70	60	20
Assam	Daranga	69	NA	69	60	20
Arunachal Pradesh	Naharlagun	69	NA	69	60	20
Maharashtra	Bhiwandi	NA	69	69	60	20
Madhya Pradesh	Amlai/Shahdol	NA	69	69	60	20
Andhra Pradesh	Kadapa	70	69	69	60	20
Telangana	Ramagundam	65	68	68	60	20
Telangana	Warangal	58	67	67	60	20
Andhra Pradesh	Kurnool	82	67	67	60	20
Goa	Goa	55	66	66	60	20
Karnataka	Belgaum	64	66	66	60	20
Andhra Pradesh	Nellore	66	66	66	60	20
Andhra Pradesh	Ongole	67	65	65	60	20
Telangana	Adilabad	NA	65	65	60	20
West Bengal	Coochbehar	NA	63	63	60	20
Andhra Pradesh	Rajahmundry	62	63	63	60	20
Andhra Pradesh	Chittoor	67	63	63	60	20
Telangana	Nizamabad	NA	63	63	60	20
Andhra Pradesh	Kakinada	62	62	62	60	20
Telangana	Nalgonda	76	60	60	60	20
Himachal Pradesh	Parwanoo	60	NA	60	60	20
Andhra Pradesh	Tirupati	62	60	60	60	20
Meghalaya	Shillong	59	NA	59	60	20
Odisha	Rayagada	50	59	59	60	20
Madhya Pradesh	Nagda	59	NA	59	60	20
Chhattisgarh	Korba	65	58	58	60	20
Odisha	Berhampur	54	58	58	60	20
Telangana	Kothagudem	NA	58	58	60	20
Tamil Nadu	Coimbatore	46	58	58	60	20
Tamil Nadu	Mettur	49	56	56	60	20
Kerala	Thrissur	48	55	55	60	20

STATE	CITY	2015 AVERAGE	2016 AVERAGE	YEARLY AVERAGE POLLUTION LEVELS 2016 OR 2015 (RECENT)	NAAQS	WHO
Himachal Pradesh	Shimla	55	NA	55	60	20
Karnataka	Bellary	NA	54	54	60	20
Kerala	Kottayam	61	54	54	60	20
Kerala	Thiruvananthapuram	55	53	53	60	20
Telangana	Karimnagar	64	52	52	60	20
Tamil Nadu	Salem	54	51	51	60	20
Kerala	Kochi	40	51	51	60	20
Kerala	Kozhikode	48	51	51	60	20
Kerala	Wayanad	37	50	50	60	20
Tamil Nadu	Cuddalore	56	49	49	60	20
Karnataka	Mysore	49	48	48	60	20
Kerala	Kannur	NA	48	48	60	20
Telangana	Khammam	60	48	48	60	20
Karnataka	Mangalore	36	47	47	60	20
Assam	Bongaigaon	47	NA	47	60	20
Himachal Pradesh	Manali	47	NA	47	60	20
Karnataka	Chitradurg	47	46	46	60	20
Kerala	Kollam	46	46	46	60	20
Karnataka	Mandya	42	45	45	60	20
Mizoram	Aizawl	44	NA	44	60	20
Kerala	Kasargod	NA	42	42	60	20
Karnataka	Karwar	NA	42	42	60	20
Kerala	Palakkad	47	41	41	60	20
Mizoram	Lunglei	40	NA	40	60	20
Karnataka	Bhadravati	NA	38	38	60	20
Kerala	Malappuram	44	37	37	60	20
Meghalaya	Khliehriat	37	NA	37	60	20
Himachal Pradesh	Dharamshala	36	NA	36	60	20
Meghalaya	Dawki	36	NA	36	60	20
Kerala	Idukki	NA	35	35	60	20
Puducherry	Karaikal	35	NA	35	60	20
Puducherry	Pondicherry	35	NA	35	60	20
Kerala	Alappuzha	45	35	35	60	20
Mizoram	Kolasib	33	NA	33	60	20
Mizoram	Champhai	33	NA	33	60	20
Meghalaya	Tura	30	NA	30	60	20
West Bengal	Darjeeling	NA	29	29	60	20
Meghalaya	Nongstoin	26	NA	26	60	20
Kerala	Pathanamthitta	24	26	26	60	20
Karnataka	Hassan	25	26	26	60	20

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Greenpeace is a global organisation that uses non-violent direct action to tackle the most crucial threats to our planet's biodiversity and environment. Greenpeace is a non-profit organisation, present in 40 countries across Europe, The Americas, Asia and the Pacific.

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Greenpeace has been campaigning against environmental degradation since 1971 when a small boat of volunteers and journalists sailed into Amchitka, an area north of Alaska, where the US Government was conducting underground nuclear tests.This tradition of 'bearing witness' in a non-violent manner continues today, and ships are an important part of all its campaign work.

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Taj Mahal on a hazy winter morning.

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