# Spare the Air

EXAMINING AIR POLLUTANT LEVELS IN 11 MAJOR CITIES ACROSS INDIA BASED ON THE LATEST W.H.O. GUIDELINES

GREENPEACE
ग्रीनपीस

# Spare the Air


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## CONTENTS



# INTRODUCTION

Air pollution in recent years has become one of the most critical environmental issues. According to the 2021 World Air Quality Report[1], almost every Indian city exceeded the recommended WHO air quality levels. In India, the national ambient air quality standards (NAAQS) for some pollutants are already higher than the outgoing WHO air quality guidelines.

On September 22, 2021, the WHO updated their air quality guidelines based on the latest insight to protect public health[2]. The organization has set the new guidelines in light of new scientific evidence over the past decade which portrays a significantly grimmer picture of the effects of both, long term and short-term exposure to air pollutants. There is enough evidence to establish that even low levels of exposure to air pollution is harmful for human health, and the impacts can worsen with chronic exposure. It is increasingly evident that there is no safe level of air pollution[3]. In India, cities across the country are breathing polluted air and, contrary to the popular opinion, air pollution is not just limited to northern Indian cities.

In order to highlight the gravity of the crisis, Greenpeace India has analyzed air quality data from eleven major Indian cities between 2021 and 2022. **Our analysis of the data collected from IQAir reveals that the average pollution levels in these cities are much higher than the updated WHO air quality guidelines**. The results indicate that air pollution is a public health crisis across northern and southern Indian cities. The latest stringent guidelines push many more cities into the category of dangerously polluted cities.

We need comprehensive, systemic, and time-bound action to reduce air pollution levels across the country. If we do not act now, many major cities in India could face the grim repercussions of pollution, as faced by cities such as New Delhi—where the perils of air pollution are stark and, dishearteningly, unequivocally accepted across socio-political lines as a reality.

# DATA AND METHODOLOGY

For this study, we analyze data collected by IQAir over the period between 22 September 2021 and 22 September 2022 to look at particulate matter levels in eleven major cities spread across India. These cities that are studied include Bengaluru, Bhopal, Chennai, Cochin, Hyderabad, Jaipur, Kolkata, Lucknow, Mumbai, Patna, and Pune. We focus on the three key contaminants, namely, $PM_{2.5}$, $PM_{10}$, and $NO_2$.

The WHO focuses on two different averaging methodologies for determining risks due to contaminants in the air**. First, they examine the annual average to study the impact of chronic exposure to these contaminants. And second, they examine the 99th percentile of distribution of the 24-hour averages across the year. This second metric highlights the peak levels of contaminants.** The 99th percentile is considered to ignore some of the extreme outlier data points. These peak levels can lead to severe short term health impacts owing to acute exposure, even if the exposure only lasts for a few days. Therefore, we have two separate guidelines, one for chronic exposure, and the other for acute exposure.

Based on the available data, we compare the observed air quality data in these eleven cities to the updated WHO standards. The revised guidelines are shown in the table below.

[1] https://www.iqair.com/in-en/newsroom/WAQR_2021_PR

[2] https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution

[3] https://www.sciencedirect.com/journal/environment-international/special-issue/10MTC4W8FXJ

**Table 1: 2005 WHO air quality guidelines, 2019 standards set by the central pollution control board, and the updated 2021 WHO air quality guidelines.**

| Pollutant | Averaging time | 2005 AQG* (µg/m³) | **2021 AQG* (µg/m³)** | 2009 NAAQS** (µg/m³) |
|---|---|---|---|---|
| **$PM_{2.5}$** Particulate matter ≤ 2.5µm | Annual | 10 | **5** | 40 |
| | 24-hour† | **25** | **15** | 60 |
| **$PM_{10}$** Particulate matter ≤ 10µm | Annual | 20 | **15** | 60 |
| | 24-hour† | **50** | **45** | 100 |
| **$NO_2$** Nitrogen dioxide | Annual | 40 | **10** | 40 Residential / Industrial / Rural area<br>30 Ecologically Sensitive Area |
| | 24-hour† | - | **25** | 80 Residential / Industrial / Rural area<br>80 Ecologically Sensitive Area |

* Air Quality Guidelines
** National Ambient Air Quality Standards
† 99th percentile (i.e., 3-4 exceedance days per year)

# RESULTS

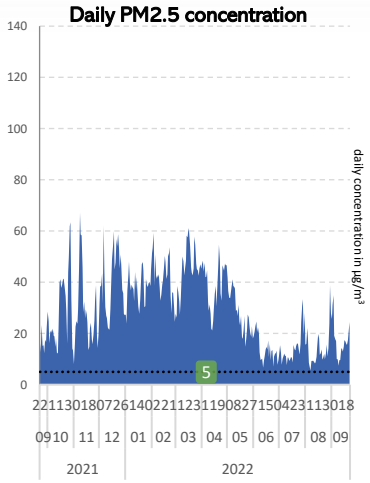
The results are nothing short of alarming for each of the cities under investigation. The updated WHO $PM_{2.5}$ standards push the air quality in all these cities to disturbing levels throughout the year. With the exception of $NO_2$ levels in Bhopal, all the cities have alarming to dangerously hazardous levels of all three pollutants for a majority of the year, with the annual average and 24-hour peaks frequently exceeding the latest WHO guidelines.

In the next section, we break down the details of the pollutant levels across each of the cities.

# Bengaluru, Karnataka

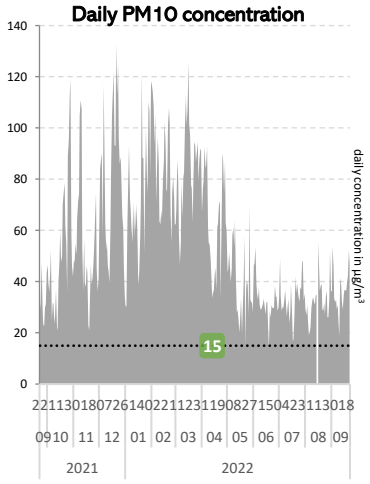
## PM2.5

We retrieve the records of PM2.5 levels in the city of Bengaluru on 366 days. The city averages an annual PM2.5 concentration of 29.01 µg/m³. This amounts to being 5.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99th percentile of 24-hour concentrations recorded in the city over this period was 61.46 µg/m³. This was 4.1 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 283 days or 77.32 % of all the days on record.



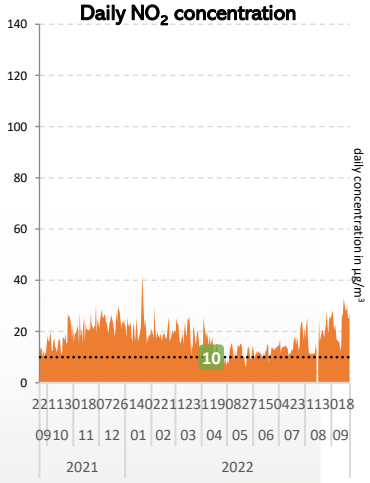

## PM10

We retrieve the records of PM10 levels in the city of Bengaluru on 365 days. The city averages an annual PM10 concentration of 55.14 µg/m³. This amounts to being 3.7 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 363 days or 99.45 % of all the days on record. The 99th percentile of 24-hour concentrations recorded in the city over this period was 122.22 µg/m³. This was 2.7 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 195 days or 53.42 % of all the days on record.




## $NO_2$

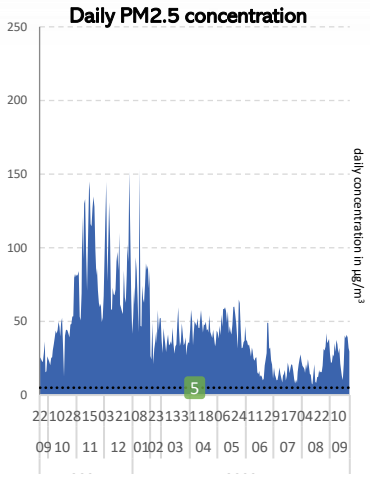
We retrieve the records of $NO_2$ levels in the city of Bengaluru on 365 days. The city averages an annual $NO_2$ concentration of 17.86 µg/m³. This amounts to being 1.8 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 342 days or 93.7 % of all the days on record. The 99th percentile of 24-hour concentrations recorded in the city over this period was 31.05 µg/m³. This was 1.2 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 44 days or 12.05 % of all the days on record.



# Bhopal, Madhya Pradesh

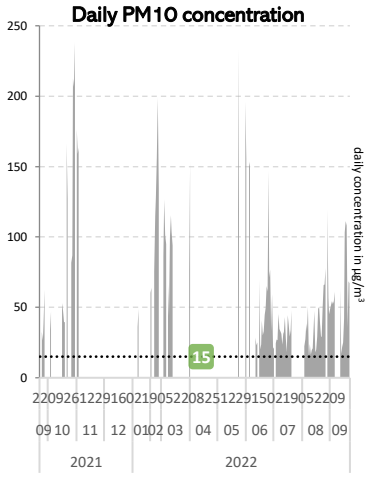
## PM2.5

We retrieve the records of PM2.5 levels in the city of Bhopal on 337 days. The city averages an annual PM2.5 concentration of 45.45 µg/m³. This amounts to being 9.1 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 337 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 142.76 µg/m³. This was 9.5 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 300 days or 89.02 % of all the days on record.



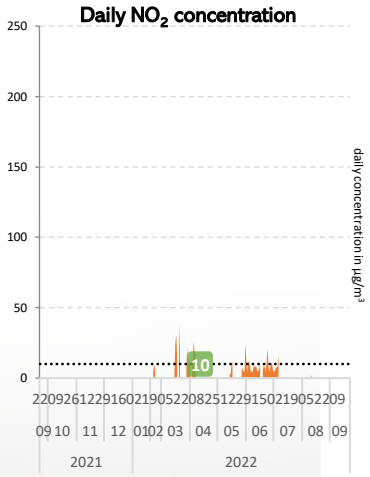

## PM10

We retrieve the records of PM10 levels in the city of Bhopal on 134 days. The city averages an annual PM10 concentration of 68.51 µg/m³. This amounts to being 4.6 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 133 days or 99.25 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 203.71 µg/m³. This was 4.5 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 76 days or 56.72 % of all the days on record.




## $NO_2$

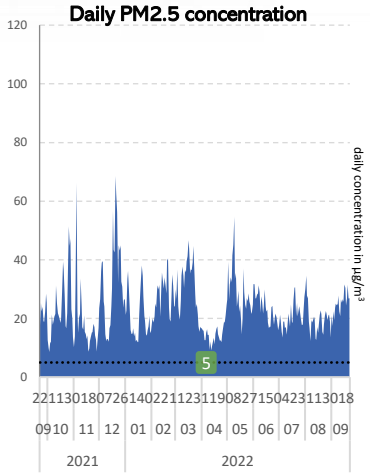
We retrieve the records of $NO_2$ levels in the city of Bhopal on 65 days. The city averages an annual $NO_2$ concentration of 10.18 µg/m³. This is marginally greater than the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city crosses this level of $NO_2$ concentration which can have a negative long term health impact on 26 days or 40 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 25.22 µg/m³. This was again marginally greater than the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 4 days or 6.15 % of all the days on record.



# Chennai, Tamil Nadu

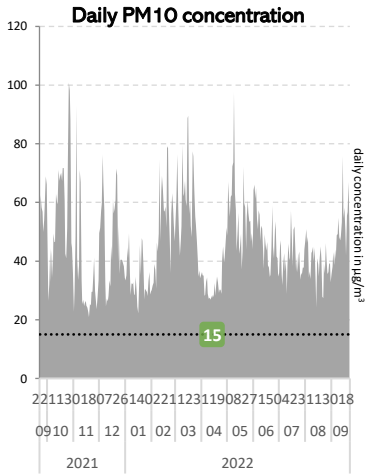
## PM2.5

We retrieve the records of PM2.5 levels in the city of Chennai on 366 days. The city averages an annual PM2.5 concentration of 23.81 µg/m³. This amounts to being 4.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 56.33 µg/m³. This was 3.8 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 306 days or 83.61 % of all the days on record.



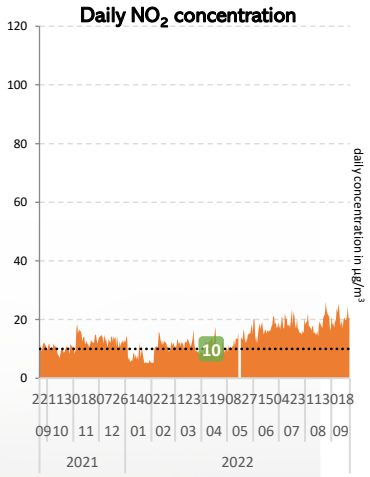

## PM10

We retrieve the records of PM10 levels in the city of Chennai on 366 days. The city averages an annual PM10 concentration of 45.9 µg/m³. This amounts to being 3.1 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 90.7 µg/m³. This was 2 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 170 days or 46.45 % of all the days on record.




## $NO_2$

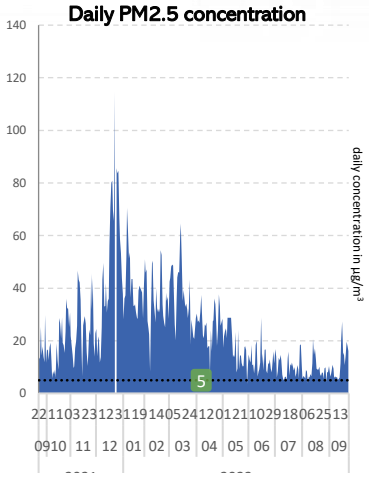
We retrieve the records of $NO_2$ levels in the city of Chennai on 364 days. The city averages an annual $NO_2$ concentration of 13.51 µg/m³. This amounts to being 1.4 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 291 days or 79.95 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 23.68 µg/m³. This was lower than the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records hazardous levels of $NO_2$ concentration on 2 days or 0.55 % of all the days on record. But they are ignored as statistical outliers.



# Cochin, Kerala

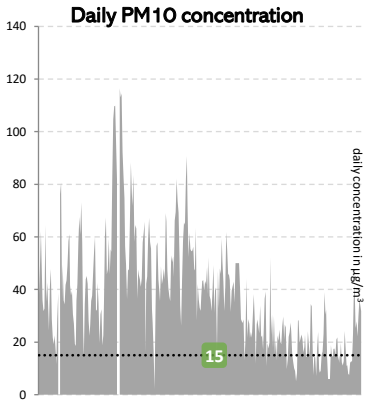
## PM2.5

We retrieve the records of PM2.5 levels in the city of Cochin on 351 days. The city averages an annual PM2.5 concentration of 24.11 µg/m³. This amounts to being 4.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 348 days or 99.15 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 82.25 µg/m³. This was 5.5 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 218 days or 62.11 % of all the days on record.



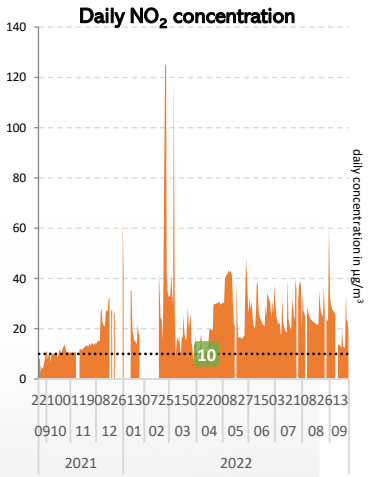

## PM10

We retrieve the records of PM10 levels in the city of Cochin on 349 days. The city averages an annual PM10 concentration of 37.99 µg/m³. This amounts to being 2.5 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 305 days or 87.39 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 109.72 µg/m³. This was 2.4 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 110 days or 31.52 % of all the days on record.




## $NO_2$

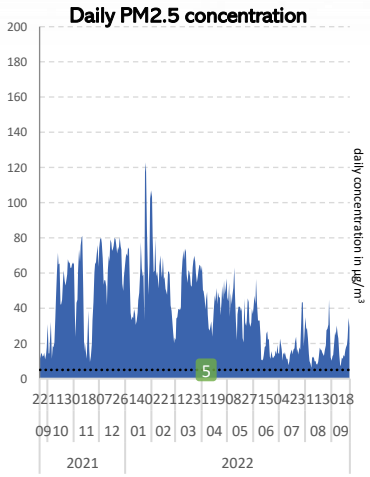
We retrieve the records of $NO_2$ levels in the city of Cochin on 307 days. The city averages an annual $NO_2$ concentration of 23.02 µg/m³. This amounts to being 2.3 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 284 days or 92.51 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 70.32 µg/m³. This was 2.8 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 116 days or 37.79 % of all the days on record.



# Hyderabad, Telengana

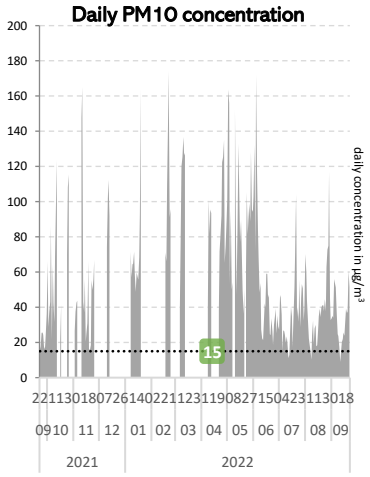
## PM2.5

We retrieve the records of PM2.5 levels in the city of Hyderabad on 366 days. The city averages an annual PM2.5 concentration of 40.91 µg/m³. This amounts to being 8.2 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 102.64 µg/m³. This was 6.8 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 300 days or 81.97 % of all the days on record.



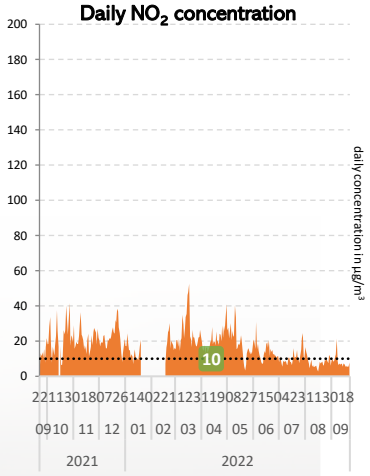

## PM10

We retrieve the records of PM10 levels in the city of Hyderabad on 237 days. The city averages an annual PM10 concentration of 57.84 µg/m³. This amounts to being 3.9 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 232 days or 97.89 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 163.38 µg/m³. This was 3.6 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 121 days or 51.05 % of all the days on record.




## $NO_2$

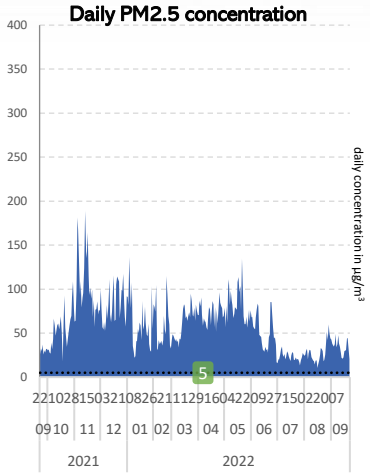
We retrieve the records of $NO_2$ levels in the city of Hyderabad on 337 days. The city averages an annual $NO_2$ concentration of 17.06 µg/m³. This amounts to being 1.7 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 258 days or 76.56 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 41.18 µg/m³. This was 1.6 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 53 days or 15.73 % of all the days on record.



# Jaipur, Rajasthan

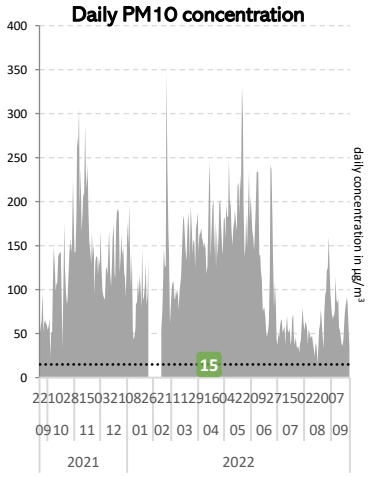
## PM2.5

We retrieve the records of PM2.5 levels in the city of Jaipur on 358 days. The city averages an annual PM2.5 concentration of 59.06 µg/m³. This amounts to being 11.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 358 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 152.01 µg/m³. This was 10.1 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 354 days or 98.88 % of all the days on record.



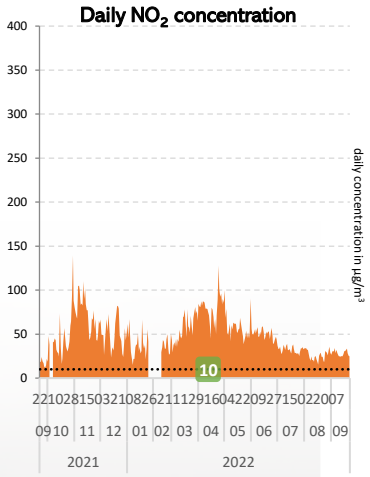

## PM10

We retrieve the records of PM10 levels in the city of Jaipur on 344 days. The city averages an annual PM10 concentration of 122.86 µg/m³. This amounts to being 8.2 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 344 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 290.12 µg/m³. This was 6.4 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 313 days or 90.99 % of all the days on record.




## $NO_2$

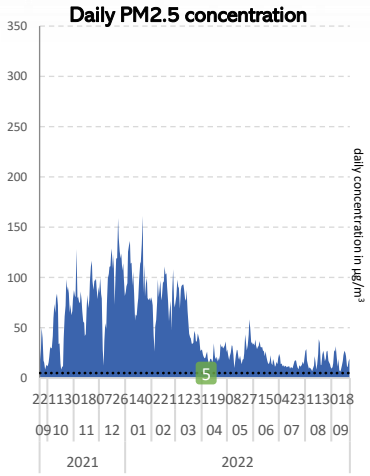
We retrieve the records of $NO_2$ levels in the city of Jaipur on 341 days. The city averages an annual $NO_2$ concentration of 48.27 µg/m³. This amounts to being 4.8 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 341 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 104.75 µg/m³. This was 4.2 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 302 days or 88.56 % of all the days on record.



# Kolkata, West Bengal

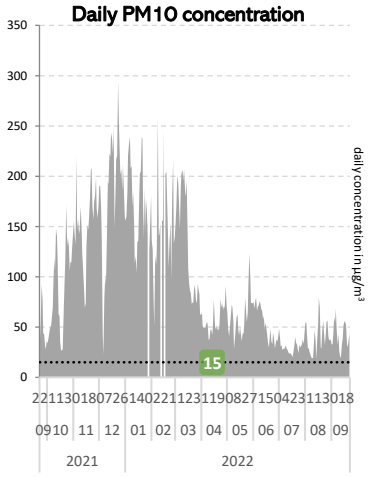
## PM2.5

We retrieve the records of PM2.5 levels in the city of Kolkata on 366 days. The city averages an annual PM2.5 concentration of 49.1 µg/m³. This amounts to being 9.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 134.38 µg/m³. This was 9 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 298 days or 81.42 % of all the days on record.



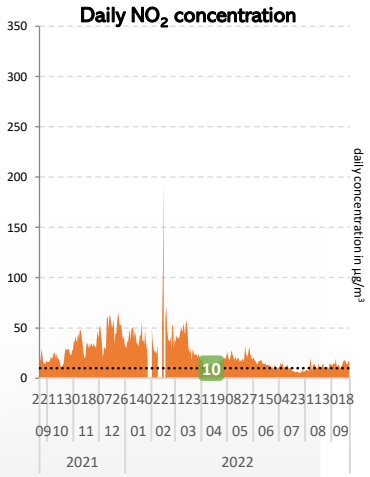

## PM10

We retrieve the records of PM10 levels in the city of Kolkata on 363 days. The city averages an annual PM10 concentration of 95.82 µg/m³. This amounts to being 6.4 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 363 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 248.24 µg/m³. This was 5.5 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 259 days or 71.35 % of all the days on record.




## $NO_2$

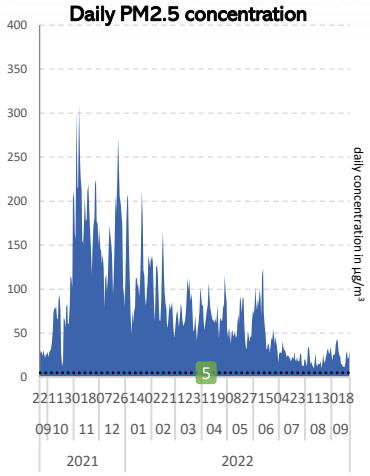
We retrieve the records of $NO_2$ levels in the city of Kolkata on 358 days. The city averages an annual $NO_2$ concentration of 25.49 µg/m³. This amounts to being 2.5 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 322 days or 89.94 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 63.67 µg/m³. This was 2.5 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 140 days or 39.11 % of all the days on record.



# Lucknow, Uttar Pradesh

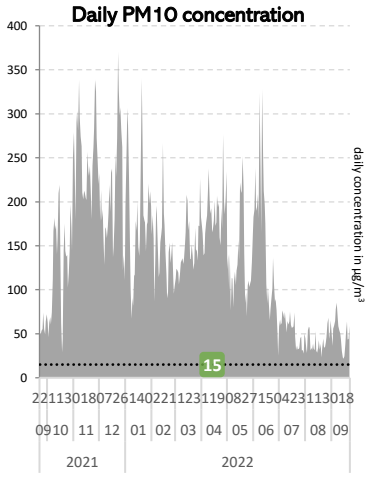
## PM2.5

We retrieve the records of PM2.5 levels in the city of Lucknow on 366 days. The city averages an annual PM2.5 concentration of 79.24 µg/m³. This amounts to being 15.8 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 246.52 µg/m³. This was 16.4 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 349 days or 95.36 % of all the days on record.



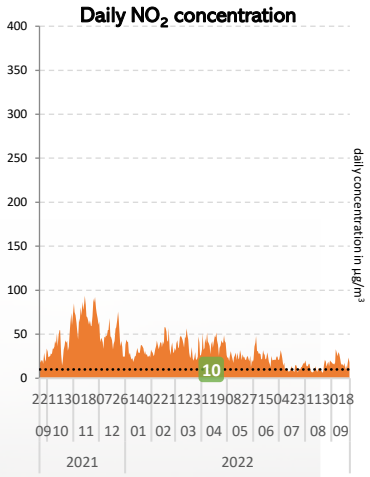

## PM10

We retrieve the records of PM10 levels in the city of Lucknow on 366 days. The city averages an annual PM10 concentration of 140.09 µg/m³. This amounts to being 9.3 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 331.29 µg/m³. This was 7.4 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 323 days or 88.25 % of all the days on record.




## $NO_2$

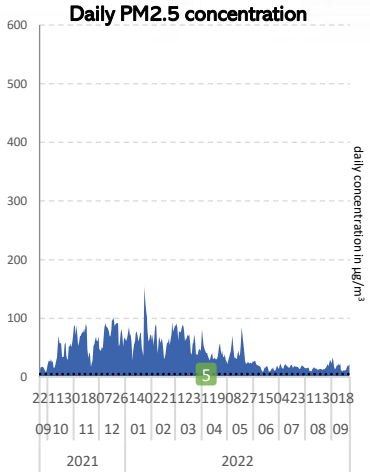
We retrieve the records of $NO_2$ levels in the city of Lucknow on 366 days. The city averages an annual $NO_2$ concentration of 32.95 µg/m³. This amounts to being 3.3 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 341 days or 93.17 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 86.32 µg/m³. This was 3.5 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 222 days or 60.66 % of all the days on record.



# Mumbai, Maharashtra

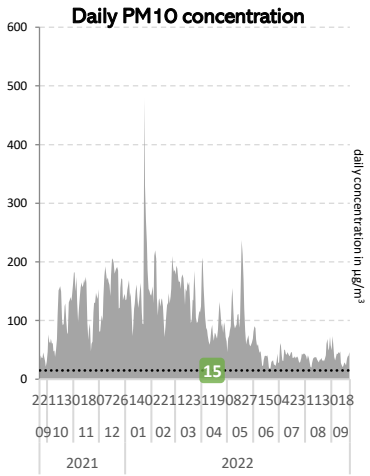
## PM2.5

We retrieve the records of PM2.5 levels in the city of Mumbai on 366 days. The city averages an annual PM2.5 concentration of 43.26 µg/m³. This amounts to being 8.7 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 102.15 µg/m³. This was 6.8 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 314 days or 85.79 % of all the days on record.



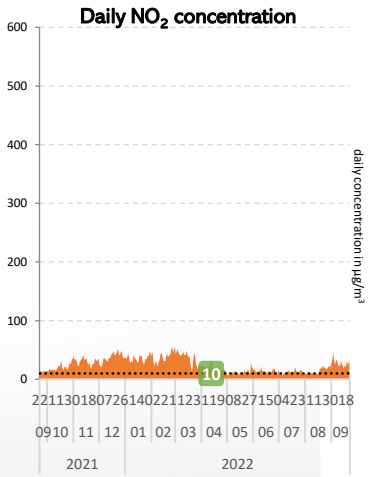

## PM10

We retrieve the records of PM10 levels in the city of Mumbai on 366 days. The city averages an annual PM10 concentration of 99.1 µg/m³. This amounts to being 6.6 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 233.49 µg/m³. This was 5.2 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 271 days or 74.04 % of all the days on record.




## $NO_2$

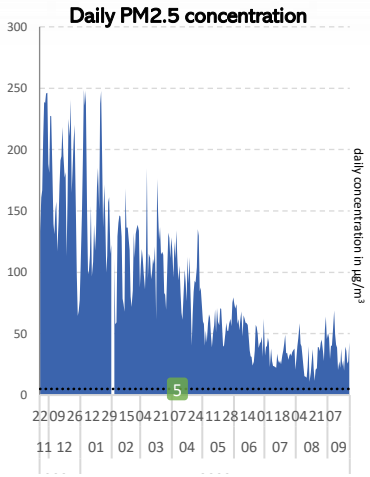
We retrieve the records of $NO_2$ levels in the city of Mumbai on 366 days. The city averages an annual $NO_2$ concentration of 24.32 µg/m³. This amounts to being 2.4 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 337 days or 92.08 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 51.1 µg/m³. This was 2 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 155 days or 42.35 % of all the days on record.



# Patna, Bihar

## PM2.5

We retrieve the records of PM2.5 levels in the city of Patna on 303 days. The city averages an annual PM2.5 concentration of 89.76 µg/m³. This amounts to being 18 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 303 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 246.3 µg/m³. This was 16.4 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 299 days or 98.68 % of all the days on record.

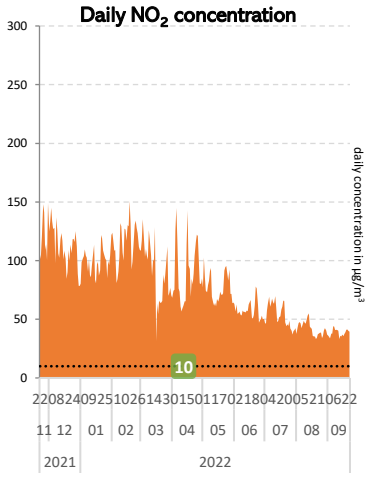



## PM10

We observe no PM10 records in the city of Patna in this period.

## $NO_2$

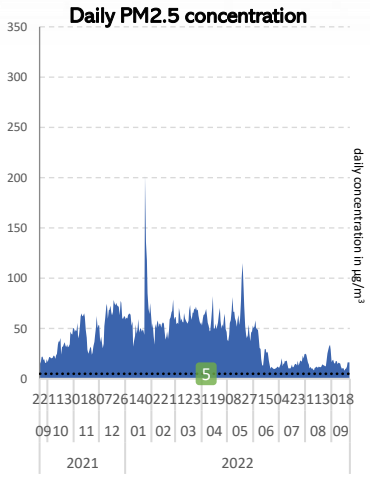
We retrieve the records of $NO_2$ levels in the city of Patna on 305 days. The city averages an annual $NO_2$ concentration of 79.74 µg/m³. This amounts to being 8 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 305 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 145.11 µg/m³. This was 5.8 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 305 days or 100 % of all the days on record.



# Pune, Maharashtra

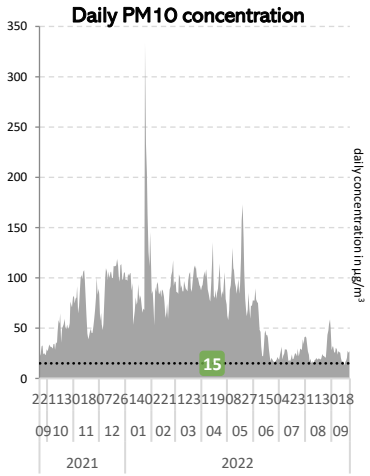
## PM2.5

We retrieve the records of PM2.5 levels in the city of Pune on 366 days. The city averages an annual PM2.5 concentration of 42.25 µg/m³. This amounts to being 8.5 times the safe levels (5 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM2.5 concentration which can have a negative long term health impact on 366 days or 100 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 105.48 µg/m³. This was 7 times the levels (15 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM2.5 concentration on 304 days or 83.06 % of all the days on record.



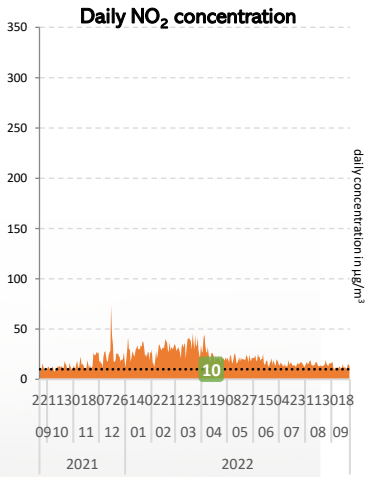

## PM10

We retrieve the records of PM10 levels in the city of Pune on 366 days. The city averages an annual PM10 concentration of 67.05 µg/m³. This amounts to being 4.5 times the safe levels (15 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of PM10 concentration which can have a negative long term health impact on 364 days or 99.45 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 166.67 µg/m³. This was 3.7 times the levels (45 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of PM10 concentration on 241 days or 65.85 % of all the days on record.




## $NO_2$

We retrieve the records of $NO_2$ levels in the city of Pune on 366 days. The city averages an annual $NO_2$ concentration of 20.43 µg/m³. This amounts to being 2 times the safe levels (10 µg/m³) as stated by the updated WHO guidelines. In this period, the city records such alarming levels of $NO_2$ concentration which can have a negative long term health impact on 352 days or 96.17 % of all the days on record. The 99$^{th}$ percentile of 24-hour concentrations recorded in the city over this period was 43.72 µg/m³. This was 1.7 times the levels (25 µg/m³) that can cause severe short term health crisis according to the revised guidelines. The city records such hazardous levels of $NO_2$ concentration on 100 days or 27.32 % of all the days on record.



# CONCLUSIONS

Exposure to severe air pollution increases the likelihood of premature death and many medical conditions including asthma, preterm birth, low birth weight, depression, schizophrenia, diabetes, stroke and lung cancer. This has even been found to be the case in places where air pollution levels meet the 2005 WHO Air Quality Guidelines. The health impacts also take a financial toll. Work absences due to sickness and lost life years due to premature death are accompanied by a substantial economic cost to society. Therefore, we must act on the air pollution crisis to safeguard public health and the nation's economy. The good thing is that we know the solution to air pollution. With the help of a coordinated and consistent action plan to tackle major sources of pollution, we can ensure cleaner air for our citizens.

### The following are our recommendations on actions that must be undertaken to address the air pollution crisis:

1. State pollution control boards need to set up more real-time air quality monitoring stations in affected cities in an equitable manner—based on population density, wind direction and source profile across the city.
2. State and city governments need to urgently seek alternatives to burning fossil fuels for power, transport and industry because burning fossil fuels is one of the major sources of air pollution. The local government must promote decentralized renewable energy solutions such as rooftop solar and address other contributors including vehicular emissions, waste burning, the construction sector, industrial emissions and biomass burning.
3. State and city governments must prioritize transportation plans for the masses rather than private vehicles by providing sustainable mobility solutions which are accessible and link all citizens to jobs, education, social services and recreation at an affordable cost and within reasonable journey time. The state should ensure the provision of transport infrastructure that revolves around walking and cycling—or for longer distances and people with additional needs, electric buses, and trains—and stop using fossil-fuel based modes of private transport.
4. Urban local bodies (ULBs) can introduce travel demand management in cities. Such practice influences travel behaviour through various policy measures, financial instruments, infrastructural changes and the encouragement of alternative modes of travel. The plan should include implementation of congestion charge and low emission zones in city centres.
5. The state should bring policies to convert all brick kilns to Zig-Zag technology to reduce emissions and close the kilns which do not comply.
6. The state must implement Continuous Emission Monitoring Systems for all industries and make the collected data available to the general public through the pollution control board's website. This is in order to enhance public pressure on polluting industries and, therefore, ensure compliance alongside using the same for enforcement purposes.
7. The local government must start communicating with local residents: Describe the health and financial problems of air pollution in their region and present the solutions. Governments must lead with policy and system-wide changes while supporting residents to take personal steps that benefit air quality.
8. The state must recognize that people occupy centre-stage in our cities and all plans should be for their common benefit and well-being. Thus, bringing a more equitable allocation of road space with people, rather than vehicles, as its main focus.

9. India's Central Pollution Control Board (CPCB) must introduce new national ambient air quality standards (NAAQS) based on the updated WHO air quality guidelines which are based on the latest scientific understanding.
10. Cities under the National Clean Air Programme (NCAP) should express the ambition to move to NAAQS in a time-bound manner before setting up a timeline to move towards the WHO guidelines.

## Emergency measures during pollution episodes:

- Early prediction of air pollution episodes
- Issuing health advisory to public, hospitals, and schools
- Access to distribute N 95 (PM2.5) masks for sensitive groups and people who will be impacted by the occupation. i.e., traffic police, bus conductors and drivers, waste workers, etc.
- Public announcements on how to protect the health with preventive measures.
- Enhance parking fee for vehicles by 3-4 times to encourage public transportation.
- Reduce fares of public transportation to enhance public transportation during pollution episodes.

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Greenpeace India is an independent campaigning organization that acts to change attitudes and behaviour, to protect and conserve the environment and to promote peace.