

December 2018



**AHMEDABAD**

# Air Information & Response Plan



**BIJAL PATEL**  
MAYOR



## AMDAVAD MUNICIPAL CORPORATION

Mahanagar Seva Sadan



### Mayor's Message

I am delighted to present Ahmedabad's updated Air Information and Response (AIR) Plan. The Ahmedabad Municipal Corporation (AMC) is proud to join international public health and air pollution experts from the Indian Institute of Public Health-Gandhinagar (IIPH-G), Natural Resources Defense Council (NRDC) and the Indian Institute of Tropical Meteorology, Pune (IITM) in developing and implementing this plan. The AMC greatly values the support of the Gujarat Pollution Control Board in developing and implementing the AIR plan.

In an effort to protect local communities from rising air pollution levels, the AMC has developed an air quality index (AQI) with the technical expertise of IITM and SAFAR (System of Air Quality and Weather Forecasting And Research). I am also proud that as part of the AIR Plan and AQI, the AMC is working schools across the city raise awareness and protect the health of the hundreds of children. To support the AIR Plan implementation, IIPH-G and NRDC are working with the AMC on developing information, education, and communication strategies for the AQI in Ahmedabad.

The Ahmedabad AIR Plan is the first of its kind in India. The plan is based on air quality programs and experiences from New Delhi, Beijing, Los Angeles, Mexico City and elsewhere.

The combined efforts of government agencies, health professionals, and community leaders can serve to effectively inform the public about rising air pollution health risks in India. At the heart of the plan is a health-based approach with steps to protect public health, especially the most vulnerable, from harmful pollution.

*Bijal Patel*  
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## Introduction

Air pollution is a major global public health risk in cities across the world. It is one of the highest-ranking environmental health challenges in the world, especially in developing countries like India. Ahmedabad is one of India's largest and fastest growing cities with a population of nearly 7 million. According to the Central Pollution Control Board, Ahmedabad has some of the highest air pollution levels in India. The World Health Organization has also found that Ahmedabad ranks among the most polluted cities in the world.<sup>[1]</sup>

In an effort to protect local communities from rising air pollution levels, the Ahmedabad Municipal Corporation (AMC) has developed two key tools: an air quality index (AQI), and this updated Air Information & Response (AIR) Plan. The Ahmedabad AQI is supported by technical expertise of the Ministry of Earth Sciences, Indian Institute of Tropical Meteorology, Pune (IITM) and Indian Meteorological Department's System of Air Quality and Weather Forecasting And Research (SAFAR) program. The original AIR Plan and AQI were launched in May 2017. Based on experience and feedback, the AMC has updated the AIR Plan.

The Ahmedabad AIR Plan is a health-based program designed to protect and increase awareness among residents on air pollution. With the AQI as the center point, the Ahmedabad AIR Plan focuses on health risk communication with immediate and longer-term actions to increase preparedness, information-sharing, and response coordination to reduce the health impacts of air pollution on vulnerable populations. The Ahmedabad AIR Plan is the first of its kind in India. It is developed by the AMC with national and international experts and draws lessons from global best practices on AQI health risk communication from Beijing, Los Angeles, Mexico City and New Delhi. AQI systems are also operational in some cities in India including, Delhi, Pune, Mumbai, yet Ahmedabad is the only city to have an AIR Plan to support the AQI.

## Purpose of the Ahmedabad AIR Plan

The central aim of this project is about saving lives and helping the people of Ahmedabad to create healthier communities, secure from the dangers of air pollution, and a prosperous economy. Through the AQI and the AIR Plan, lives can be saved from air pollution, while also opening collaborative pathways to pollution reduction.

The Ahmedabad AIR Plan focuses on five key strategies:

- 1. Health-Based AQI Warning and Interagency Coordination** - strengthen interagency coordination plan and alert system.
- 2. Public Awareness and Community Outreach** - update AMC website with AQI and AIR Plan; engage media on AQI and AIR plan; broadly disseminate information, education and communication (IEC) materials.
- 3. Focused Activities for Vulnerable Groups** - disseminate and update pamphlets, hoardings, videos, SMSs; expand school flag program that corresponds to daily AQI levels.
- 4. Capacity Building Among Medical Professionals** - engage with private and public medical professionals to build health awareness and protection strategies on air pollution.
- 5. Set Priorities for Air Pollution Mitigation** - identify key interventions for mitigation based on local experts and international practices with support from the Ahmedabad Expert Working Group.

## **Organization and Implementation of the Ahmedabad AIR Plan**

As the lead agency, the AMC Health Department has the overarching responsibility for the coordination of the AQI and AIR Plan related to health activities. This includes monitoring the daily AQI and alerts, and disseminating public health messages to local departments, community service providers and the Gujarat State Pollution Control Board. The AMC Health Department also works with the AMC press office to increase media coverage, including local language and social media, around protection from harmful air pollution levels.

The AIR Plan serves to focus attention on those individuals who are most at risk from air pollution, including people with respiratory and heart ailments, children, pregnant women, outdoor workers and the elderly. The Plan also focuses on creating awareness among individuals and organizations, such as Urban Health Centres (UHCs) and link workers, who frequently work with at-risk populations and can provide early diagnosis of asthma and other respiratory illnesses. Individuals and community groups are also essential in fighting the effects of air pollution. Individuals can take specific preventative steps to protect themselves, their families, and their communities from harmful air pollution. These steps include learning about early signs of respiratory and cardiovascular illness and limiting outdoor activities, using masks and air filters, as well as, raising awareness on pollution levels.

The media is vital in spreading the word about air pollution and the AQI. It plays an essential awareness-building role by sharing news about health threats; and can aid in increasing public health protection by running ads and providing local information. Newspaper reports on the AQI and the health risk communication have proven to be very effective, based on stakeholder feedback in Ahmedabad on the AIR Plan and AQI.

### **Key Stakeholders of the Ahmedabad AIR Plan**

*The Ahmedabad AIR Plan is part of a broader collaboration between AMC and public health and policy experts at the Indian Institute of Public Health, Gandhinagar, and Natural Resources Defense Council as well as Indian Institute of Tropical Meteorology and Indian Meteorological Department's SAFAR project.*

The Gujarat State Pollution Control Board is also critical to the creation of the plan, as are key local researchers and civil society groups. The combined efforts of government agencies, health professionals, and community leaders can serve to effectively inform the public about rising air pollution related health risks in India, and the steps they can take to protect community and individual health.

The original AIR Plan released in May 2017 and this updated December 2018 draft were developed based on extensively engagement by the AMC along with IIPHG, NRDC and IITM through a series of stakeholder discussions on air pollution in India and Ahmedabad. In December 2016, hosted by the Honorable Mayor, the AMC and partners convened an international workshop “*Air Pollution and Health: Laying the Foundation for Effective Use of Ahmedabad Air Quality Index*”, and released an underlying issue brief on the evidence base for creating the AIR Plan, “*Protecting Health from Rising Air Pollution in Ahmedabad.*” In February 2017, the AMC and partners convened another discussion on the draft *Air Information and Response Plan* for the city.

As part of the updated AIR Plan in 2018, the AMC and partners convened key India and international experts for a major workshop on “*The Role of Cities in Addressing Air Pollution to Protect Public Health.*” The Honorable Mayor also released a new issue brief focused on health-risk communication, “*Getting the Word Out: Air Pollution Communication Strategies Health Risk Communication on Ahmedabad's Information, Outreach and Communication Materials and School Flags Program.*”

## **Air Pollution Levels and Health Effects in Ahmedabad**

While sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), ozone (O<sub>3</sub>), ammonia (NH<sub>3</sub>), carbon monoxide (CO), coarser particles (PM<sub>10</sub>), fine particles (PM<sub>2.5</sub>), lead (Pb), arsenic, nickel, benzene and benzo-a-pyrene are all health-harming pollutants, PM<sub>10</sub> and PM<sub>2.5</sub>, are the primary pollutants of concern and are most frequently monitored in Ahmedabad. This is because PM<sub>10</sub> and PM<sub>2.5</sub> can penetrate deeply into the respiratory tract and pose grave health risks.

Since at least 2008, Ahmedabad has exceeded both WHO standards and India's air quality standards for particulate matter. The WHO Global Ambient Air map reports annual mean concentrations of 100 µg/m<sup>3</sup> for PM<sub>2.5</sub> and 83 µg/m<sup>3</sup> for PM<sub>10</sub>,<sup>[2]</sup> in Ahmedabad for 2013 and 2012, respectively.<sup>[3]</sup> PM<sub>10</sub> levels in Ahmedabad exceeded permissible limits for all five years between 2008 and 2012. They exceeded the national standards in India, which are less restrictive than the WHO guidelines, by 30–50 percent.<sup>[4]</sup> Similarly, studies show that PM<sub>2.5</sub> levels in Ahmedabad also exceed national standards.<sup>[5]</sup> According to air pollution experts, Ahmedabad's high PM<sub>2.5</sub> and O<sub>3</sub> levels, can pose serious health risks, such as more premature deaths, increased hospitalizations and emergency room visits for respiratory and cardiovascular illnesses, allergic effects, increased risks of bacterial or fungal infection and fibrosis.<sup>[6]</sup>

In 2010, Ahmedabad experienced over 4,900 premature deaths attributed to excessive ambient air pollution, as estimated by recent research.<sup>[7]</sup> Deteriorating air quality in Ahmedabad has also resulted in serious health concerns including increased morbidity, especially affecting vulnerable populations. With the new AQI and AIR Plan, Ahmedabad experienced several poor air quality, especially during Diwali and winter in 2017 and 2018. Air pollution remains a growing problem with rapid urbanization and vehicle growth.

### **Ahmedabad Pollution Sources**

The World Health Organization's urban air quality database, and several international and Indian studies have identified Ahmedabad as one of the most polluted cities in the world.<sup>[8]</sup> Additionally, the Gujarat Pollution Control Board (GPCB), located in Gandhinagar, is actively working with the city of Ahmedabad to address air pollution through a city clean air program.<sup>[9]</sup> New Delhi has dominated the list of most polluted cities in the world and, in response, has developed the "Graded Response Action Plan" in 2018 to control sources of air pollution. Other cities in India are taking action, including efforts outlined in the draft "National Clean Air Plan," also released in 2018.

Air pollution is emitted from several local sources in Ahmedabad. Available studies suggest that rapid urban growth has led to increase in air pollution from vehicle-related emissions and stationary sources in Ahmedabad. From 2001 to 2011, the number of vehicles, including motorcycles and scooters, reportedly doubled in Ahmedabad, while the population grew at a rate of 58 percent.<sup>[10]</sup> Ahmedabad has two thermal coal-fired power plants: the 800 MW Gandhinagar plant and the 400 MW Sabarmati plant, one of the oldest in India. The city also has almost 3,000 industrial units including 855 chemical factories, 511 foundries and 380 textile plants among others.<sup>[11]</sup> The surrounding low-efficiency brick kilns and trash burning also contribute to air pollution in the city.

### **Ahmedabad Emission Inventory**

An emission inventory for Ahmedabad was developed by IITM's SAFAR Programme in 2017.<sup>[12]</sup> It covers the Ahmedabad Metropolitan Region (30 km x 35 km domain) which includes Ahmedabad, Gandhinagar city area, and surrounding villages to facilitate accurate air quality forecasting. The emission inventory uses a bottom up approach, with a high spatial resolution of 1.67 km x 1.67 km. It considers all eight criteria pollutants that the Indian National Ambient Air Quality Standards (NAAQs) covers: Oxides of Nitrogen (NO<sub>x</sub>); Carbon Monoxide (CO); Black Carbon (BC); Organic Carbon (OC); PM<sub>2.5</sub>; PM<sub>10</sub>, Sulphur Dioxide (SO<sub>2</sub>) and Volatile Organic Compounds (VOCs).

The emission inventory relies on a major data collection effort to quantify air pollution sources (see Table 1) directly through on-the-ground field surveys and indirectly from reviews of government and industry records. More than 200 student-volunteers collected over 81,000 survey data points and researchers collected data from local authorities, such as the AMC, Gandhinagar, state-level GPCB, and individual industrial site operators, such as local power plants.

**Table 1: Sources of air pollution and related activities that were considered for the IITM Emissions Inventory.**

	Sectors	Source of Pollution	Data collected for
1	Transport	On road vehicles	Number of vehicles, existing vehicular technology or age of vehicle, vehicle density on road, vehicle kilometres travelled (km/day), traffic composition, fuel type and quantity of fuel used, use of vehicle (hr/day or month or year)
		Paved and unpaved roads	Number of wet days, road surface silt loading surface material silt content, mean vehicle speed and mean weight of vehicle traveling on road
2	Residential sector	Cooking and heating	Total area – slum or other residential, number of households and slum pockets in the area, number of families and family size, type of fuel used and quantity of fuel required for cooking or heating purposes, time for cooking/heating practices, and stove type used
3	Commercial sector	Cooking and heating activity in hotels & restaurants, street vendors, use of generator sets	Number of hotels & restaurants, street vendors, time for cooking / heating practices, stove type used, and type and quantity of fuel used
4	Industrial sector	Use of fossil fuel	Type of industry located in study area – industrial location, number of industrial zones, fuel type used, fuel consumption (daily/monthly), details of installed emission control devices, operation type (days), and production capacity
5	Agricultural sector	Crop production, agricultural burning, agricultural pumps	Type of crop cultivated, area under production crop yield, type of land and mode of irrigation, use of fertilizer and pesticide, quantity of waste burned, composition of waste burned, hours of usage of pumps, number of pumps, and size of pumps
8	Waste	Solid waste burning, solid waste disposal sites	Composition of waste, quantity of Municipal Solid Waste generated, quantity of waste burned and mode of burning, and fraction of MSW disposed to solid waste disposal sites
9	Other Sources	Commercial or industrial generators	Hours of power cut off, number of generators, capacity of generators

Source: IITM (2017)

The key results from the Emissions Inventor reveal that for small particles (PM<sub>2.5</sub>), two sectors – transportation and industry – are responsible for more than two-thirds of polluting emissions. The other contributors were wind-blown dust (21%), residential emissions from activities like solid fuel combustion (7%), and open trash burning (3%). Overall, the results revealed that the transport sector is the largest contributor to PM<sub>2.5</sub> (see Fig.1), ozone precursors (NO<sub>x</sub> and VOCs), and carbon monoxide (results not shown graphically here). Wind-blown dust contributes the most to coarse particle (PM<sub>10</sub>) levels (see Fig.1). Industrial emissions contribute most to health-damaging SO<sub>2</sub> pollution. The emission inventory includes a sectoral breakdown for each pollutant of concern, to allow for a detailed understanding of local conditions.

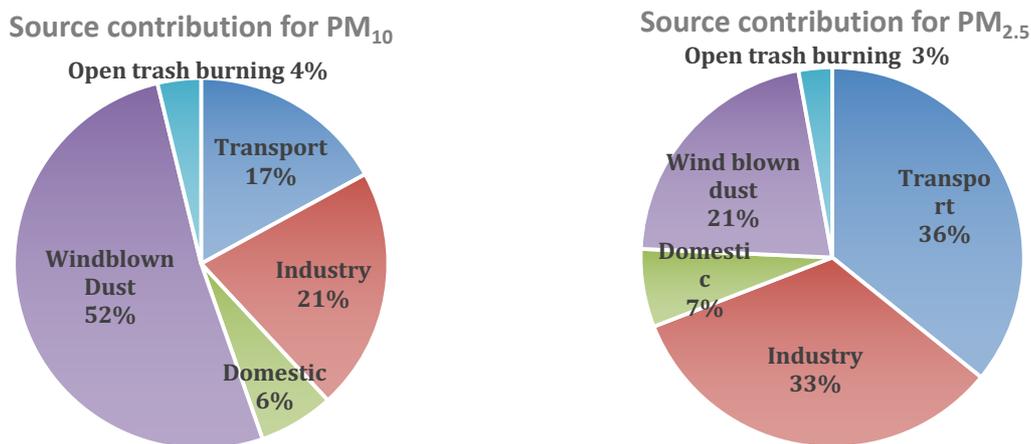


Figure 1: Source contributions for key pollutants PM<sub>10</sub> and PM<sub>2.5</sub>. Source: IITM Emission Inventory (2017).

The emission inventory carried out by IITM provides multiple data points that help policy makers and experts working on air pollution mitigation in designing informed, data-based air pollution reduction strategies for the city of Ahmedabad.

### Ahmedabad's AQI Developed with SAFAR

Ahmedabad's AQI is part of SAFAR's network in Mumbai, New Delhi and Pune. The AQI is an independent effort of the Indian Ministry of Earth Sciences and complements the AQI implemented by the Central Pollution Control Board under the Ministry of Environment, Forest and Climate Change and stations by the Gujarat State Pollution Control Board.

For Ahmedabad, SAFAR installed and operates an air quality monitoring network with 8 stations across the city of Ahmedabad, located in Bopal, Satellite, Pirana, Raikhad, Navrangpura, Rakhial, Chandkheda and the Airport (see Fig.2). SAFAR also provides location-specific information on air quality in near real-time and forecasts 1-2 days in advance.<sup>[13]</sup> This information is combined with an early warning system of weather parameters.

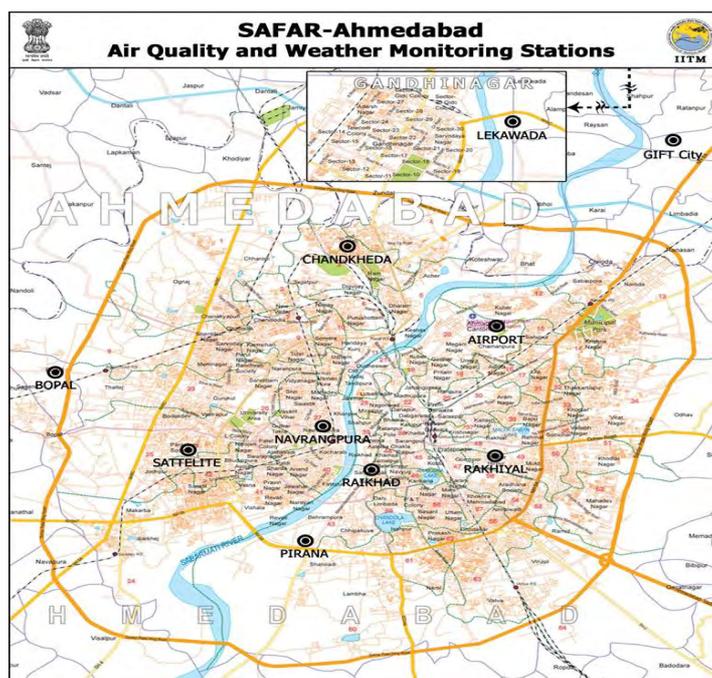


Figure 2. Map of SAFAR Air Quality Monitoring Stations in Ahmedabad and Gandhinagar. Source: IITM (2017)

## AQI Scale and Colour-Coded System

The Ahmedabad AQI, as operated by SAFAR, comprises of eight pollutants with sub-indices and health breakpoints calculated for each: PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>, NH<sub>3</sub>, and Pb. These eight have short-term (up to 24-hours) India National Ambient Air Quality Standards.<sup>[14]</sup> Breakpoints for the five main pollutants that are most prevalent are as follows (see Fig.3): <sup>[15]</sup>

Air Quality Descriptor	AQI Overall Value	PM <sub>2.5</sub> (µg/m <sup>3</sup> ) 24-hr average	PM <sub>10</sub> (µg/m <sup>3</sup> ) 24-hr average	O <sub>3</sub> (ppb) 8-hr average	NO <sub>2</sub> (ppb) 24-hr average	CO (ppm) 8-hr average
Good	0-100	0-60	0-100	0-50	0-43	0-1.7
Moderate	101-200	61-90	101-250	51-84	44-96	1.8-8.7
Poor	201-300	91-120	251-350	85-104	97-149	8.8-14.8
Very Poor	301-400	121-250	351-430	105-374	150-213	14.9-29.7
Severe	401-500	251-350	431-550	375-450	214-750	29.8-40

Figure 3. Ahmedabad AQI scale. Source: SAFAR (2013)

The Ahmedabad AQI uses five AQI categories: Good + Satisfactory, Moderate, Poor, Very Poor, and Severe. Each of these categories is based on ambient concentration values of air pollutants and their likely health impacts (known as health breakpoints).<sup>[16]</sup> AQIs additionally incorporate a more comprehensive data set and a more advanced health assessment model that evaluates statistics on data for diseases including hospital visits, admissions, mortality data and weather conditions.<sup>[17]</sup>

The Ahmedabad AQI uses a system in which SAFAR calculates its AQI in two parts: first by forming sub-indices and individual AQI readings for each air pollutant; and second, by determining the health-relevant breakpoints of these sub-indices. Breakpoints are decided by the national ambient air quality standards (NAAQS) in conjunction with epidemiological studies on air pollution exposures and adverse health risks. Different air pollutants pose health risks to different sensitive groups, when their AQI exceeds 100. The raw concentration measurements from monitoring stations are converted into separate AQI sub-index values for each air pollutants that comprise the AQI. The highest of these sub-index AQI values determines the overall AQI value for the day.

When the AQI is above 100, some countries also report which groups are especially vulnerable or sensitive to that pollutant, for example, children, or people with asthma or heart disease. If two or more individual air pollutants have AQI values over 100, all sensitive groups are reported. For example, if the AQI is 140 for particle pollution and 105 for ozone, the AQI value that day would be announced as 140 for particle pollution, and also note that ozone smog levels are high, alerting sensitive groups.<sup>[18]</sup> Some countries provide both information on today's AQI and forecast for the next day's AQI. This helps people plan their outdoor activities for times when air quality is better, in order to protect their health.

The Ahmedabad AQI and forecasts are available on the AMC website as part of the Ahmedabad AIR Plan. The SAFAR website at [safar.tropmet.res.in/](http://safar.tropmet.res.in/) provides the daily AQI and the associated health impacts for the cities of Delhi, Pune, Mumbai and Ahmedabad, along with the next day's forecast.<sup>[19]</sup> In addition to the website, people can download the SAFAR-Air app on their smart phones. Ahmedabad has several Digital Display Board System that displays current air quality data to citizens by setting up large LED screens in populated areas in each of the cities.

AQI information is also available on SAFAR Air Health Alert System (SAHAS) ([safar.tropmet.res.in/sahas/](http://safar.tropmet.res.in/sahas/)). SAHAS serves as an early warning system and provides a list of actions for public, doctors, and local administration on days when air quality poses a health risk.

## Ahmedabad Air Information and Response (AIR) Strategies

### 1. Health-Based AQI Warning and Interagency Coordination

As part of the Air Information & Response Plan, the AMC will issue a health alert when the air quality index is forecasted to be “Very Poor” (levels 301 – 400) and a health warning when the air quality index is forecasted to be “Severe” (levels 401 – 500).

**A Health Advisory** is issued to vulnerable groups when the air quality index is forecasted “Poor” (levels 201 – 300). Information about alerts will be shared with the Gujarat Pollution Control Board.

Actions to be carried out under health advisory:

- Nodal officer to inform relevant departments, medical facilities of air quality and instruct schools to hoist “orange” coloured flag.

**For Health Alert:** An AIR health alert would be called when AQI levels are forecasted to be 301 or greater in the next 24 hours.

Actions to be carried out under health alert:

- Nodal officer to inform urban health centres as well as private medical practitioners including pulmonologists, paediatricians to alert them to expect and be prepared for more cases of respiratory health effects

**For Health Warning:** An AIR health warning would be called when AQI levels are forecasted to be equal to or greater than 401 in the next 24 hours.

Actions to be carried out for a health warning:

- i. Nodal Officer
  - Nodal officer to inform urban health centres as well as private medical practitioners including pulmonologists, paediatricians to expect and be prepared for more cases of respiratory health effects
  - Nodal officer to inform 108 EMRI Ambulance Service that air pollution levels are forecasted at “Severe”
  - Nodal officer to inform other AMC departments including transport, traffic police, estate department, schools & colleges, and environmental management
- ii. Media
  - Publish AIR Health Warning in print and broadcast media, including newspapers, radio, and television

## AQI Colour Signal System for AIR Health Alerts & AIR Health Warnings

The AMC issues AQI alerts, as an additional means of communication by using the following colour signal system (see Fig.4).

Air Quality Index (AQI)	PM 2.5 Health Advisory	PM 2.5 Health Effect Statement	Overall Associated Health Impact with AQI Level
Good (0 – 100)	No cautionary action required	Air pollution poses little or no risk	Minimal impact
Moderate (101 – 200)	Unusually sensitive people should consider reducing prolonged or heavy exertion and heavy outdoor work	Air quality acceptable for general public but moderate health concern for sensitive people	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor (201 – 300)	Children and adult with heart or lung disease, should reduce prolonged or heavy exertion and limit outdoor activity	Children and adult people at risk. More chances of precipitating respiratory symptoms in sensitive individuals.	May precipitate severe attack on short term exposure in high risk individuals and respiratory symptoms (breathing discomfort) in normal individual on long term exposure.
Very Poor (301 – 400) Triggers <b>“Health Alert”</b>	Everyone should reduce prolonged or heavy exertion. More caution for children or adult with heart or lung disease.	Triggers health alert. Everyone may experience more health effects. Significant increase in respiratory effects in general population	May cause mild respiratory problems in normal individual/ more pronounced in people with lung and heart disease.
Severe (401 – 500) Triggers <b>“Health Warning”</b>	Everyone should avoid all outdoor physical activity. Sensitive individual should remain indoor with minimal activity.	Should be declared as emergency condition. Serious risk of respiratory effect in general population as high risk.	May cause respiratory effects even on healthy people and serious health impacts on people with lung and heart diseases. The health impacts may be experienced even during light physical activity

Figure 4. AQI index value ranges are shown on the left; associated public health impacts in the middle; and air quality descriptors on the right. Source: IITM (2017)

### Interagency Coordination Plan

Successful implementation of the AIR Plan requires coordinated action between many diverse stakeholders, including government departments; health care professionals including emergency medical personnel, health centre staff, and hospital staff; and community groups.

Following the forecasting of air pollution events, immediate notification of the public and all those participating in the response is critical to ensure the plan is activated (see Fig.5).

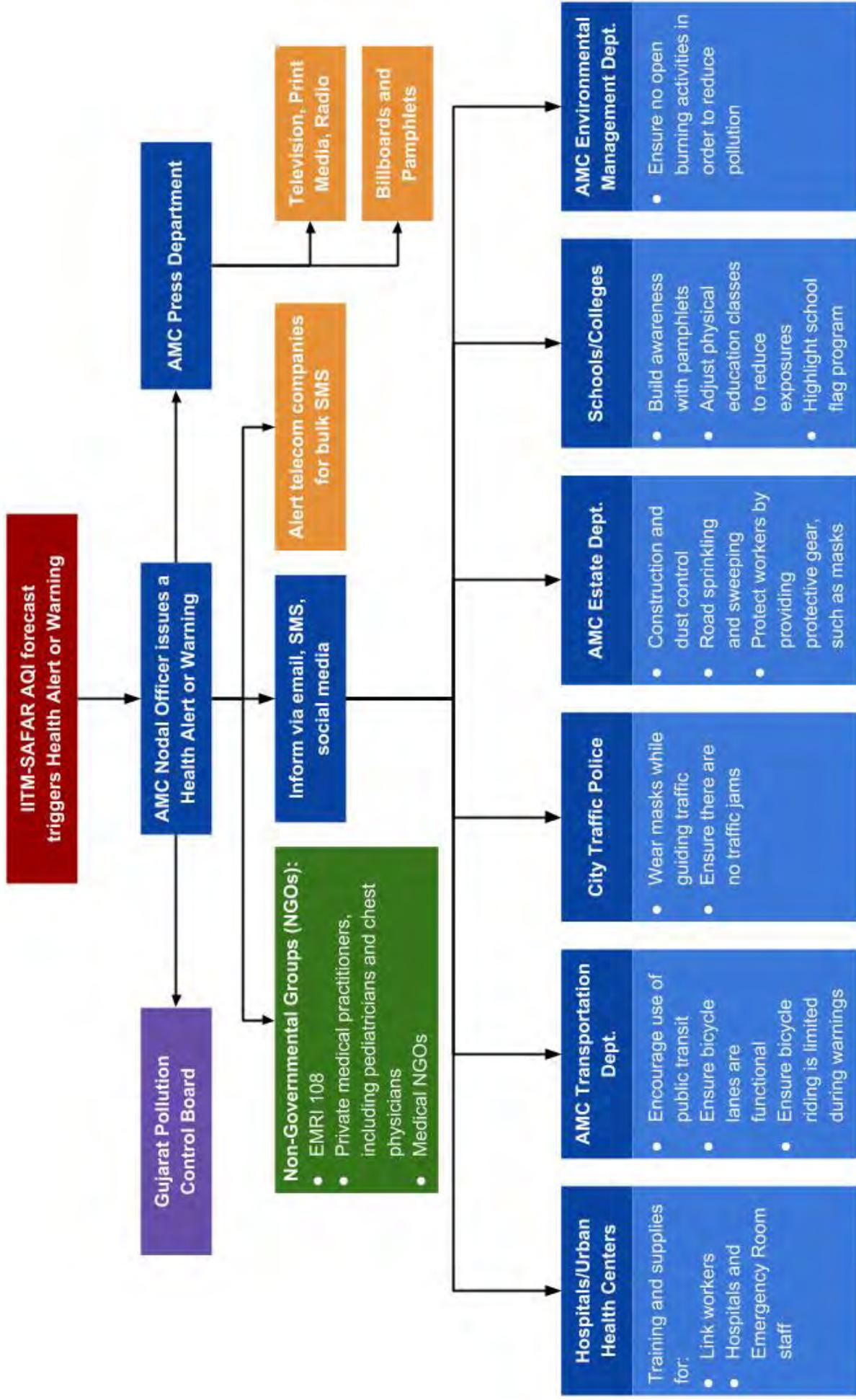


Figure 5. AIR Plan communications. Source: Limaye et al. (2018)

## 2. Public Awareness and Community Outreach

The AMC will update their website with AQI and AIR Plan; engage media on AQI and AIR plan; develop information, education and communication (IEC) materials (see Fig.6 and Appendix).

The AMC and partners will focus on:

- Disseminating and updating information, education and communication (IEC) materials for hoardings, pamphlets and videos for general public awareness.
- Updating AMC website with AQI and AIR Plan which can also provide access to useful information on air quality related FAQs.
- Engaging media on AQI and AIR plan for regular broadcast of AQI in newspapers and associated health advisories whenever issues by AMC.



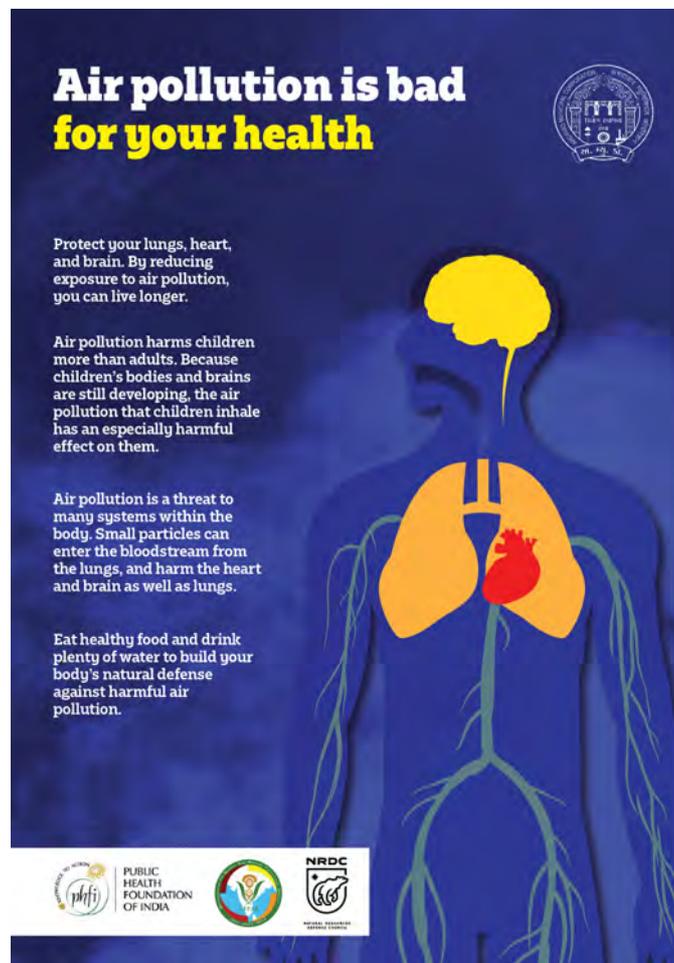


Figure 6. New communication materials developed by the AMC, with recommendations from the Expert Working Group (Dec. 2018)

### 3. Focused Activities for Vulnerable Groups

The Ahmedabad Municipal Corporation will disseminate and update pamphlets, hoardings, videos, SMSs to increase awareness of vulnerable groups. AMC will continue to implement the school flag programme (see Fig.7).

The AMC and partners will focus on:

- Implementing school flag programme that coordinates with schools to display coloured flags corresponding to AQI levels for each day.
- Studying chronic respiratory illness patients and children sensitization programmes with the help of government and private doctors.
- Developing specific sensitization programmes for communities living in high level AQI localities of Ahmedabad
- Conducting asthma clinics & pulmonary health promotion programme.
- Sending SMS and WhatsApp Alerts to asthma/Chronic Obstructive Pulmonary Disease patients



Figure 7. Students from an Ahmedabad school demonstrating the colored flags used a part of school flags programme. Photo credit: Ahmedabad Municipal Corporation.

#### 4. Capacity Building Among Medical Professionals

The AMC will engage with private and public medical professionals to build health awareness and protection strategies on air pollution (see Fig.8).

The AMC and partners will focus on:

- Trainings of medical and paramedical workforce to build their capacity on air pollution, health and mitigations measures.
- Engage with private and public medical professionals to build health awareness and protection strategies on air pollution.
- Work with institutions specializing in public health and medical sciences to conduct epidemiological studies to ascertain impact of air pollution on health.



Figure 8. Participants at a workshop on air pollution organized by the AMC. Photo Credit: NRDC (2018)

#### 5. Set Priorities for Air Pollution Mitigation

Mitigation is critical to improve the air quality in Ahmedabad (see Table 2). Working closely with the GPCB, the AMC, and the Ahmedabad Expert Working Group, partners will:

- Engage and drawn upon expertise of local institutions and experts to develop air quality improvement recommendations for the city.
- Analyze 1-2 key sectors in more depth and detail out interventions required to reduce pollution.
- Analyze and develop a compendium of best practices based on national and international experiences of other cities

**Table 2. Suggested Agency Activities for High Pollution Levels**

<b>Air Pollution Level</b>	<b>Actions Suggested</b>	<b>Agency Responsible</b>
<b>Poor (201 - 300)</b>	Activate response system – inform all relevant departments	AIR Plan Nodal Officer
	Alert schools to raise “orange” flags to inform children of pollution risk, alert vulnerable patient group through emails, WhatsApp groups	AIR Plan Nodal Officer
	Mobilize media to disseminate warnings on air pollution	AMC Publicity Department
	Inform hospitals to be prepared for higher cases of respiratory illness	AMC Health Department

<b>Very Poor (301 – 400) Triggers “Health Alert”</b>	Activate health “alert” and response system – inform all relevant departments	Air Plan Nodal Officer
	Alert schools to raise ‘red’ flags to inform children of high pollution risk, alert vulnerable patient group through emails, WhatsApp groups	AIR Plan Nodal Officer
	Alert newspapers/TV/radio/FM stations to advise people with respiratory and cardiac illnesses to avoid polluted areas and restrict outdoor movement	AMC Publicity Department
	Inform hospitals to be prepared for higher cases of respiratory illness, ensure adequate supply of oxygen and medicines	AMC Health Department
	Inform outside workers about air pollution risk	AMC Estate Department
	Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine	Ahmedabad Municipal Transport Service (AMTS), Bus Rapid Transit System (BRTS), Traffic Police
	Deploy traffic police for smooth traffic flow in areas likely to have congestion	Traffic Police
	Stringently enforce/stop garbage burning landfills and other places and impose heavy fines on person responsible	Director Solid Waste Management (SWM)

<b>Severe (401 – 500) Triggers “Health Warning”</b>	Activate alert “warning” and response system – inform all relevant departments	Air Plan Nodal Officer
	Alert schools to raise ‘maroon’ flags to inform children of severely high pollution risk, alert vulnerable patient group through emails, WhatsApp groups	AIR Plan Nodal Officer
	Alert newspapers/TV/radio/FM stations to advise people with respiratory and cardiac illnesses to avoid polluted areas and restrict outdoor movement	AMC Publicity Department
	Ensure hospitals are prepared for higher cases of respiratory illness, ensure adequate supply of oxygen and medicines	AMC Health Department
	Inform outside workers about air pollution risk, stop outside work. Ensure workers use masks if working outside,	AMC Estate Department
	Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine	Ahmedabad Municipal Transport Service (AMTS), Bus Rapid Transit System (BRTS), Traffic Police
	Deploy traffic police for smooth traffic flow in areas likely to have congestion	Traffic Police
	Ensure no garbage burning in landfills and other places take place and impose heavy fines on person responsible	Director Solid Waste Management (SWM)
	Increase frequency of mechanized cleaning of road and sprinkling of water on roads	Deputy Health Officer (all); Joint Director (Mechanical), Workshop, AMC
	Stringently enforce rules for dust control in construction activities and close non-compliant sites	AMC Estate Department
	Stop use of diesel generator sets	Gujarat Pollution Control Board
	Enhance parking fee by 3-4 times, ensure higher frequency of public busses	Deputy Municipal Commissioner, Ahmedabad Municipal Transport Service (AMTS), Bus Rapid transit System (BRTS),
	Order shutting down of schools if Severe pollution persists for two consecutive days	Education Department in consultation with boards

## References

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- $$I = \frac{I_{high} - I_{low}}{C_{high} - C_{low}}(C - C_{low}) + I_{low}$$
- where,  
I is the (Air Quality) index,  
C is the pollutant concentration,  
C<sub>low</sub> is the concentration breakpoint that is ≤ C,  
C<sub>high</sub> is the concentration breakpoint that is ≥ C,  
I<sub>low</sub> is the index breakpoint corresponding to C<sub>low</sub>,  
I<sub>high</sub> is the index breakpoint corresponding to C<sub>high</sub>.
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## Air pollution is bad for your health

Protect your lungs, heart, and brain. By reducing exposure to air pollution, you can live longer.

Air pollution harms children more than adults. Because children's bodies and brains are still developing, the air pollution that children inhale has an especially harmful effect on them.

Air pollution is a threat to many systems within the body. Small particles can enter the bloodstream from the lungs, and harm the heart and brain as well as lungs.

Eat healthy food and drink plenty of water to build your body's natural defense against harmful air pollution.

## Steps you can take to help improve air quality

- Instead of using a car, consider taking public modes like buses and trains.
- Cycling benefits your health and helps reduce pollution.
- Avoid highly trafficked roads during rush hour. More congestion means more pollution.
- Don't burn trash, outdoors or indoors, because harmful air pollutants are released by burning.

## Take precautions to protect yourself from air pollution

- Check SAFAR website ([www.http://sifar.tropmet.res.in](http://sifar.tropmet.res.in)) and download the SAFAR Air Quality Index (AQI) mobile app to keep a daily check on air pollution levels.
- Limit outdoor activity during high air pollution episodes.
- Before any strenuous physical activity or work outdoors, check the current AQI level.
- If you have respiratory ailments, like bronchitis or asthma, keep your medications handy.
- If you're having trouble breathing, see a health professional. Take advice from health professionals about opting for protective gear.

### Resources and Issue Briefs

### December 2018

## AHMEDABAD Air Information & Response Plan

### DECEMBER 2018

## GETTING THE WORD OUT

Health Risk Communication Strategies for Ahmedabad's AIR Plan

### Issue Brief | May 2017

## PROTECTING HEALTH FROM INCREASING AIR POLLUTION IN AHMEDABAD

Supporting Research and Analysis for the Ahmedabad Air Information & Response (AIR) Plan

### Development of Ahmedabad's Air Information and Response (AIR) Plan to Protect Public Health

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Ahmedabad India, one of the world's largest cities, has some of the highest ambient air pollution levels in the world. While national efforts on building metropolitan networks continued, actions to reduce air pollution, both at the city and regional levels, are being taken on the challenge to protect communities from the health problems caused by the harmful environmental exposures. In 2015, the city of Ahmedabad launched a regional air pollution monitoring and risk communication project, the Air Information and Response (AIR) Plan. The objective of the plan is an air quality index developed by the Indian Institute of Tropical Meteorology to monitor air quality and the communication project, the Air Information and Response (AIR) Plan. The objective of the plan is an air quality index developed by the Indian Institute of Tropical Meteorology to monitor air quality and the communication project, the Air Information and Response (AIR) Plan. The objective of the plan is an air quality index developed by the Indian Institute of Tropical Meteorology to monitor air quality and the communication project, the Air Information and Response (AIR) Plan.

Keywords: air pollution, exposure, vulnerability, climate change, India, vulnerability, urban public health, and communication, community engagement, environmental health, environmental health.

### Clearing the Air: Highlighting Actions on Fighting Air Pollution in India

The AIR POLLUTION PROBLEM

Air pollution is a serious problem in India. Air quality is poor in many cities, and it's getting worse. This is because of many reasons, including the use of coal and diesel for power and transport, and the burning of waste. Air pollution is bad for our health and the environment. It causes many diseases, including asthma, heart disease, and lung cancer. It also contributes to global warming and climate change. We need to take action to reduce air pollution in India. This report highlights some of the actions that are being taken to improve air quality in India. It also provides information on how you can help reduce air pollution in your community.

