



Ministry of Health & Family Welfare  
Government of India

# HEALTH ADAPTATION PLAN FOR DISEASES DUE TO AIR POLLUTION

National Programme on Climate Change and Human Health  
National Centre for Disease Control  
Directorate General of Health Services  
Ministry of Health and Family Welfare  
Government of India

JULY 2021



National Programme  
on Climate Change  
and Human Health



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### Message

Air pollution is one of the leading environmental concerns which can cause human health problems. India faces a challenging public health concern due to exposure to air pollution in the cities as well as in rural India. The Government of India has been undertaking various major initiatives to minimize the health effects due to air pollution for people in the country and also, this Ministry is undertaking various health measures to protect, control and manage the ill effects due to air pollution.

Recently, the National Programme on Climate Change and Human Health (NPCCHH) under the Ministry of Health Family Welfare has developed a document on '**Comprehensive Health Adaptation Plan for Diseases due to Air Pollution**'. It deals on various health issues arising due to on air pollution related illnesses including the cardiopulmonary and other allergic health problems. It elaborates health-related structures and mechanisms to manage the health response plans in context of associated issues with air pollution exposure in the state. This document will help guide the States/UTs on how the health sector has to coordinate with non-health sectors while addressing health problems arising due to exposure to air pollution and poor air quality index (AQI).

I sincerely urge the States/UTs to refer this technical manual to bring out state health response plans to strengthen the health sector in providing health care services to the people particularly the vulnerables to such diseases. I am sure that this will help to manage the people's health associated with air pollution.

I express my sincere gratitude to all the professional experts who involved in designing this manual and supporting the NPCCHH programme depicting MoHFW commitment for betterment of public health concern and to build a better society and sustainable future in the country.

(Mansukh Mandaviya)





डॉ. भारती प्रविण पवार  
Dr. Bharati Pravin Pawar



सर्वेसन्तु निरामया



स्वास्थ्य एवं परिवार कल्याण राज्य मंत्री  
भारत सरकार

MINISTER OF STATE FOR  
HEALTH & FAMILY WELFARE  
GOVERNMENT OF INDIA

### MESSAGE

Air pollution is considered as a serious environmental concern to public health in the country. Indians living in the cities, urban and even in rural areas are facing challenging health problems associated with air pollution. These affect comparatively more on the health of the children, women, elderly and marginalized and poorer people etc.

This document on 'Comprehensive Health Adaptation Plan for Diseases due to Air Pollution' is developed under the National Programme on Climate Change and Human Health (NPCCHH), MoHFW to help support the States/UTs in addressing the concerning health issues associated with air pollution. Major health action points of the plan in context of air pollution are clearly illustrated focusing the institutional structural and functional mechanisms at various levels in the state. The States/UTs can refer the broad guidelines in the present document while undertaking health related planning and responses on air pollution related matters in the state. This may help in protecting, preventing and managing of negative health problems arising against the people particularly the more vulnerables in the State.

I fully trust that the manual will be a helpful guiding support for tackling the increasingly challenging health problems in context of air pollution in the States/UTs in the country particularly to those in the identified non-attainment cities in the country due to outdoor air pollution and also, to those affected by the indoor air pollution even in the rural areas in the country.

I am very pleased with all NPCCHH programme team members and to all experts who were involved in successful development of the health action plans in the document to help address such priority health concern due to air pollution and to benefit the public health in the country.

*BP*

(Dr. Bharati Pravin Pawar)

“दो गज की दूरी, मास्क है जरूरी”





भारत सरकार  
स्वास्थ्य एवं परिवार कल्याण विभाग  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय

Government of India  
Department of Health and Family Welfare  
Ministry of Health and Family Welfare

राजेश भूषण, आईएएस  
सचिव

**RAJESH BHUSHAN, IAS**  
SECRETARY



### Message

Air pollution is a major environmental risk factor for morbidity and premature mortality worldwide. It is recognized that both ambient (outdoor) and household (indoor) air pollution are associated with a large proportion of health problems like respiratory and heart diseases, stroke etc. in cities and also, in both urban and rural India.

In order to help address the urgent health concerns associated with air pollution like cardiopulmonary and allergic health issues, the National Programme on Climate Change and Human Health (NPCCHH) under the Ministry of Health and Family Welfare has recently brought out a document on 'Comprehensive Health Adaptation Plan for Diseases due to Air Pollution'. I am sure this national health adaptation plan in context of air pollution will be very useful in planning health actions in the States/UTs to minimize and control the burden of disease, disability and mortality associated with air pollution. I am confident that its implementation will play a significant role in increasing awareness on air pollution, its negative health impact and its various health adaptation measures. This will also enable health care professionals and community level health workers to tackle the health issues of the people due to exposure to air pollution. I appeal to all health care professionals and facilities across the country to refer to it and become a role model in the fight against air pollution.

I am thankful to the NPCCHH programme team and all those experts who extended constant support in bringing out this important technical manual on air pollution and health to benefit for the urgent public health.

(Rajesh Bhushan)



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Government of India

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Directorate General of Health Services



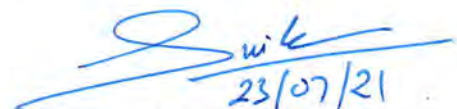
### MESSAGE

The health impact due to air pollution has been a huge concern not only globally but also, across the country including many cities from the hanging smog and in both the urban and rural parts of the country from the smoke in the households. Air pollution is also considered a leading environmental risk factor for causing the morbidity and premature mortality in the country as it is found to be associated with a large proportion of health problems like respiratory and heart diseases, stroke etc. among the more vulnerable populations like the children, women, elderly and the poor etc.

To address such an urgent health concern due to air pollution in the country, the National Programme on Climate Change and Human Health (NPCCHH) division at NCDC under the Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare has developed a document on 'Comprehensive Health Adaptation Plan for Diseases due to Air Pollution'. This adaptation plan on air pollution will help to guide the States/UTs in developing its specific health actions plans to minimize and control the burden of disease, disability and mortality associated with air pollution in the state. The plan also briefly mentions on the structural and functional mechanisms which may help implement and coordinate the activities at various levels across the county and in the state. It briefs on the various approaches on how the plans are to execute in the state and this includes the situational analysis of the health issues due to air pollution, capacity building requirements, awareness generation measures, surveillance strengthening, preparedness and responses and importance of research for evidence generation in the Indian settings.

This document will also guide the States/UTs in understanding the roles and responsibilities of various levels of health care professionals and community level health workers to tackle the health impact due to exposure to air pollution. I am very sure that the health sector including health care professionals and facilities across the country will refer to it and will fight against ill effects of air pollution successfully.

I am extremely glad that the NPCCHH programme team and the experts have brought together such an important technical plan to address the urgent health concern of the people particularly the vulnerables across the whole country.

  
23/07/21  
(Sunil Kumar)



# Acknowledgement

Comprehensive Health Adaptation Plan for diseases due to air pollution is prepared under National Programme on Climate Change and Human Health, Ministry of Health and Family Welfare in consultation with technical experts from three Centres of Excellence (CoEs). The action plan was conceptualized under the vision and leadership of Mr. Rajesh Bhusan, Secretary (Health) MoHFW. The action plan was possible and successfully completed under the guidance of Mrs. Aarti Ahuja, Additional Secretary, Ministry of Health and Family Welfare. The constant support and valuable inputs from Mr. Lav Agarwal, Joint Secretary, (PH), MoHFW has enable to successfully develop the concept and implementation strategy of the health adaptation plan. Through his endless encouragement and direction, Dr. Sujeet Kumar Singh, Director, National Centre for Disease Control, has guided the NPCCHH team at NCDC to deliver their best in consultation with the CoEs.

The development of the HAP document at the NPCCHH programme division at NCDC was made possible with contributions from the three Centres of Excellence designated under the National Programme on Climate Change and Human Health. The NPCCHH team along with the PGIMER Chandigarh has developed the plan with inputs and feedbacks from the CoEs of the programme. We are grateful to Dr. Ravindra Khaiwal, Additional Professor from the PGIMER Chandigarh and the Nodal Officer for the Centre of Excellence on Air pollution illnesses for his valuable suggestions for the plan. We also thank Prof. Anand Krishnan and Dr. Harshal Ramesh Salve, Associate Professor from AIIMS, New Delhi for providing full support and inputs particularly in the cardiopulmonary related areas. Dr. Raj Kumar, Director, VP Chest Institute, New Delhi and Dr. Parul Mrigpuri, Assistant Professor for their valuable inputs and support in context of allergic health problems in the developing plan. We specially thank to all the stakeholders and partners who provided their valuable inputs and suggestions in developing the action plan.

Thanks to the NPCCHH team at NCDC, New Delhi for the full support and constant cooperation in bringing out the document on Comprehensive Health Adaptation Plan for diseases due to air pollution

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Lastly, a special thanks to Ms. Renuka Saroha, Consultant, WHO India for her support and editing in bringing out the present form of the document of Health Adaptation Plan for diseases due to air pollution.

**NPCCHH Team**



# Abbreviations

AB-HWC	Ayushman Bharat- Health & Wellness Centres
ACE-2	Angiotensin Converting Enzyme - 2
AIIMS	All India Institute of Medical Science
AQI	Air Quality Index
ARI	Acute Respiratory Infection
ASHA	Accredited Social Health Activist
AWC	Anganwadi Centre
AWW	Anganwadi Worker
BMO	Block Medical Officer
CDPO	Child Development Project Officer
CEOH & CCH	Centre for Environmental &Occupational Health, Climate Change & Health
CHC	Community Health Centre
CHO	Community Health Officer
CMO	Chief Medical Officer
COPD	Chronic Obstructive Pulmonary Disease
CPCB	Central Pollution Control Board
CPD	Cardio Pulmonary Disease
DAPCCHH	District Action Plan on Climate Change
DGHS	Director General of Health Services
DNO-CC	District Nodal Officer –Climate Change
ED	Emergency Department
ICMR	Indian Council of Medical Research
IEC	Information Education Communication
IHD	Ischemic Heart Disease
IIHMR	Indian Institute of Health Management Research
IMD	Indian Meteorological Department
IV	Invasive Ventilation

MAS	Mahila Aarogya Samiti
MoEFCC	Ministry of Environment, Forest and Climate Change
MoHFW	Ministry of Health and Family Welfare
MO	Medical Officer
MWCD	Ministry of Women and Child Development
NCA	National Clean Air Programme
NCDC	National Centre for Disease Control
NCD	Non Communicable Disease
NFHS	The National Family Health Survey
NGO	Non Governmental Organization
NHM	National Health Mission
NIV	Non Invasive Ventilation
NPCCHH	National Programme on Climate Change and Human Health
NPCDCS	National Programme for Prevention and Control of Cancer , Diabetes, Cardiovascular Diseases and Stroke
OIC	Officer in Charge
PGIMER	Postgraduate Institute of Medical Education and Research
PHC	Primary Health Centre
PM 2.5	Particulate Matter 2.5
PM 10	Particulate Matter 10
PMCC	Prime Minister Council on Climate Change
PMO	Prime Minister's Office
RBSK	Rashtriya Bal Swasthya Karyakram
RKSK	Rashtriya Kishore Swasthya Karyakram
SAFA	System of Air Quality and Weather Forecasting And Research
SAPCCHH	State Action Plan on Climate Change and Human Health
SARS	Severe Acute Respiratory Syndrome
SARS-CoV	Severe Acute Respiratory Syndrome –related Corona virus of the genus Beta-coronavirus

SBCC	Social and Behaviour Change Communication
SH	Sub Health Centre
SNO –CC	State Nodal Officer –Climate Change
SOP	Standard Operating Procedure
SPCB	State Pollution Control Board
TERI	The Energy and Resource Institute
UNEP	United Nations Environment Programme
VHSNC	Village Health, Sanitation and Nutrition Committees
WHO	World Health Organization



# Executive Summary

Air pollution is known to drive climate change, and conversely, it is worsened due to climate change. Exposure to air pollution affects everyone, some more than others. Those with underlying medical problems like heart disease, respiratory disorder, pregnant women, outdoor workers, the elderly, children under age 14, and athletes are more vulnerable to air pollution.

Tackling air pollution and its health impacts is a huge challenge in the country. It adversely affects the health of people throughout the year.

"Health Adaptation Plan" is an action-oriented road map to reduce the health burden of Air Pollution. The plan is centered around improving public health and is developed under the National Programme of Climate Change and Human Health (NPCCHH), the Ministry of Health and Family Welfare.

The plan will help support the programme officers in the States/UTs to develop health action plans suitable to the region and tackle their respective states' health issues. The document highlights how public health suffers due to air pollution and climate change. It enumerates steps to identify the air pollution hotspots and how to prepare health services in those areas to address the need of communities living there.

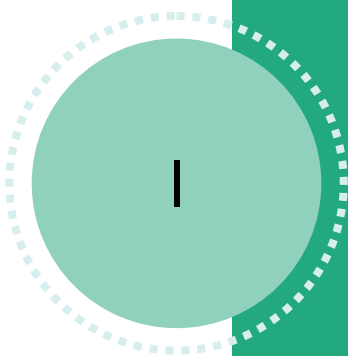
Along with strengthening medical response, it is vital to create mass awareness on the issue. Health professionals, community health workers, and community members must be informed about the health impacts of exposure to pollutants. HAP includes different IEC tools and training products created under NPCCHH programme. Such mechanisms support the knowledge enrichment of the reader and give them the required tools for community outreach.

Over the years, a robust surveillance mechanism to identify air pollution's health problems has been established. Through HAP, all the states and UTs can learn about this exercise and be part of the network if needed.

The plan also outlines the roles and responsibilities for programme officers, health professionals, and workers in the health sectors. It states the need for convergence with other health programmes to further boost the health sector's response. A crucial aspect of health adaptation plans is operational coordination and involvement of all stakeholders. The document notes non-health sectors and their role in minimizing air pollution sources by adopting more sustainable and friendly mechanisms. They can take up measures to achieve clean air, while the health sectors take up the health action plans to provide the best services to improve public health.

The Health Adaptation Plan provides the foundation for India's response to the health impacts of air pollution. The plan is flexible to accommodate emerging information on the subject and evolve strategies accordingly.





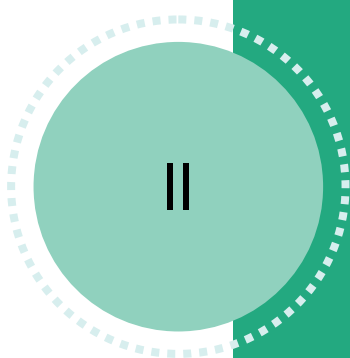
# Climate Change and Air Pollution

Climate change impacts social and environmental determinants of health like clean air, safe drinking water, sufficient food and secure shelter. Among all, air pollution is a major environmental risk to health. The formation, transport and dispersion of many air pollutants is determined partly by climate and weather factors such as temperature, humidity, wind, storms, droughts, precipitation and by human activities like industrialisation, construction and demolition activities, vehicular pollution, episodic crop residue burning etc. known to produce various air pollutants. Air pollution is also associated with acid rain, eutrophication due to nitrogen oxides emission in air from power plants, cars, trucks, and other sources; haze; toxic effects on wildlife; ozone depletion in the atmosphere; crop and forest damage etc. The health risks due to air pollution are associated with exposure to high levels of particulate matter (PM), ozone (O<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) etc. and the air quality levels in an area are collectively communicated to the public as Air Quality Index (AQI). The particulate matters of less than 10 and 2.5 microns in diameter (PM<sub>10</sub> and PM<sub>2.5</sub>) are capable of penetrating deep into the airway passages, entering the bloodstream, causing illnesses from acute and chronic respiratory systems, increase in malfunction of the other organs affecting health of cardio- cerebrovascular- renal diseases, and among pregnant females due to trans- placental crossing of pollutants affect foetus resulting in low birth congenital problems and associated complications.

Among the air pollutants, Ozone, a secondary pollutant is formed via sunlight driven photochemical reactions involving precursor hydrocarbons and oxides of nitrogen. Ozone pollution is projected to increase because warmer temperatures enhance these reactions. Ozone is a powerful oxidant that has been persistently associated with damage to airways or lung tissue structures. It contributes to the more severe symptom of asthma, an increase in other respiratory illnesses and deaths. High levels of ground-level Ozone with heat- waves may result in higher frequency and severity of cardio-pulmonary attacks. Similarly, the combination of high levels of Ozone and dust storms or alteration of allergens or all will result in outbreaks of asthma, allergic rhinitis and other allergic manifestation of varying degrees depending on exposure dosage and duration and vulnerability of exposed persons.

Ambient (outdoor) air pollution in both cities and rural areas was estimated to cause approximately 7 million deaths worldwide, and 90% of these deaths have occurred in low and middle- income countries. In India, nearly 12.5% of deaths have been attributed to air pollution. Thus, it is logical to assume that reduction in air pollution levels can help reduce the burden of diseases like acute and chronic respiratory diseases, heart diseases, strokes and other allergic problems.

The quality of air is expressed as Air Quality Index (AQI) which is broadly categorized into six levels as Good, Satisfactory, Moderately Polluted, Poor, Very Poor, and Severe to communicate and help understand and the associated health problems with the public and officials.



## Linkage of Climate Change, Air Pollution and Infectious Diseases including COVID-19 Infection

Climate change threatens public health systems across the world. Apart from damage to infrastructure, it also affects various illnesses, including but not limited to respiratory tract problems like asthma, rhinosinusitis, chronic obstructive pulmonary diseases (COPD), bacterial and viral infections affecting respiratory passage (Coronavirus, SARS, Influenza). The cited reasons may vary from poor air quality, high ground-level ozone, dust storms, changing of temperature, alteration of allergens, extreme heat, desertification, change in timing and duration of survival due to more particle surface to stick and transported over affecting transmission cycle of respiratory virus, alteration in bird migration. Further, the other contributory factors are demographic factors (age, sex, immunity status, pregnancy, prevailing endemic illnesses, etc.); low socioeconomic status, poor hygienic conditions, accessibilities to health care facilities etc. Population experiencing more episodes of coughing and sneezing with the increase in the susceptibility of respiratory infection like Tuberculosis, SARS and Coronavirus, immuno-compromised level, or mentally or physically challenged people are also at high risk due to exposure to air pollutants.

Air pollution is observed to be associated with the increasing severity and mortality of the COVID-19 cases. Some of the empirical findings from the studies on air pollution and Covid-19 are presented in Table 1.

Studies have provided preliminary evidence of association of COVID-19 positivity and severity with higher PM 2.5 concentration, exposure to NO<sub>2</sub> and other pollutants. However, the following associations between air pollution and COVID-19 need to be explored scientifically with the more evidence in future.

- PM 2.5 concentration and rapid spread of COVID -19
- Effects on lung function due to air pollution and COVID-19
- Exposure to air pollutants and COVID-19 and their effect on multiple systems in the human body in the long term
- Universal proper mask use as a preventive measure at an individual and population level

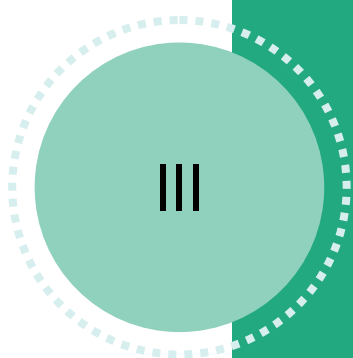
**Table 1. Studies (2020) of the linkage between Air Pollution and COVID-19 infection**

Studies (2020) of the linkage between Air Pollution and COVID-19 infection			
	Global Studies on COVID-19 and Air pollution (2020)	Inference	Source of the study
1	Assessing nitrogen dioxide (NO <sub>2</sub> ) levels as a contributing factor to coronavirus (COVID-19) fatality	Highest NO <sub>2</sub> concentrations combined with downwards airflow prevent an efficient dispersion of air pollution. These	<a href="https://doi.org/10.1016/j.scitotenv.2020.138605">https://doi.org/10.1016/j.scitotenv.2020.138605</a>

	regional scale and combined with the number of death cases taken from 66 administrative regions in Italy, Spain, France and Germany Yaron Ogen	results indicate that the long-term exposure to this pollutant may be one of the most important contributors to fatality caused by the COVID-19 virus in these regions and maybe across the whole world	
2	Ambient nitrogen dioxide pollution and spreadability of COVID-19 in Chinese cities Ye Yao, Jinhua Pan, Zhixi Li, et.al.	A significant association between NO <sub>2</sub> exposure and R <sub>0</sub> , suggesting that ambient NO <sub>2</sub> may contribute to the spread ability of COVID-19 effects of NO <sub>2</sub> on host defenses that prevent the spread of the virus.	<a href="https://doi.org/10.1101/2020.03.31.20048595">https://doi.org/10.1101/2020.03.31.20048595</a> .
3	Two mechanisms for accelerated diffusion of covid-19 outbreaks in regions with high intensity of population and polluting industrialization: the air pollution-to-human and human-to-human transmission dynamics Mario CocciaCnr -- national research council of Italy	The results reveal that accelerated transmission dynamics of COVID-19 in specific environments is due to two mechanisms given by air pollution-to-human transmission and human-to-human transmission; in particular, the mechanisms of air pollution-to-human transmission play a critical role rather than human-to-human transmission	<a href="https://doi.org/10.1101/2020.04.06.20055657">https://doi.org/10.1101/2020.04.06.20055657</a>
4	The Potential Role of Particulate Matter in the Spreading of COVID-19 in Northern Italy: First Evidence-based Research Hypotheses Leonardo Setti, Fabrizio Passarini, Gianluigi De Gennaro, et.al.	Association between higher mortality rates due to COVID-19 observed in Northern Italy and the peaks of particulate matter concentrations, frequently exceeding the legal limit of 50 µg/m <sup>3</sup> as PM <sub>10</sub> daily average	<a href="https://doi.org/10.1101/2020.04.11.20061713">https://doi.org/10.1101/2020.04.11.20061713</a> .
5	SARS-Cov-2 RNA found on Particulate Matter of Bergamo in Northern Italy: First Preliminary Evidence Leonardo Setti, Fabrizio Passarini, Gianluigi De Gennaro, et.al.	An association is found between increases in PM concentrations and mortality rates due to COVID-19.	<a href="https://doi.org/10.1101/2020.04.15.20065995">https://doi.org/10.1101/2020.04.15.20065995</a> .
6	Risk of COVID-19 and long-term exposure to air pollution: evidence from the first wave in China Paiz heng, Yonghong Liu, Hongbin Song, et.al.	Long-term exposure to air pollution, especially PM <sub>2.5</sub> , has also been associated with COVID-19 mortality.	<a href="https://doi.org/10.1101/2020.04.21.20073700">https://doi.org/10.1101/2020.04.21.20073700</a>
7	Urban Air Pollution May Enhance COVID-19 Case-Fatality and Mortality Rates in the United States Donghai Liang, Liuhua Sh, Jingxuan Zhao, et.al.	Long-term exposure to NO <sub>2</sub> , which largely arises from urban combustion sources such as traffic, may enhance susceptibility to severe COVID-19 outcomes, independent of long-term PM <sub>2.5</sub> and O <sub>3</sub> exposure	<a href="https://doi.org/10.1101/2020.05.04.20090746">https://doi.org/10.1101/2020.05.04.20090746</a>

8	Effects of meteorological conditions and air pollution on COVID-19 transmission: Evidence from 219 Chinese cities by Zhenbo Zhang, Ting Xue, Xiaoyu Jin.	Air pollution has exerted a positive impact on the transmission of and infection by COVID-19	<a href="https://doi.org/10.1016/j.scitotenv.2020.140244">https://doi.org/10.1016/j.scitotenv.2020.140244</a>
9	Assessing the relationship between ground levels of Ozone (O <sub>3</sub> ) and nitrogen dioxide (NO <sub>2</sub> ) with coronavirus (COVID-19) in Milan, Italy By Maria A. Zoran, Roxana S., Savastru, et.al.	<p>COVID-19 viral infections are positively correlated with ground-level ozone.</p> <ul style="list-style-type: none"> <li>Ground level nitrogen dioxide is inversely correlated with COVID-19 infections.</li> <li>Dry air, low winds and precipitation rates support COVID-19 virus diffusion.</li> <li>Warm-season will not stop COVID-19 from spreading.</li> <li>Outdoor airborne aerosols might be possible carriers of COVID-19.</li> </ul>	<a href="https://doi.org/10.1016/j.scitotenv.2020.140005">https://doi.org/10.1016/j.scitotenv.2020.140005</a>
10	Air Pollution Exposure and Covid-19 in Dutch Municipalities Matthew A. Cole, CerenOzgen, Eric Strob	A positive relationship between air pollution, and particularly PM <sub>2.5</sub> concentrations, and Covid-19 cases, hospital admissions and deaths	<a href="https://doi.org/10.1007/s10640-020-00491-4">https://doi.org/10.1007/s10640-020-00491-4</a>
11	Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study Xiao Wu, Rachel C Nethery, M Benjamin Sabath, Danielle Braun, Francesca Dominici	Small increase in long-term exposure to PM <sub>2.5</sub> leads to a large increase in the COVID-19 death rate	<a href="https://doi.org/10.1101/2020.04.05.20054502">https://doi.org/10.1101/2020.04.05.20054502</a>
12	Coronavirus (COVID-19) related mortality rates and the effects of air pollution in England Research report examining the potential relationship between long-term air pollution exposure and coronavirus (COVID-19) mortality rates.	Possibility of a correlation between PM <sub>2.5</sub> exposure and coronavirus (COVID- 19) related mortality of a similar scale to that found by Wu et al. (2020)	
13	Air pollution aggravating COVID-19 lethality? Exploration in Asian cities using statistical models Ankit Gupta, Hemant Bherwani, Sneha Gautam, Saima Anjum, Kavya Musugu, Narendra Kumar, Avneesh Anshul	A positive correlation between the level of air pollution of a region and the lethality related to COVID-19	<a href="https://doi.org/10.1007/s10668-020-00878-9">https://doi.org/10.1007/s10668-020-00878-9</a>

14	<p>Severe air pollution links to higher mortality in COVID-19 patients: The "double-hit" hypothesis. Antonio Frontera, Lorenzo Cianfanelli, Konstantinos Vlachos, Giovanni Landoni</p>	<p>The "double-hit hypothesis": chronic exposure to PM2.5 causes alveolar ACE-2 receptor overexpression. This may increase viral load in patients exposed to pollutants in turn depleting ACE-2 receptors and impairing host defences. High atmospheric NO2 may provide a second hit causing a severe form of SARS-CoV-2 in ACE-2 depleted lungs resulting in a worse</p>	<p><a href="http://www.elsevier.com/locate/jinf">www.elsevier.com/locate/jinf</a></p>
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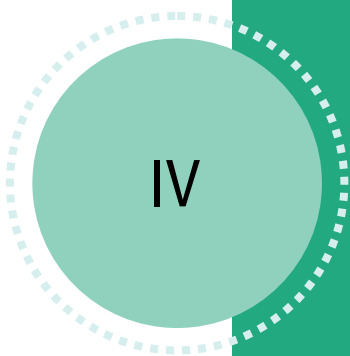


## Health Impacts of Air Pollution

Air Pollution is recognised as the greatest environmental risk to human health and is a main avoidable and preventable risk factor. It can affect every part of the body, particularly skin, respiratory tracts, cardiovascular and cerebrovascular functions, etc. It may be associated with health problems like asthma, chronic respiratory problems like Chronic Obstructive Pulmonary Disease (COPD), cardiovascular problems like ischaemic coronary heart diseases, cerebrovascular events like strokes, cancers, diabetes, hypertension, etc. According to the report of Steering Committee on air pollution from the MoHFW (2015) and WHO reports on air pollution and health, particularly short term and long-term health effects due to air pollution are shown as in Table 1:

Table 2. Health effects attributed to short-term and long-term exposures to air pollution	
Health effects attributed to short-term exposure to air pollution	Health effects attributed to long-term exposure to air pollution
1. Respiratory & cardiovascular emergency department visits	1. Acute symptoms (Wheezing, coughing, phlegm production, respiratory infections)
2. Respiratory & cardiovascular primary care visits	2. Chronic respiratory diseases incidence & prevalence (asthma, COPD, chronic pathological changes)
3. Use of respiratory & cardiovascular medications	3. Physiological changes (e.g. lung function)
4. Respiratory & cardiovascular hospital admissions	4. Chronic changes in physiologic functions
5. Days of restricted activity	5. Chronic cardiovascular diseases
6. Work absenteeism	6. Intrauterine growth restrictions (low birth weight at term, intrauterine growth retardation, small for gestational age)
7. School absenteeism	7. Mortality due to cardiovascular & respiratory diseases
8. Daily mortality/deaths	8. Lung cancers

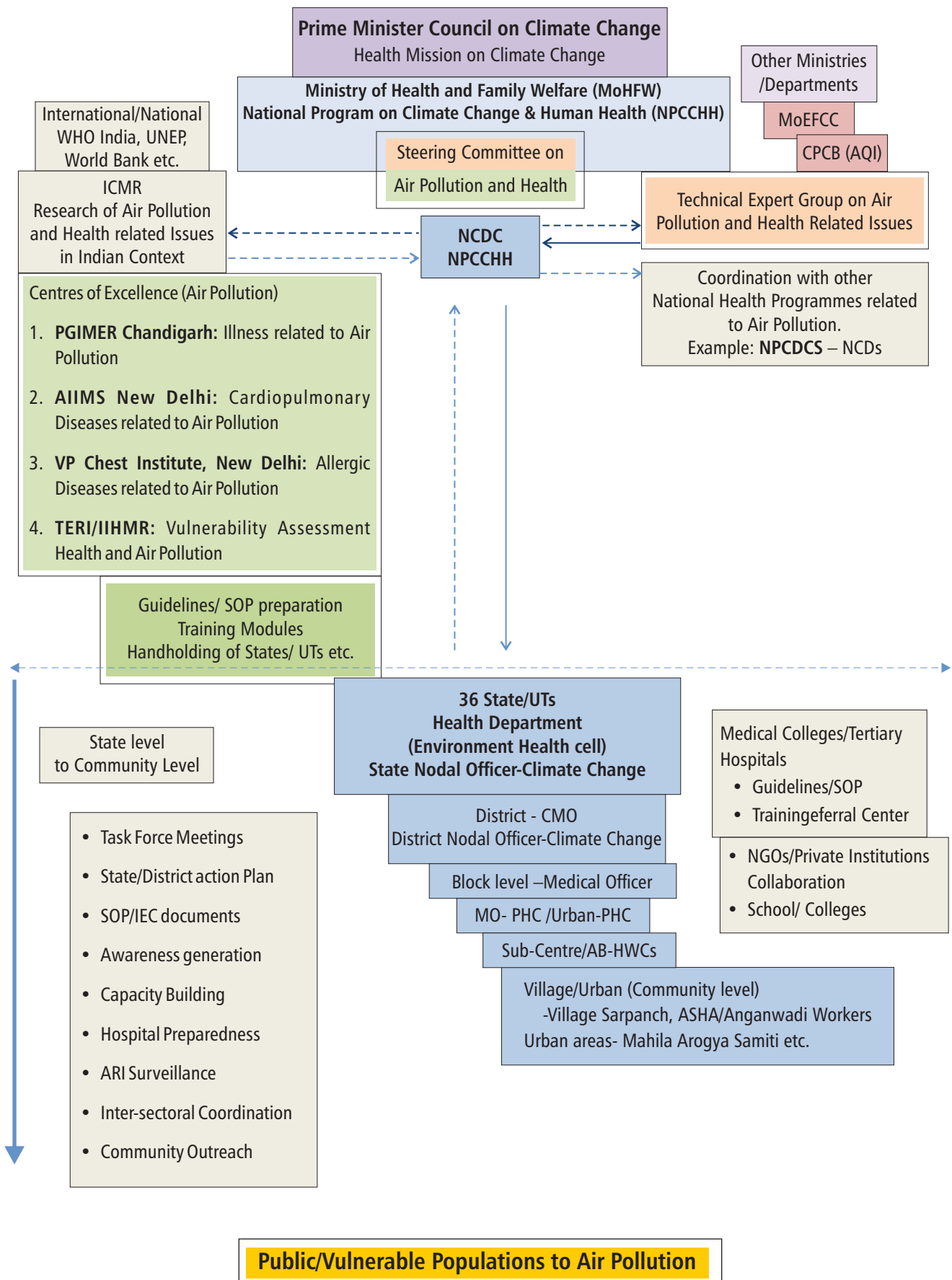
As air pollution is recognised to impact the health of a large population living in both urban and rural areas in India, there is an urgent need to develop state-specific health adaptation related to air pollution. So, this will help develop the capacity of the health professionals and workers in the health sector to enable making aware of health and other implications to the public and more vulnerable groups of people.

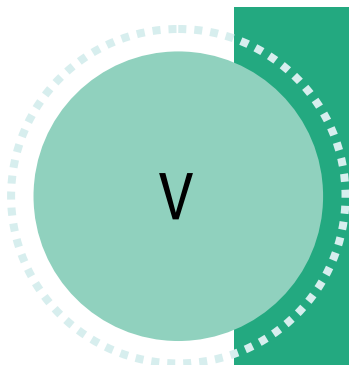


## Structural and Functional Flow of Activities on Air Pollution and Health under the NPCCHH Programme

The various structural and functional elements to implement a health adaptation plan on Air Pollution and Health under the NPCCHH programme are shown below in Figure 1. It shows the flow of structures and functions initiating from the Ministry of Health and Family Welfare (MOHFW) percolating down to the States/UTs and District level, including collaboration with other ministries and departments. International and national premier institutes and NGOs working to support efforts to reduce air pollution and help control, protect and prevent its health impacts are also part of the structure.

**Fig.1 Structural and Functional Flow of Activities on Air Pollution and Health under NPCCHH (MoHFW)**





## Vision, Goal and Objectives of Air Pollution and Health under NPCCHH

The Vision, Goal and Objectives of the Health Adaptation Plan on Air Pollution and Health under the NPCCHH programme are outlined in Table 2.

**Table 3: Vision, Goal and Objectives of the Health Adaptation Plan on Air Pollution and Health under the NPCCHH program**

**Vision:** A resilient health system that promotes health and protects against health impacts due to air pollution for all Indian citizens, especially the vulnerable, which include children, women, elderly and marginalised populations, etc.

**Goal:** To reduce morbidity, mortality, health vulnerability due to air pollution

**Objective:** To develop a comprehensive response of the health system for prevention and control of health impacts due to air pollution

**Specific Objectives:**

1. To create awareness on health impacts due to air pollution among the general population, vulnerable communities, health-care providers, and policymakers
2. To strengthen the capacity of the health system (infrastructure, training, guidelines, SOP etc.) to respond to health crisis/ emergencies due to air pollution
3. To provide situational analysis to strengthen preparedness and response at national / state/ district/ below district levels to cope with adverse health impacts due to air pollution
4. To assist states to assess health vulnerabilities due to air pollution and accordingly, build capacities to adapt and mitigate the risk and vulnerabilities
5. To develop partnerships with other related stakeholders in the government and non-government sectors, including civil society, and creating synergy to ensure that health-related issues are adequately represented in policies in the country
6. To strengthen supervision, monitoring, surveillance mechanism of the programme related activities
7. To develop research capacity at the state level to understand linkages of air pollution and health outcomes and develop a mechanism to fill the gap in the evidence-based health policy

## VI

# Comprehensive Health Adaptation Plan on 'Air Pollution and Health' under the NPCCHH Programme

A comprehensive health adaptation plan on 'Air Pollution and Health' under the (NPCCHH) is being developed to protect, prevent, control health problems and reduce morbidity and mortality rate due to illnesses attributed to exposure to air pollution.

The major components of the comprehensive health adaptation plan for air pollution and health are shown in Table 3.

**Table 4: The major components of the comprehensive health adaptation plan for air pollution and health.**

- A. Situational analysis of illnesses in the context of air pollution
- B. Awareness generation through targeted IEC for vulnerable populations in locally acceptable language
- C. Surveillance establishment on illnesses due to air pollution to help understand the health problems in the area
- D. Need-based capacity building: training, workshops, meetings to be conducted to sensitise and to update on activities related to air pollution and its health impacts
- E. Public health Management of the illnesses: based on the reported pattern of illnesses, types and severity of illnesses reported at the health facilities, management of the available resources (human resources, materials and finances) to address the health problems
- F. Timely issue of alerts/ warnings on health risk factors related to the air quality level (AQI) and weather conditions like temperature, humidity etc. obtained from IMD/ Pollution Control Boards to the health professionals and the people  
  
To coordinate with other sectors to promptly alert/ early warning for health risk factors related to air pollution like AQI levels, weather, and other relevant data
- G. Operational coordination with other stakeholders (Health & Non-health)

The major components considered under the comprehensive health adaptation plan on air pollution and health are described in detail in the following sections:

### **A. Situational analysis for illnesses in the context of Air Pollution**

1. **Vulnerable area** - Geophysical & climatic variables (geography, meteorological variables, extreme weather conditions, green cover, industries, type of occupations and practices).

**2. Selection of air pollution hotspots:** States may refer to the MoEFCC website for enlisting their non-attainment cities as listed under the National Clean Air Programme (NCAP). But, as the AQI levels are dependent on various natural and human-induced activities, the hotspots for air pollution may vary from day to day at any place. Some suggestive lists of hotspot areas that are likely to have higher air pollution (hazard), risk of exposure, and health impacts to those exposed, are areas with routine traffic congestion, industrial area, schools and bus/truck bay. Detailed surveys to identify such hotspots need to be conducted by the state and update data regularly in terms of the AQI level displayed at CPCB/ SPCB websites. States may preferably maintain a digital and live database for:

- I. Districts covered under the AQI monitoring:
  - a) Districts with live AQI monitoring (also include details like number of the monitoring station, type of monitoring at those stations, etc. if available) and
  - b) High-risk districts with no monitoring data
- II. Enlist vulnerable areas for high air pollution levels as 'hotspots' in Spatial-temporal trends as per CPCB or SPCB.
- III. Document episodic event contributing to worsening of AQI like crop residue burning or high bio-aerosol seasons.
- IV. Periodically seek list and update hotspots as per data at CPCB or SPCB.
  - a. **Vulnerable population-** Air pollution affects everyone, but the magnitude is different. Vulnerable groups are identified as under-five children, adolescents, elderly, pregnant females, those with underlying medical conditions, outdoor workers, migrants and those working in areas close to emission sources enlist the burden of respiratory, cardiac, cerebrovascular diseases, allergies and other illnesses like kidney disease.
  - b. Information at state/ district/ sub-district level on disease burden and risk factors can be obtained by various national surveys (NFHS, NCD Survey), programme data (NPCDCS), locally conducted research (from medical colleges) should be periodically obtained
  - c. Document specific risk factors at the population level such as - tobacco use, salt intake, alcohol use, biomass fuel use, if identified, for the above said types of illnesses
  - d. Vulnerability mapping: A preliminary assessment for risk factors may be made using AQI level, weather and other meteorological variables against illnesses reported

Information on the following needs to be collected at the district level

Health outcomes (Proportion and mortality)	Risk factors (prevalence/ proportion)
<ul style="list-style-type: none"> <li>Chronic Respiratory Diseases (COPD, Asthma)</li> <li>Hypertension</li> <li>Diabetes Mellitus</li> <li>Myocardial infarction</li> <li>Stroke</li> </ul>	<ul style="list-style-type: none"> <li>Tobacco use</li> <li>Alcohol use</li> <li>Salt intake</li> <li>Physical inactivity</li> <li>Obesity</li> <li>Use of biomass fuel for cooking</li> <li>Stress levels</li> </ul>

### 3. Resource mapping & Stakeholder analysis for providing healthcare services:

- i. **Health care Infrastructure:** Enlist type of services available (PHC, CHC, district hospital, tertiary care hospitals- government as well as private);
- ii. **Human resources:** Availability of trained human resources to manage illnesses due to exposure to air pollution (Cardiopulmonary-cerebrovascular illnesses)
- iii. **Logistics:** Availability of essential equipments and technologies, drugs and supplies for managing illnesses (may refer to NPCDCS programme operational manual for list of essential equipments and technologies at various levels of health facilities)
- iv. **Healthcare facilities** to avail the services at the health facility preferably for more accessibility to far-off people and more cases are reporting or attending the facility
- v. **Mapping of potential stakeholders** (health & non-health) who may be contributing to reduction of AQI levels through the mitigation activities or providing support to the vulnerable population

#### Expected outcome of situational analysis:

- Database of high-risk areas, frequently identified as hot spots as per AQI level (data available at CPCB /SPCB/ or app like SAMEER, SAFAR, or Urban Emission).
- District maps highlighting more vulnerable population in terms of demography (age, gender, occupation, residential area, work area)
- Health facilities where healthcare services are sought more, for examples - higher bed occupancy rate/ emergency/ OPD attendance rate etc
- Episodic calendar indicative of various illnesses depicting the pattern of illnesses (respiratory, cardiovascular, cerebrovascular problems) in relation to AQI and weather variables

### B. Establish surveillance on illnesses due to air pollution to help understand the health problems in the area and establish a pattern

Some steps to conduct sentinel surveillance for illnesses in the context of air pollution at the identified hospital like the emergency department of a hospital are as follows:

#### a. Selection of sentinel surveillance cities

- 1 Prioritise the non-attainment cities as identified under the National Clean Air Programme (NCAP) of the MoEFCC
- 2 Prioritise to select cities in the state with higher AQI levels or those with comparatively poorer air quality levels amongst other cities. For example: Consideration of cities for the surveillance may be done if the previous data of the AQI in the city are available and as follows
  - I. **High priority cities** - Cities with annual average AQI consistently in very poor or more categories for the last three years
  - II. **Mid priority cities** - Cities with annual average AQI consistently in poor category for last three year
  - III. **Low priority cities** - Cities with annual average AQI occasionally goes in the poor category for the last three years

Cities with AQI value of more deficient categories may be considered for at least the last year if data are not available.

- I. Refer SPCB or SAFAR, if state has 'none of its city' been listed under the non-attainment cities' list under NCAP of MoEFCC
- b. Selection of sentinel surveillance hospitals
  - i. Hospitals (public/ private) having a high footfall of patients in its emergency department, mainly due to respiratory and cardiovascular diseases
  - ii. Medical/ tertiary care hospitals with facilities for treating respiratory and cardiovascular emergencies
  - iii. District/ civil hospital may be selected if it is the first referral centre for primary and secondary healthcare facilities
  - iv. At least four- five sentinel hospitals per city may be identified for representativeness of the city
- c. Conduction of surveillance in the sentinel hospitals
  - i. Sentinel hospital at present to collect daily data of respiratory emergencies for 24 hours and report against total attendance of patients in the emergency department for the corresponding day
  - ii. Nodal officer of sentinel hospital to send the report to nodal officer at district level, in format (annexed A-I, II, III)
  - iii. District nodal officer – climate change to collect and collate data of sentinel hospitals. DNO-CC must take the AQI level for the corresponding day (Annexure C). Similarly, data must be collated and analysed at the state level against the AQI levels.
  - iv. A monthly report and the collected data to be sent to the NCDC before the specified date  
  
(Details on the surveillance may be referred to the SOP on the surveillance in the context of air pollution developed under the NPCCHH programme)
- C. Public health management of illnesses:** Based on the reported pattern of illnesses, types and severity of illnesses reported by the health facilities, a management plan of the available resources (human resources, materials and finances) to address the health problems may be created
  - a. Appropriate allocation of human resources in the hospital/ healthcare facilities
  - b. Enlisting essential and desirable logistics, equipments, drugs, vaccine etc., for managing health problems reported to the healthcare facilities like acute respiratory illnesses, exacerbation of cardio-vascular illnesses or other allergic manifestations, etc.
  - c. Emergency plan to be prepared with the roles and responsibilities of stakeholders (health & non-health)
  - d. Refer to NPCDS programme for management of non-communicable diseases
- D. Awareness generation through targeted IEC for vulnerable populations in locally acceptable language**
  - ❖ Develop/ translate communication messages for audio-visual and print media
  - ❖ Mass campaign using print IEC and electronic messages (audio/ audio-visual)
  - ❖ Advocacy and public awareness through street plays, folk methods, wall paintings, hoardings etc
  - ❖ Social mobilisation (women's self-help groups, community leaders, NGOs, school children) for adaptive measures for health impacts due to air pollution

❖ Considerations of areas for IEC development may be as follows:

### Considerations for IEC development on air pollution and health

Air pollution is recognised as greatest environmental and avoidable risk factor for human health and found to be associated with health problems, deaths, disabilities and reduced life expectancy

- More vulnerable populations (children, women, elderly, underlying medical conditions etc.)
- More vulnerable cities or areas of exposures, months, diurnal variations of air pollutions
- Air quality, AQI and its alerts and associated health advisories
- Promotion of activities related to reduction of air pollution – Use of public transport, avoiding biomass burning, use of cleaner fuel for cooking, avoid firecrackers, crop and waste burning etc
- Prevention of risk factor for illnesses like cardio-pulmonary diseases – promotion of healthy diet, physical activity, no use of tobacco and alcohol
- Other health adaptive measures to air pollution
- Do's and Don'ts as shared in the IEC developed under the NPCCHH and by the state

### E. Operational coordination with other stakeholders (health & non-health)

State and district Nodal Officers- climate change may coordinate with the Principal Secretary (health) at the state level and District Magistrate/ District Collector at the district level to ensure multi-sectoral involvements for the development of state or district level health adaptation plans in the State/ District Task Force Meetings (Multi-sectoral).

The following Ministries/ Departments/ Agencies may be referred or involved in the multi-sectoral coordination for developing HAP related to air pollution and health:

- MoEFCC:** For mitigation action information, including revised plans and actions related to air pollution
- Pollution Control Board:** CPCB/ S P C B/ District P C B for the air quality information or AQI in the city/ area and its forecast.
- The Ministry of Earth and Sciences:** Information from India Meteorological Department/ SAFAR related to AQI forecasting or timely warning of weather, temperature, humidity, wind direction and speed, etc
- Agriculture:** Actions and measures to reduce stubble burning, which is considered to aggravate air pollution during certain seasons; alteration in cropping pattern to reduce pollutant count in an area etc
- Other National Health Programmes** - like NPCDCS etc. which also address health issues related to air pollution
- Medical Commissions and Health-Related Councils** to include curriculum on air pollution and its health impacts to increase awareness and build capacity of the health professionals graduating from-medical, dental, nursing and AYUSH institutes
- Women and Child Development Department:** Advocate through Sf H G and Mahila Mandals to protect the health of the women and children from significant exposure to smoke from biomass while inside the house. Awareness-raising can be done to improve household ventilation to reduce smoke inhalation from lighting (ex. kerosene) or to cook fuels.

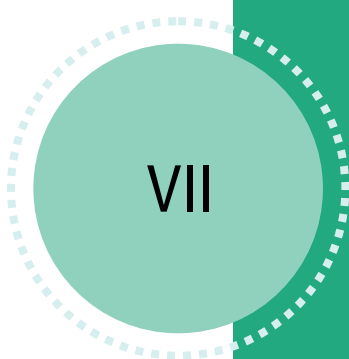
- h. **Ministry of Petroleum & Natural Gas**, initiatives like the PM Ujjawala scheme to increase the availability of LPG and other cleaner fuels to the rural and tribal areas; expanding the piped natural gas network to reach out to a larger population and better target LPG subsidies to poorer households
  - i. **The Ministry of Road & Transport and Highways** ensure effective implementation of the New Motor Vehicles Act (once approved) and to ensure proper engine checks for vehicles to assess pollution levels
  - j. **Panchayati Raj** to involve creating enabling conditions to facilitate community participation like those SHGs
  - k. **Academic Institutes/Medical Colleges** capacity building, operational and community- based research related to air pollution and related health intervention areas
- F. Timely issuance of alerts/ warnings on health risk factors related to the air quality level (AQI) and weather conditions like temperature, humidity etc. obtained from IMD/ Pollution Control Boards to the health professionals and the people**

To coordinate with other sectors like India Meteorological Department, SAFAR, Pollution Control Boards in an area for information on the air quality level and weather conditions like AQI level, temperature, humidity, wind speed and direction in an area which are likely to increase the health issues among the more vulnerable groups of people. The health risk factors' information may be conveyed in advance as an alert or early warning information as forecasted by the concerned ministries/ departments.

**G. Need-based capacity building of the health professionals and workers:**

Trainings, workshops, and meetings to sensitise and update target groups on air pollution and its health impacts and various health adaptation mechanisms.

Development of state-level Training of Trainers (ToTs), district nodal officers, designated nodal officers related to surveillance in the context of air pollution, Medical Officers and other health professionals like nursing officers, pharmacists, and community health care workers such as ASHA in the health sector on the health problems of air pollution, the various health adaptation plans to address the health issues of the more vulnerable people.



## Roles and Responsibilities of the Programme Nodal Officers on Air Pollution and Health

The Nodal Officers- Climate Change under the NPCCHH are responsible for coordinating with the multi-sectoral State/ District Task Force members in the state to implement the health-related action plans under the programme.

1. State Nodal Officer- Climate Change, at the state level
2. District Nodal Officer- Climate Change, at the district level
3. Medical Officer at the block level
4. Nursing officers, Pharmacists
5. Community-level health workers

- **State Nodal Officer – Climate Change**

### Roles and responsibilities of State Nodal Officer-Climate Change

1. To coordinate with the state level task force meetings to develop a HAP on air pollution and health as part of the State Action Plan on Climate Change and Human Health (SAPCCHH)
2. To undertake situational analysis of health impacts in the context of air pollution in the State:
  - a. Reports/ Documents/ Policies developed related to air pollution and health undertaken in various programmes and other departments in the state
  - b. AQI Monitors installed in the state (CPCB/ SPCB/ SAFAR)
  - c. Hot spot sites in the context of air pollution identified - CPCB/ SPCB/ SAFAR
  - d. AQI monitors required in the non-attainment cities/ hot spot areas
  - e. Identification and capacity building of human resources–
    1. Professionals from medical college, directorate health, institutes working related on air pollution, NGOs, etc
    2. Notification of designated nodal officers at every level- district/ block
    3. Identification of nodal officers from the designated sentinel hospitals in the context of air pollution
    4. Capacity building of nodal officers and other health professionals and community health workers- ASHAs, AWWs
3. IEC development, translation and dissemination planning

4. Development and dissemination of health advisories
5. Surveillance establishment in the context of air pollution
6. Hospital preparedness related to air pollution diseases
7. Timely issue of warnings to hotspot areas, health professionals and vulnerable and general population
8. To coordinate with the district nodal officers for overall periodic reviews, supervision, Monitoring and evaluation of the identified activities being carried out at all levels – State, Districts, Blocks, Towns and Villages/wards

Besides the above, the nodal officers, including the state nodal officers at various levels in the State, have essential role in addressing increase in problems related to allergic reactions associated with climate and weather in an area like temperature, humidity etc. Allergic health problems may also occur due to raised pollen counts known to vary with seasons, changes in seasons, dust storms, extreme weather events like cyclones, floods etc. The following considerations on health risk factors and adaptation plans may be done while addressing such health issues in an area-

1. Months known to have raised pollen counts, which can increase the respiratory problems also in different regions in the country

Region of India	Pollen season which may aggravate allergic health problems
Northern India	February- April and September- November
Eastern India	August and March- July
Southern India	August- November and February- April
Central India	March- Mid- May, September-November and December- February

2. During transitions between seasons, pollen counts may rise and can create more allergic health problems, which may be as follows:
  - a. Winters seasons: Acute exacerbation of allergic health problems due to indoor allergens
  - b. Winter to Spring change: Increase in grass and tree pollens  
Increase in outdoor mold
  - c. Spring to summer change: Grass pollens, mold spores peak in warm regions
3. When humidity levels in the atmosphere change, there can be an increase in allergic health problems, and these may be as follows:
  - a. High humidity and hot environment: Increase in moulds and dust mites
  - b. High humidity and worsening of air quality: Increase in asthmatic attacks
  - c. Increase in ozone level and high humidity: Increase in respiratory illnesses like asthma
4. During and after extreme weather events like floods, thunderstorms, cyclones, and natural disasters etc. pollen counts may increase due to disruption of the environment and increased risk of exposures for allergic health problems, including skin and respiratory problems, etc. These events are increasing in frequency and magnitude due to climate change

5. To address the above allergic health issues, the following health action considerations may be taken up to include at various levels in the state:

- Written SOPs to list out the allergenic months and seasons in an area in the context of climate change and to prioritise health problems, particularly respiratory problems like asthmatic attacks at the healthcare facilities
- Customised medication plans to treat allergic symptoms and health problems
- Ensuring the availability of the drugs such as antihistamines, nasal sprays, inhalational medicines and vaccines to help reduce the allergic health issues
- Before major festivals and episodic events like crop residue burning, which are associated with air pollution and increasing health problems-
  - Awareness generation on prevention, especially before festivals known to raise levels of pollutants and for seeking health advice
  - Enhanced healthcare preparedness, including logistics, drugs, etc
- Increase public awareness on climate change and allergic problems
  - ✓ Secondary prevention of allergy
  - ✓ Maintaining adequate humidity levels at home
  - ✓ When to restrict outdoor activities
- **District Nodal Officer-Climate Change**

The District Nodal Officer-Climate Change is responsible for implementing the programme at the district level and coordinating with officials in both health and non-health sectors.

#### **Roles and responsibilities of the District Nodal Officer-Climate Change**

- To develop a HAP on air pollution and health as part of the DAPCCHH
- To undertake situational analysis on air pollution and health at the district level
  - I. Reports/ Documents/Policies developed related to air pollution and health undertaken in the district
  - II. AQI Monitors installed in district - (CPCB/ SPCB/ SAFAR or NCAP)
  - III. Hot spot sites identified - (CPCB/ SPCB/ SAFAR or NCAP)
  - IV. Monitors required in hot spots
  - V. Human Resource-
    - Professionals from Medical Colleges, Training Institutes
    - Notification of designated Nodal Officers at every level
    - Capacity Building of Medical Officers, health professionals & workers
    - Community Health Workers - ASHAs, AWWs
- IEC Dissemination Plan

- Dissemination of Health Advisories
- Surveillance establishment and reporting (ARI sentinel surveillance at present)
- Healthcare facilities preparedness
- Timely issue of warning/ alerts to more hotspot areas, health professionals and more vulnerable and general population
- Periodic reviews, supervision and monitoring of the identified activities-  
IEC, Capacity Building, Surveillance, Preparedness of Healthcare facilities-
  - a. District
  - b. Block
  - c. Town
  - d. Village/ Ward

#### • **Block Medical officer**

Block Medical officer has the roles and responsibilities to implement the programme at the block level:

- Implementation of the identified activities on air pollution and health as per DAPCCHH or in consultation with DD-CC/ SNO-CC
- Capacity Building of
  1. Medical officers
  2. Nursing officers
  3. Pharmacists
  4. Communities health officers/ workers

Integrate and coordinate to get support from Rashtriya Bal Swasthya Karyakram and Rashtriya Kishore Swasthya Karyakram

- IEC Dissemination for increasing awareness generation to public and officials
- Health advisories dissemination
- Hospital preparedness for public health emergencies related to air pollution
- Supervision and monitoring of Surveillance activities if any sentinel hospitals are involved in the block area

#### **Medical officer at the Primary Health Centre/ Urban Healthcare Centre level:**

The medical officer is responsible for implementing Comprehensive Primary Healthcare Services through a network of Health and Wellness Centers that are envisaged in the Ayushman Bharat to provide promotive, preventive, and curative services etc. near the community through active participation of the whole team through the following actions:

- I. Creating awareness at the healthcare facilities and at the community level
- II. Capacity building, developing village level health adaptation plan related to air pollution
- III. Management of outdoor cases of health problems, emergency services and their referrals for cases in the context of air pollution

### **Roles of the Nursing officers/Staff Nurses-**

- a. Public awareness generation on promotive, preventive and control of health problems related to air pollution
- b. Patients attending outdoor, emergency and immunisation areas etc. may be advised on adverse health impacts of air pollution, particularly to children, women and pregnant women
- c. Capacity building of the community level health workers on health problems
- d. Preparedness of the resources and logistics for managing cases associated with air pollution, particularly respiratory and cardiac cases etc., attending emergency, ward, outdoor departments etc
- e. Coordinate with hospital administrators, doctors and staffs for managing of diseases related to air pollution

### **Roles of the Pharmacists:**

Regarding procurement, stock maintenance, logistics supply including medicines, equipment, ambulances etc for the health facility-

- a. To enlist required drugs and medications, stock and buffer maintenance and availability of drugs/ medicines required for managing diseases due to air pollution like Cardio-pulmonary diseases and allergies
- b. Prioritise procurement of logistics, drugs and medications, kits like antiallergic and respiratory medications, oxygen supply, nebulisers etc. which are required to deal with health problems due to air pollution such as Cardio-pulmonary diseases and allergies (Annexure E)
- c. To ensure functionality of the equipments, proper maintenance and repair of the logistics like nebulisers, ventilators etc

### **Community Health workers at the Village Level/ Ward Level**

- Village Health Sanitation Nutrition Committee in Rural areas
- MAS (Mahila Arogya Samiti) in Urban wards
- Community level public awareness generation on health effects of air pollution, and ways to protect and prevent health problems

**ASHAs** are community-level health workers acting as important link between the community and the healthcare system. With their community outreach activities, the following may be done.

- a. Awareness generation at the community level on the sources of air pollution, health problems and ways to protect and prevent air pollution
- b. Organise campaigns particularly on health problems of women and children related to air pollution

**AWWs** – (Through CDPO): At the Anganwadi centres during immunisation sessions, information may be given on the sources of air pollution in the household and outside, its health problems, particularly on women and children and ways to address them

### **Convergence of the programme with the other health implementing schemes :**

#### **1. Rashtriya Bal Swasthya Karyakram (Children upto 18 years)**

- I. Visit of RBSK teams at government/ government-aided schools at the block level twice a year to create

awareness among children at school

- II. RBSK teams visit and sensitise on air pollution and Health to Anganwadi Workers (AWWs). Women beneficiaries can be targeted through AWWs

## **2. Rashtriya Kishore Swasthya Karyakram (Adolescent Health)**

- I. Identifies peer educators who are enthusiastic teenagers with good communication skills on air pollution and health
- II. To make them aware of the adverse impacts of air pollution on human health and measures to avoid health risks
- III. Inclusion of a chapter on air pollution and health in their training module

## VIII

# Graded Health Response according to the Air Quality Level (Air Quality Index Categories)

Air pollution affects people's health, particularly the more vulnerable populations, depending on the air quality, which is usually expressed in the Air Quality Index (AQI). Some health-related events like increased hospitalisation are an index of morbidity due to air pollution.

The health of the people may be affected according to the various AQI category levels, depending on the vulnerability and hazard exposure as follows:

AQI level (as per CPCB)	AQI level in relation to Health
<100	Good to Satisfactory
101-300	Moderate to Poor
301- 400	Very Poor
400- 500	Severe
> 500	Severe + or Emergency

Based on data and seasonality, states must be prepared to manage health issues arising from worsening air quality. As a precautionary measure, following activities can be planned

- Refresher training exercise of different stakeholders
- Ensuring availability essential medicines, equipment, and technologies at all health facilities
- Situation analysis
- Prepare schedule for awareness activities at a community level like radio announcements, community announcements, newspaper announcements

Based on the worsening of air quality (AQI) and temperature and humidity variation, health problems due to air pollution may vary and increase. The following health-related measures may be taken up as responses by the health sector at various levels accordingly:

AQI: Good to Satisfactory (AQI <100) Temperature: Low, Humidity: Low	<b>Clinical manifestation:</b> Acute respiratory problems; Hypertension, Acute Coronary Syndrome, Heart failure and Indoor pollutants' allergies
AQI: Good to Satisfactory (AQI <100); Temperature: High, Humidity: High	<b>Clinical manifestation:</b> Grass pollen allergies, mold spore allergies, acute respiratory problems including asthmatic exacerbations and severe attacks; Heat-related illnesses and stroke (death/ morbidity), dehydration, Chronic Kidney Disease,

Interventions to be taken on Air Pollution and Health	Intervention Agencies / Officials
<p>1. State/ District level Task Force Meetings (Multi-sectoral) to continue considering 'Air Pollution and Health' as an important agenda with other ministries and departments to mitigate air pollution.</p> <ul style="list-style-type: none"> <li>• Forests (CPCB/ SPCB/ DPCB)</li> <li>• Agriculture</li> <li>• Transport</li> <li>• Construction</li> <li>• Power/coal-based power plants</li> <li>• Industries</li> <li>• Education (Schools/ Colleges)</li> <li>• NGOs related to air pollution</li> </ul>	By State/ District level Task Force and State/ District Nodal Officer-Climate Change
<p>2. Coordination to get information on Air Quality (AQI) of non-attainment cities under NCAP and other hotspots identified and its forecast from CPCB/ SAFAR/ SPCB/ DPCB etc.–website/ mobile app. where daily AQI can be available and dissemination of the same with main stakeholders in the health sector.</p>	By State/ District Nodal Officer-Climate Change, CMO/CMHO, Medical Superintendent, Block Medical Officer, Medical Office of the Healthcare facilities in coordination with officials of the respective pollution control boards
<p>3. Awareness generation on air pollution, health effects and ways to protect, prevent, control using acceptable modes of IEC creatives in local language- print, audio-visuals wherever applicable, area Identification (Hotspots) for IEC campaigns, Involved Health personnel and target groups for IEC</p>	By State/ District Nodal Officer-Climate Change; CMO, MS, BMO, MO and Healthcare workers Healthcare facilities

Capacity building of health professionals to address illnesses due to air pollution like cardiopulmonary problems, allergic health problems, NCDs etc	By State/ District Nodal Officer- Climate Change
Arrange manpower, logistics, drugs, kits for illnesses due to air pollution like cardiopulmonary & allergic health problems	By State/ District Nodal Officer- Climate Change
Sentinel Surveillance on air pollution-related illnesses (ARI, CPD & Allergies)	By State/ District Nodal Officer- Climate Change; Nodal Officers of Sentinel Surveillance Hospitals
Situational analysis, risk mapping and vulnerability assessment on Air Pollution and Health  Mock drill, if required, for health facility preparedness	By State/ District Nodal Officer- Climate Change Head of the healthcare facilities

<p>AQI: Moderate to Poor (AQI 101-300)</p> <p>Concentration values of Ambient <math>PM_{2.5}</math> (61-120 <math>\mu g/m^3</math>)/<math>PM_{10}</math> (101-350 <math>\mu g/m^3</math>)</p> <p>Temperature: Low, Humidity: Low</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Dust Allergies, Asthma exacerbation, Rhino-ocular symptoms, Cardiovascular problems- Acute Coronary Syndrome</p>
<p>AQI: Moderate to Poor (AQI 101-300);</p> <p>Concentration values of Ambient <math>PM_{2.5}</math> (61-120 <math>\mu g/m^3</math>) or <math>PM_{10}</math> (101-350 <math>\mu g/m^3</math>)</p> <p>Temperature: High, Humidity: High</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, grass pollen allergies, mold spore allergies, Asthma exacerbation, asthmatic attacks, cardio-vascular problems, heat-related illnesses and stroke (death/ morbidity), Dehydration, Chronic Kidney Disease</p>

Additional activities besides the above activities mentioned above in the good to satisfactory categories of air pollution	Intervention agencies/officials (Health sector)
Increase monitoring for implementation of the above activities weekly	By State/District Nodal Officer-Climate Change; CMO, MS, BMO, MO and Healthcare workers  Healthcare facilities
More IEC activities to hotspot areas	
Increase coordination for sharing of AQI levels and its forecast information to health care facilities and health professionals/workers	
Healthcare facilities to increase emergency and OPD services etc. and logistics availability to address the demands	By State/District Nodal Officer-Climate Change; CMO, MS, BMO, MO and Healthcare workers Healthcare facilities

<p>AQI: Very Poor (AQI 301- 400);</p> <p>PM<sub>2.5</sub> (121-250 µg/m<sup>3</sup>) or PM<sub>10</sub> (351-430 µg/m<sup>3</sup>)</p> <p>Temperature: Low, Humidity: Low</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation, Rhino-ocular symptoms, Acute Coronary Syndrome, dust Allergies</p>
<p>AQI: Very Poor (AQI 301- 400);</p> <p>PM<sub>2.5</sub> (121-250 µg/m<sup>3</sup>) or PM<sub>10</sub> (351-430 µg/m<sup>3</sup>)</p> <p>Temperature: High, Humidity: High</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation Heat stroke (death/ morbidity), dehydration, Chronic Kidney Disease, grass pollen allergies, mold spores allergies, asthmatic attacks, trigger for cardiovascular collapse</p>

Additional activities besides the above activities mentioned in the moderate to poor categories of air pollution	Intervention agencies/officials (Health sector)
Increase monitoring of the above activities daily wise	By State/District Nodal Officer-Climate Change; CMO, MS, BMO, MO and healthcare workers at healthcare facilities
More IEC activities for the public, including the hotspot areas and community outreach activities	
Increase coordination for sharing of the AQI levels and its forecast information to health care facilities and health professionals/workers	
OPD activities to increase, including outreach services if required	To coordinate with the Pollution Control Boards for timely information
Emergency Services/Indoor Services Logistics arrangements	CMO, MS, BMO, MO, Nursing Officers and healthcare workers at healthcare facilities
Healthcare facilities to strengthen their preparedness and services overall	

<p>AQI: Severe (AQI 400- 500)</p> <p>PM<sub>2.5</sub> (~250 µg/m<sup>3</sup>) or PM<sub>10</sub> (430 µg/m<sup>3</sup>)</p> <p>Temperature: Low, Humidity: Low</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation, Rhino-ocular symptoms, Acute Coronary Syndrome, dust Allergies, IHD</p>
<p>AQI: Severe (AQI 400- 500)</p> <p>PM<sub>2.5</sub> (~250 µg/m<sup>3</sup>) or PM<sub>10</sub> (430 µg/m<sup>3</sup>)</p> <p>Temperature: High, Humidity: High</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation Heatstroke (death/ morbidity), dehydration, Chronic Kidney Disease, grass pollen allergies, mould spores allergies, asthmatic attacks, trigger for cardiovascular collapse.</p>

Intervention activities to do under the NPCCHH programme	Intervention agencies/ officials (Health sectors)
<p>Increase Review/Monitoring of implementing activities on air pollution and Health Daily-wise.</p> <p>Increase coordination with other Ministries and Departments on the information of the actions to minimize air pollution etc.</p> <ul style="list-style-type: none"> <li>• Forests (CPCB/SPCB/DPCB)</li> <li>• Agriculture</li> <li>• Transport</li> <li>• Construction</li> <li>• Thermal Power Plants (coal-based power plants)</li> <li>• Industries</li> <li>• Education (Schools/Colleges)</li> <li>• NGOs related to air pollution</li> </ul>	<p>State/District level Task force</p> <p>By State/District Nodal Officer-Climate Change</p>
<p>Daily alert and update to coordinate on the information of AQI level and its forecasts from CPCB/SAFAR/ SPCB/DPCB to health officials if required for further actions and planning</p>	<p>By State/District Nodal Officer-Climate Change in coordination with pollution control boards</p>
<p>Continuous monitoring of whether the Health Advisories Dissemination is in the hotspot area and vulnerable populations are reached</p>	<p>State/District Nodal Officer-Climate Change</p>
<p>IEC activities to increase for the public in the identified more Hotspot areas</p>	<p>Healthcare facilities and community level health care workers (ASHA/AWW)</p> <p>School health team- Teachers may increase awareness generation to students in school / colleges</p>

Timely and Complete Reporting of sentinel surveillance data on health problems in the context of air pollution to relevant officials for actions	Sentinel Hospitals, Hospital Nodal Officers, District/State Nodal Officer
Outreach OPD facilities and referrals related to illnesses due to air pollution	Health care professional team
Increase outreach OPD facilities and referral services if required for illnesses due to air pollution	Director/MS/CMO-IC/BMO/MO-PHC
Strengthening OPD services for paediatrics/ medicine/ respiratory medicine and other NCD Clinics	Nodal Officers of the Emergency Department
Strengthening emergency department for illnesses due to respiratory, cardiovascular emergencies	Pharmacists/Logistic Procurement section
Availability of logistics, drugs, equipment for cardiorespiratory emergencies- Drugs, Nebulisers, Ventilators, oxygen cylinders or supply, Ambulances etc.	Nursing Superintendents, Nursing Officers
More community outreach activities- awareness generation	Community level health workers (ASHA, AWWs)

<p>AQI: Severe +/- Emergency (AQI &gt; 500)</p> <p>PM<sub>2.5</sub> (300 µg/m<sup>3</sup>) or PM<sub>10</sub> (500 µg/m<sup>3</sup>) persisting for 48 hours or more</p> <p>Temperature: Low, Humidity: Low</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation, Dust Allergies, Rhino-ocular symptoms, Acute Coronary Syndrome, Ischaemic Heart Diseases</p>
<p>AQI: Severe +/- Emergency (AQI &gt; 500)</p> <p>PM<sub>2.5</sub> (300 µg/m<sup>3</sup>) or PM<sub>10</sub> (500 µg/m<sup>3</sup>) persisting for 48 hours or more</p> <p>Temperature: High, Humidity: High</p>	<p><b>Clinical manifestation:</b> Acute Respiratory Illnesses, Asthma exacerbation, Heatstroke (death/ morbidity), Dehydration, Chronic Kidney Disease, grass pollen allergies, mold spore allergies, asthmatic attacks, trigger for cardiovascular collapse</p>
Intervention activities to do under the NPCCHH programme	Intervention by health sector (Healthcare Facilities + Community Outreach)
<p>Increase Review/Monitoring of activities related to the air pollution and health daily</p> <p>Increase coordination with other Ministries and Departments which help to mitigate air pollution, etc.</p> <ul style="list-style-type: none"> <li>• Forests (CPCB/SPCB/DPCB)</li> <li>• Agriculture</li> <li>• Transport</li> </ul>	<p>State/District level Taskforce</p> <p>By State/District Nodal Officer-Climate Change</p>
Daily alert and update to coordinate on the information of AQI level and its forecasts from CPCB/SAFAR/ SPCB/DPCB to health officials if required for further actions and planning	By State/District Nodal Officer-Climate Change in coordination with pollution control board officials if required
Continuous monitoring whether the Health Advisories Dissemination is in the hotspot area and vulnerable populations are reached	State/District Nodal Officer-Climate Change
IEC activities to increase for the public in the identified more Hotspot areas	<p>Healthcare facilities and Community level health care workers (ASHA/AWW)</p> <p>School health team- Teachers may increase awareness generation to students in School / Colleges</p>
Timely and Complete Reporting of sentinel surveillance data on health problems in context of air pollution to relevant officials for actions	Sentinel Hospitals, Hospital Nodal Officers, District/State Nodal Officer

Increase outreach OPD facilities and referral services if required for illnesses due to air pollution	Health care professional team
Strengthening OPD services for Paediatrics/ Medicine/ Respiratory Medicine and other NCD Clinics	Director/MS/CMO-IC/BMO/MO-PHC
Strengthening Emergency Department for illnesses due to respiratory, cardiovascular emergencies	Nodal Officers of the Emergency Department
Availability of Logistics, Drugs, equipments for cardiorespiratory emergencies- Drugs, Nebulisers, Ventilators, oxygen cylinders or supply, Ambulances etc	Pharmacists/Logistic Procurement section
Enhanced functional Emergency/Hospital Beds; Emergency Medicines/Drugs/Equipments Counselling/Awareness Generation to patients/families and relatives	Nursing Superintendents, Nursing Officers
More Community Outreach activities- awareness generation	Community level health workers (ASHA, AWWs)



## IX

# IEC materials related to Air Pollution and Health under the NPCCHH Programme

States are developing a media action plan to organise and campaign for public awareness about air pollution and health. States may do development, translation and dissemination planning of related IEC creatives or coordinate with the programme division for its support. While developing media action plan, the states may take into considerations types of media, culturally and acceptable languages, areas of hotspots to conduct and areas for more visibility and reaching the masses, the calendar months to increase the IEC campaigns for the public particularly in the colder months starting September to February -March. However, air pollution occurs throughout the year and during seasonal spikes in an area. Village level media plan may consider the inclusion of air pollution and health consideration for the vulnerable areas, populations and the timing and duration of the days/months in a year. States may share their specific IEC developments with the programme division, which may help support other states in their media plan and IEC organising and campaigns.

The IEC materials are being developed in Air Pollution and Human Health under the NPCCHH programme are as

1. Print
2. Audio- Visuals
3. Social media messages

स्वास्थ्य एवं परिवार कल्याण मंत्रालय  
भारत सरकार

राष्ट्रीय रोग नियंत्रण केंद्र  
NATIONAL CENTRE FOR  
DISEASE CONTROL  
DELHI-110016

# समझदार बनें... प्रदूषण के असर से बचें

**प्रदूषित हवा  
स्वास्थ्य के लिए  
हानिकारक है**

सुबह व शाम की सैर टालें

घरों के खिड़की-दरवाजे सुबह व शाम बन्द रखें

ज्यादा प्रदूषित जगहों पर ना जायें

जरूरत पड़ने पर ही घर से बाहर निकलें

आस्रों में जलन, साँस की तकलीफ या खाँसी होने पर डॉक्टर से सम्पर्क करें

दिल, फेफड़े, व अन्य गंभीर बीमारी के रोगियों का विशेष ध्यान रखें

पटाखे, कूड़ा, पत्तियां आदि न जलाए

घुआ रहित ईंधन का प्रयोग करें

घूसपान से बचें

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स्वास्थ्य एवं परिवार कल्याण मंत्रालय  
भारत सरकार

# प्रदूषित हवा स्वास्थ्य के लिए हानिकारक है

## प्रदूषण का आपके स्वास्थ्य पर असर

- चक्कर आना
- साँस लेने में तकलीफ
- खाँसी
- छाती में तकलीफ
- आँखों में जलन



जरूरत पड़ने पर ही घर से बाहर निकलें



आँखों में जलन, साँस की तकलीफ या खाँसी होने पर डॉक्टर से सम्पर्क करें



दिल, फेफड़े एवं अन्य गंभीर बीमारी के रोगियों का विशेष ध्यान दें



पुआ रहित ईंधन का प्रयोग करें



ज्यादा प्रदूषित जगहों पर ना जाएं



घरों के खिड़की-दरवाजे सुबह व शाम बन्द रखें



सुबह व शाम की सैर टालें



पटाखे, कूड़ा, पत्तियाँ आदि न जलाएं



धूमपान से बचें

## समझदार बनें...प्रदूषण के असर से बचें



Ministry of Health and Family Welfare  
Government of India



Act to  
**protect**  
your  
**health**  
from  
Air Pollution

## Consult Doctor for



Giddiness



Breathlessness



Cough



Chest discomfort



Irritation  
in eyes

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Government of India



## How to **protect yourself** from **AIR POLLUTION**



**Check  
air quality index  
before leaving**



**Avoid  
congested  
areas**



**Keep window  
& door closed**



**Don't smoke  
tobacco  
products**

<https://app.cpcbcr.com/AQI India/>

**MAPAN-SAFAR** - <http://safar.tropmet.res.in/>

[www.mohfw.gov.in](http://www.mohfw.gov.in)



Pollution Harms You

# Air Pollution

## Act to protect your health

### Consult Doctor for



Giddiness



Breathlessness



Cough



Chest discomfort



Irritation in eyes

### Don'ts



Avoid going to places with heavy traffic



Avoid opening doors and windows in early morning & late evening



Avoid going for morning walk



Don't burn firecrackers



Don't smoke tobacco products.



Ministry of Health and Family Welfare  
Government of India

### Do's

Remain indoors



Consult doctor in case of breathlessness, chest discomfort, irritation in eyes



Keep medications readily available for persons with airway, lung or heart illnesses



Use clean smokeless fuels for cooking and heating purposes.



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[www.mygov.in](http://www.mygov.in)  
[www.pmindia.gov.in](http://www.pmindia.gov.in)

YouTube: [mohfwindia](https://www.youtube.com/mohfwindia)  
Twitter: [@MoHFW\\_INDIA](https://twitter.com/MoHFW_INDIA)

<http://ncdc.gov.in/>  
Twitter: [@director\\_NCDC](https://twitter.com/director_NCDC)





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# Air Pollution

## Act to protect your health

### Do's



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Consult doctor in case of  
breathlessness, chest  
discomfort, irritation in eyes



Keep medications readily  
available for persons with  
airway, lung or heart illnesses



Use clean smokeless fuels  
for cooking and heating  
purposes.

### Consult Doctor for



Giddiness



Breathlessness



Cough



Chest discomfort,



Irritation in eyes

### Don'ts



Avoid going to places with  
heavy traffic



Avoid opening doors and  
windows in early morning &  
late evening



Avoid going for morning walk



Don't burn firecrackers



Don't smoke tobacco products.

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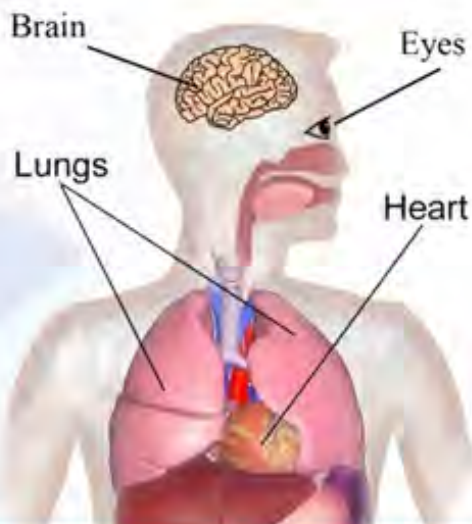
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Twitter [@director\\_NCDC](https://twitter.com/director_NCDC)





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# Air Pollution

## Act to protect your health

**Pollution Harms You**

### Check the Air Quality Index Level

Air Quality Index (AQI)# (Pollution level)	Possible Health Consequences	Advice for	
		General Population	Vulnerable Population*
<b>Good</b> (0-50)	Low risk	No special precautions	No special precautions
<b>Satisfactory</b> (51-100)	Minor breathing discomfort in vulnerable population*	No special precautions	Reduce prolonged or strenuous outdoor physical exertion
<b>Moderate</b> (101-200)	Breathing or other health related discomfort in vulnerable population*	Reduce prolonged or strenuous outdoor physical exertion	Avoid prolonged or strenuous outdoor physical exertion
<b>Poor</b> (201-300)	<ul style="list-style-type: none"> <li>Breathing discomfort in healthy people on prolonged exposure</li> <li>Breathing or other health related discomfort in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical exertion	Avoid outdoor physical activities
<b>Very Poor</b> (301-400)	<ul style="list-style-type: none"> <li>Respiratory illness in healthy people on prolonged exposure</li> <li>Pronounced respiratory or other illnesses in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical activities, especially during morning and late evening hours	Remain indoors and keep activity levels low
<b>Severe</b> (401-500)	<ul style="list-style-type: none"> <li>Respiratory illness in healthy people on prolonged exposure</li> <li>Serious respiratory or other illnesses in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical activities	Remain indoors and keep activity levels low

\* Vulnerable population (high risk): Elderly, children under 5 years, pregnant women, pre-existing illnesses like asthma and other airway or lung (respiratory) and heart (cardiovascular) diseases

#AQI= Air Quality Index; Check the daily AQI through the following websites before planning your day

**CPCB** - [https://app.cpcbcr.com/AQI\\_India/](https://app.cpcbcr.com/AQI_India/)

**MAPAN-SAFAR** - <http://safar.tropmet.res.in/>

[www.mohfw.nic.in](http://www.mohfw.nic.in)  
[www.mygov.in](http://www.mygov.in)  
[www.pmiindia.gov.in](http://www.pmiindia.gov.in)

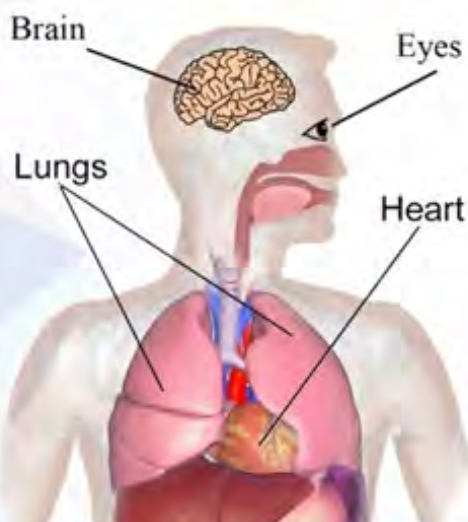
YouTube mohfwindia  
@MoHFW\_INDIA

<http://ncdc.gov.in/>  
@director\_NCDC





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**Pollution Harms You**

# Air Pollution

## Act to protect your health

### Don't

- ✗ Don't burn firecrackers, wood, leaves, agricultural products, garbage.
- ✗ Don't go to places with heavy traffic and industries.
- ✗ Don't go for morning and late evening walk, run, jog and physical exercise.
- ✗ Don't open doors and windows during morning and late evening; ventilate in afternoon (12 to 4 p.m).
- ✗ Don't smoke cigarettes, bidis and related tobacco products.

### Do's

- ✓ Remain indoors or reschedule outdoor activities.
- ✓ Consult the nearest doctor in case of breathlessness, giddiness, cough, chest discomfort or pain, irritation in eyes (red or watery)
- ✓ Persons with airway, lung or heart illnesses should keep their medications readily available.
- ✓ Continue use of clean smokeless fuels (gas or electricity) for cooking and heating purposes.

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[www.mygov.in](http://www.mygov.in)  
[www.pmindia.gov.in](http://www.pmindia.gov.in)

YouTube [mohfwindia](https://www.youtube.com/mohfwindia)  
@MoHFW\_INDIA

<http://ncdc.gov.in/>  
@director\_NCDC





# Act to **protect your health** — from **AIR POLLUTION** —

## Do's



Remain Indoor



Consult doctor in case of  
breathlessness, chest  
discomfort, irritation in eyes



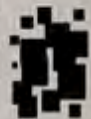
Keep medications readily  
available for persons with  
airway, lung or heart illnesses



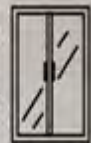
Use clean smokeless fuels for  
cooking & heating purposes

## Don'ts

Avoid going to places with  
heavy traffic & congested  
places



Avoid opening doors & windows  
in early morning & late evening



Avoid going for morning walk &  
evening walk



Don't burn fir crackers, garbage  
or waste



Don't smoke tobacco products



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Government of India



## HEALTH EFFECTS OF AIR POLLUTION

### SHORT TERM EFFECTS

Headache, Giddiness

Irritation in eyes

Coughing

Breathlessness

Skin Irritation

### LONG TERM EFFECTS

Central Nervous System  
(Stroke)

Cardiovascular Diseases  
(Heart Attack)

Respiratory Diseases  
(Asthma, Bronchitis)

Lung Cancer Risk

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## Check the **Air Quality Index (AQI)** level of your area from

CPCB-<https://app.cpcbcecr.com/AQI India/>  
MAPAN-SAFAR - <http://safar.tropmet.res.in/>

AQI - Pollution Level	Possible Health Consequences	What can you do	
		General Population	Vulnerable Population
Good (0-50)	Low risk	No special precautions	No special precautions
Satisfactory (51-100)	Minor breathing discomfort in vulnerable population	No special precautions	Reduce prolonged or strenuous outdoor physical exertion



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## Check the **Air Quality Index (AQI)** level of your area from

CPCB-<https://app.cpcbcecr.com/AQI India/>  
MAPAN-SAFAR - <http://safar.tropmet.res.in/>

AQI - Pollution Level	Possible Health Consequences	What can you do	
		General Population	Vulnerable Population
Moderate (101-200)	Breathing or other health related discomfort in vulnerable population	Reduce prolonged or strenuous outdoor physical activity	Avoid prolonged or strenuous outdoor physical activity
Poor (201-300)	<ul style="list-style-type: none"><li>➤ Breathing discomfort in healthy people on prolonged exposure</li><li>➤ Breathing or other health related discomfort in vulnerable population on short exposure</li></ul>	Avoid outdoor physical exertion	Avoid outdoor physical exertion



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## Check the **Air Quality Index (AQI)** level of your area from

CPCB-<https://app.cpcbcr.com/AQI India/>

MAPAN-SAFAR - <http://safari.tropmet.res.in/>

AQI - Pollution Level	Possible Health Consequences	What can you do	
		General Population	Vulnerable Population
Very Poor (301-400)	<ul style="list-style-type: none"><li>➤ Respiratory illness in healthy people on prolonged exposure</li><li>➤ Pronounced respiratory or other illness in vulnerable population on short exposure</li></ul>	Avoid outdoor physical activities especially during morning & late evening hours	Remain indoors and keep activity levels low
Severe (401 and above)	<ul style="list-style-type: none"><li>➤ Respiratory illness in healthy people on prolonged exposure</li><li>➤ Serious respiratory or other illness in vulnerable population on short exposure</li></ul>	Avoid outdoor physical exertion	Remain indoors and keep activity levels low

[www.mohfw.gov.in](http://www.mohfw.gov.in)

## Advisory on Air Pollution and Health

(Given the AQI levels in the Delhi NCR regions crossing the severe plus category)

Generate awareness to prevent unhealthy effects of Air Pollution:

I. General Population:

Reduce risk from exposure to air pollutants by

### DON'TS

1. Avoid places with high pollution like roads with slow & heavy traffic, areas near polluting industries, construction-demolition sites, coal-based power plants and brick kilns etc.
2. On days with poor to severe AQI, avoid outdoor morning and late evening walk, run, jog and physical exercise. Do not open external doors and windows during morning and late evening hours; may ventilate if necessary, between 12 pm to 4 pm.
3. Avoid burning biomass such as wood, coal, animal dung, kerosene. Use clean, smokeless fuels (gas or electricity) for cooking and heating purposes. If using biomass, use clean cookstoves.
4. Avoid burning firecrackers.
5. Avoid burning in open any form of wood, leaves, crop residues, and waste.
6. Do not smoke cigarettes, bidis and related tobacco products.
7. Avoid burning mosquito coils and incense sticks in closed premises.

### DO'S

1. Remain indoors on days with poor to severe-plus AQI. Reschedule outdoor activities as per AQI level.
2. Practice wet mopping instead of sweeping or vacuum cleaning inside homes. If you choose to use a vacuum cleaner, use those which has High-Efficiency Particulate Air (HEPA) filter.
3. Keep washing your eyes with running water regularly and do regular gargles with warm water.
4. Consult the nearest doctor in case of breathlessness, giddiness, cough, chest discomfort or pain, irritation in the eyes (red or watery)
5. As a "no-regret" strategy, a healthy diet with fruit and vegetables rich in antioxidants and adequate hydration by drinking water is advocated.

## II. Vulnerable Population – additional measures

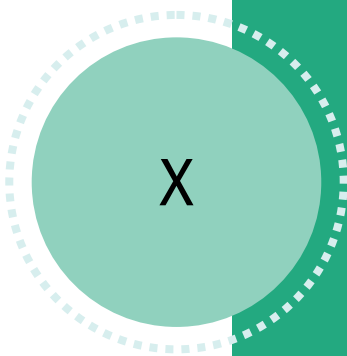
Patients with chronic pulmonary or cardiovascular problems; pregnant women, young children and the elderly should

1. Be more careful to avoid exposure to air pollution. Restrict outdoor movements as far as possible.
2. Avoid any strenuous activity.
3. Keep a check on exacerbations of symptoms.
4. Properly follow personal doctor's instructions on healthcare.
5. Keep their prescribed medications readily available.

6. Seek immediate medical advice if symptoms worsen.

### **III. Optional choice:**

1. If you choose to use a face mask, the disposable N95 or N99 is useful provided user instructions are followed. These masks may help provided the period of exposure is short. Masks should have proper fitting on users' mouth and nose. Ensure to replace the masks after usage as instructed. Paper masks, handkerchiefs, scarves and cloth are not effective.
2. If you choose to use air purifier, follow manufacturers' guidelines. Ensure to replace and clean filters as instructed. Avoid using an air purifier that works by generating ozone, as it increases pollution inside rooms.
3. When operating air conditioners in buildings or vehicle, use in "re-circulate" mode to avoid contact with outside air.



## Reporting Formats(Four) for ARI Surveillance at various levels under the NPCCHH Programme

Surveillance of health problems, particularly acute respiratory illnesses in the context of air pollution in the country, is a crucial activity initiated under the programme since November 2017 from the sentinel hospitals of Delhi. The surveillance is expanded to the other States and cities, particularly those non-attainment cities identified under the NCAP.

Four reporting formats are being developed and shared for reporting of data and its analysis from the nodal officers of the designated sentinel hospitals and from district nodal officers in the States/UTs to the State Nodal Officers and the NPCCHH programme division at NCDC as shown as:

Annexure A: Hospital level ARI surveillance daily reporting format

Annexure B: Hospital level ARI surveillance monthly reporting Format

Annexure C: District level ARI Surveillance reporting Format

Annexure D: District level ARI Surveillance Analysis Graph

## Annexure A: Hospital level ARI surveillance daily reporting format

<b>National Programme on Climate Change and Human Health</b> (Annexure A: Hospital level ARI surveillance daily reporting format ) <b>## (Daily Reporting of ARI Data format by Nodal Officers of the Hospitals)</b>							
<b>Cases of Acute Respiratory Illnesses Reporting to Emergency Departments (ED) of Sentinel Hospitals</b>							
Name of the hospital:							
Name of the city & district:				Name of the state:			
Date of compiling report: .....	Date of cases visit to Emergency	Reporting Period (24 hrs)	Specify usual time: 08:00hrs morning to 08:00hrs next morning or as per hospital considerations				
	Total Number of Emergencies Reported to ED	Total Number of Acute Respiratory illness* cases reported to ED (* check list of ARI overleaf)	Cases of Acute Respiratory illnesses reported to ED and requiring nebulisation	Cases of Respiratory Illnesses requiring admission	Cases of Respiratory Illnesses requiring Non-invasive ventilation	Cases of Respiratory Illnesses requiring Invasive ventilation	Name and Sign of OIC*
Internal Medicine ED							
Respiratory Medicine ED							
Paediatrics ED							
Total No. of cases (in ED)							
Name and Sign of hospital Nodal Officer							

## To be daily filled by the Nodal Officers of the concerned emergency unit and to be further compiled together by Nodal Officer of the hospital to send to District Nodal Officer – Climate Change and be copied to State Nodal Officer – Climate Change and NCDC at [npccch@gmail.com](mailto:npccch@gmail.com) To be retained in hospital for necessary checks.

\* OIC is Nodal Officer responsible for reporting for the concerned department – Internal Med/Respiratory Med/Paediatrics

- This report will be sent by each specialty department to Nodal Officer for ARI surveillance of the hospital.
- In this reporting format, the reporting unit's name is to be mentioned as specialty like medicine, pediatric or respiratory emergency department, etc.
- In the name of the hospital head, enter the name of the sentinel surveillance hospital and the city's name.
- A date should be the one when this report is sent to the Nodal officer of the hospital
- Reporting period will be 24 hours as per the combination of all the emergency department shifts. E.g. 8 am of the previous day to 8 am of the next day.

Doctor of each specialty must fill this format under mentioned heads as given below:

**1. Total Number of Emergencies Reported to ED-**

Here, all kinds of emergencies attended by the treating physician like accidents, medical-related, poisoning, burns, respiratory emergencies, etc. are to be entered. This will give the total count of emergencies at the emergency department.

**2. Total Number of Acute Respiratory illness cases reported to ED –**

Here all the emergencies of due to respiratory illnesses are to be included. This should include both infectious and non-infectious origin. This value will be a part of the total emergency reported to ED.

**3. Cases of Acute Respiratory illnesses reported to ED and requiring nebulisation.**

Here, all the doctor's respiratory emergencies and required nebulisation at the same time in the emergency department are to be entered. This value will be the part of the total of all respiratory emergencies, and its value should not be higher than point no. 2.

**4. Cases of acute respiratory illnesses requiring admission.**

Here out of all emergencies attended by the doctor, i.e., point no 2, those who are admitted are to be entered.

**5. Cases of acute respiratory illnesses requiring non-invasive ventilation.**

Some respiratory emergencies which are admitted require the need of Ventilation. In this head, all those admitted and put on a non-invasive ventilator are to be entered. This will be part of point no 5.

**6. Cases of acute respiratory illnesses requiring invasive ventilation.**

Those patients who are kept on an invasive ventilator are to be entered in this head. This value is also part of point no. 4

## Annexure B: Hospital level ARI Surveillance reporting Format

<b>National Programme on Climate Change and Human Health</b> (Annexure B: Hospital level ARI surveillance monthly reporting format) # (Monthly Compiled ARI Surveillance date-wise data by Nodal Officers of the Hospital)						
Acute Respiratory Illness Cases Reporting to the Emergency Department (ED) of Sentinel Hospital Details of Nodal Officer of Hospital						
Name:		Designation:				
Department:		Mobile No.		Email id:		
Name of the state:	Name of the City		Name of the Hospital:			Date of forwarding report:
(1) Date	(2) Total Number of Emergencies Reported to ED	(3) Total Number of Acute Respiratory illness cases reported to ED	(3) Total Number of Acute Respiratory illness cases reported to ED	(4) Cases of Respiratory illnesses requiring nebulization	(6) Cases of Respiratory Illnesses requiring Non-invasive ventilation	(7) Cases of Respiratory Illnesses requiring invasive ventilation
01 <sup>st</sup> Day of the Month						
Last day of month ▼						
Total No. of Cases (ED) / Month						
Sign of Hospital Nodal officer						

# To be sent every first day of the Month by Nodal Officer of sentinel hospital to District Nodal Officer – Climate Change and be copied to State Nodal Officer – Climate Change and NCDC at npcch@gmail.com. A copy to be retained by the hospital for the necessary check.

## Annexure C (District level ARI Surveillance reporting Format)

National Programme on Climate Change and Human Health												
(Annexure C: District level ARI surveillance reporting format)												
### (Analysis of ARI cases from the Sentinel Hospital by District Nodal Officer-CC)												
Analysis of Acute Respiratory illness cases reported to the Emergency Department in the Sentinel Hospital												
Details of the District Nodal Officer-CC:												
Name:				District & State:								
Mobile No.		Email ID:		Signature:								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Date	Total Number of Emergencies Reported to Emergency Dept. (ED)	Total Number of Acute Respiratory illness cases reported to ED	Total Number of Acute Respiratory illness cases reported to ED	Cases of Respiratory illnesses requiring nebulization (N)	Cases of Respiratory Illnesses requiring admission (Admin)	Cases of Respiratory Illnesses requiring Non-invasive ventilation (NIV)	Cases of Respiratory Illnesses requiring invasive ventilation (IV)	ED(ARI)/ ED %	Admin/ ED(ARI) %	IV/ED (ARI) %	IV/ admin%	AQI
1 <sup>st</sup> day of month		ED(ARI)	ED(ARI)									
Last day of month												
Total per month												

### To be sent before every 5th day of the Month by District Nodal Officer - CC to State Nodal Officer – CC and be copied to NCDC at npcch@gmail.com. A copy to be retained by DNO-CC for necessary check. A copy to be sent to respective city hospitals as feedback.

### ARI Surveillance Data Analysis Report.

The following proportions are to be calculated from the data of Annexure A.

1. **ED(ARI)/ ED %** = This will give the proportion of acute respiratory illness emergency cases out of the total emergency cases reported at the emergency department of the hospital.

**N/ ED(ARI)%** = Number of patients given nebulisation out of the total number of respiratory illness cases reported at the emergency department of the hospital. The following proportions are to be calculated from the data of Annexure A.

2. **ED(ARI)/ ED %** = This will give a proportion of acute respiratory illness emergency cases out of the total emergency cases reported at the emergency department of the hospital.
3. **N/ ED(ARI)%** = Number of patients given nebulisation out of the total number of respiratory illness cases reported at the emergency department of the hospital.
4. **Admit/ ED(ARI)%** = Number of patients admitted in the hospital out of the total number of respiratory illness cases reported at the emergency department of the hospital.
5. **NIV/ ED(ARI)%** = Number of patients required non-invasive ventilation support in the hospital out of the total number of respiratory illness cases reported at the emergency department of the hospital.
6. **IV/ ED(ARI)%** = Number of patients required invasive ventilation support in the hospital out of the total number of respiratory illness cases reported at the emergency department of the hospital.

7. **IV/ Admit%** = Number of patients required invasive ventilation support out of the total number of respiratory illness cases reported at emergency department and admitted in the hospital.

#### **Annexure D – District level ARI Surveillance Analysis Graph in context of Air Pollution**

The analysis graph shows the relationship between the average AQI value of the district with proportion of ARI cases reported to the emergency department of the sentinel hospitals in the district. A graph is to be prepared between the air quality index (AQI) variable of the district's primary x-axis. The proportion of ARI cases reported to the emergency department of all the hospitals in the district on the secondary x-axis with the dates on the y-axis.

##### **Steps for preparing graph:**

1. Select data of date, AQI and proportion of ARI cases attending ED and prepare 2D column graph.
2. Select data of proportions of ARI cases attending ED and convert it as secondary axis by right click and selecting action format data series. Then convert this secondary axis data as a 2D line graph by going to Insert and select line.
3. Select AQI data and plot linear line of average AQI by using add trendline option available after right-click.
4. Select the proportion of ARI data and plot the linear line of its average by using add trendline option available after right-click.
5. Insert primary and secondary vertical axis title by using layout section – Axis title.
6. Insert Chart title by using layout section – chart title.
7. Shift legend at the bottom by using layout section – legend.
8. Rename both the axis using the select data option available after the right click option and then using the edit name command.



**Annexure E: List of essential medicines and technologies for implementing essential NCD interventions in primary care**

Essential Medicines and Technologies list for management of cardio-pulmonary disorders at Primary Care level*	
Medicines	Technologies
Thiazide diuretic	Thermometer
Calcium channel blocker (amlodipine)	Stethoscope
Beta-blocker	Blood pressure measurement device
Angiotensin converting enzyme inhibitor	Measurement tape
Statin	Weighing machine
Isosorbide dinitrate	Spacers for inhalers
Glyceryl trinitrate	Peak flow meter
Furosemide	Nebulizer
Salbutamol	Pulse oximeter
Ipratropium	Blood cholesterol assay
Amoxicillin	Lipid profile
Hydrocortisone (inj.)	Serum creatinine assay
Epinephrine	Troponin test strips
Heparin	Urine microalbuminuria test strips
Diazepam	Electrocardiograph
Magnesium sulphate	Defibrillator
Promethazine	
Dextrose infusion	
Glucose injectable solution	
Prednisolone	
Inhaled Budesonide	
Inhaled Tiotropium	
Aspirin	
Codeine	
Morphine	
Penicillin	
Erythromycin	
Sodium chloride infusion	
Oxygen	
Digoxin tablets/Inj. Potassium chloride	
Antiarrhythmics	

\*Adapted from WHO Essential Package of NCD interventions for primary care

## Glossaries

**Acute effect:** Short-lived effect

**Adaptation:** Adaptation to **climate change** refers to adjustment in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

**Aeroallergen:** Any of various airborne substances, such as pollen or spores, which can cause an allergic response

**Air Pollution:** There is degradation of air quality with adverse effects on human health or the natural or built environment due to the introduction, by natural processes or human activity, into the atmosphere of substances (gases, aerosols) which have a direct (primary pollutants) or indirect (secondary pollutants) harmful effect.

**AQI:** Air Quality Index is a tool for effective communication of air quality status to people who are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour. There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. Each of these categories is decided based on ambient concentration values of air pollutants and their likely health impacts (known as health breakpoints).

**Capacity Building:** In the context of climate change, capacity building is developing the technical skills and institutional capability in developing countries and economies in transition to enable them to participate in all aspects of adaptation to, mitigation of, and research on climate change.

**Chronic effect:** Long-lasting effect.

**Climate:** Usually defined as the "average weather" or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period ranging from months to thousands or millions of years.

The classical period is 30 years as defined by the **WMO**. These relevant quantities are most often surface variables such as temperature, precipitation, and wind.

**Climate Change:** The **UNFCCC** defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

**Flood:** Temporary partial or complete inundation of normally dry areas caused by rapid runoff or overflow from lakes, rivers, or tidal waters.

**IHD:** Ischaemic heart disease, i.e. heart problems caused by narrowed heart arteries (also called coronary artery disease and coronary heart disease). Often causes chest pain known as angina pectoris and can ultimately lead to heart attack

**Mitigation:** Human intervention to reduce emissions or enhance the sinks of **greenhouse gases**

**Monitoring:** Performance and analysis of routine measurements aimed at detecting changes in the environment or health status of populations. Not to be confused with **surveillance**, although surveillance techniques may be used in monitoring

**Morbidity:** Rate of occurrence of disease or other health disorder within a population, taking account of the age-specific morbidity rates. Health outcomes include chronic disease incidence/prevalence, hospitalisation rates, primary care consultations and **Disability-Adjusted-Life-Years (DALYs)**.

**Nitrous oxide (N<sub>2</sub>O):** A powerful greenhouse gas emitted through soil cultivation practices, especially the use of commercial and organic fertilisers, fossil fuel combustion, nitric acid production, and biomass burning. One of the

six greenhouse gases to be curbed under the **Kyoto Protocol**.

**Ozone:** Form of the elemental oxygen with three atoms instead of the two that characterise normal oxygen molecules. Ozone is an important **greenhouse gas**. The **stratosphere** contains 90% of all the Ozone present in the atmosphere, which absorbs harmful ultraviolet radiation. In high concentrations, Ozone can be harmful to a wide range of living organisms. Depletion of stratospheric Ozone, due to chemical reactions that may be enhanced by **climate change**, results in an increased ground-level flux of **ultraviolet-B-radiation**.

**ppm:** Parts per million; unit of concentration often used when measuring levels of pollutants in air, water, body fluids, etc. One ppm is 1 part in one million by volume.

**Primary air pollutants:** Air pollutants produced because of the combustion of **fossil** and **biomass** fuels. They include carbon monoxide, nitrogen oxides and sulphur dioxide

**Primary health care:** Essential health care made accessible at a cost the relevant country and community can afford, incorporating methods that are practical, scientifically sound, and socially acceptable. This may include community education, promotion of adequate food supplies, basic sanitation and water, family planning and the prevention and control of locally **endemic** diseases.

**Relative humidity:** The ratio of the mass of water vapour in each volume of air to the value of saturated air at the same temperature

**Resilience:** The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation.


**Secondary air pollutants:** Air pollutants formed by chemical and photochemical reactions of primary air pollutants and atmospheric chemicals

**Sentinel site:** Specific health facility, usually a general/family practice, which undertakes to maintain surveillance and report certain specific predetermined events such as cases of certain infectious diseases



**Stakeholder:** Person or entity that has an interest or 'stake' in the outcome of a particular action or policy.

**Surveillance:** Continuous analysis, interpretation, and feedback of systematically collected data to detect trends in the occurrence or spread of a disease, based on practical and standardised methods of notification or registration

**Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity



Government of India

## ADVISORY ON AIR POLLUTION AND HEALTH

### What is Air Pollution?

Air pollution is the contamination of indoor or outdoor air by a range of gasses and solid particles that modify natural characteristics of air we breathe. Key health harmful pollutants include particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), carbon monoxide (CO), ozone (O<sub>3</sub>), black carbon (BC), sulfur dioxide and nitrogen oxides (Nox). Air pollution is often not visible to the naked eye as the sizes of the pollutants are smaller than the human eye can detect.



### What are major sources of Air Pollution?

Ambient (outdoor) air pollution is caused by factors such as vehicular exhaust, road dust, construction dust, burning of garbage, burning of agricultural crop residues, industrial emissions, fossil fuel fired thermal power plants and brick kilns, burning of biomass in households, burning of firecrackers etc.

Household air pollution is caused by burning biomass such as wood, coal, dung, kerosene in chulhas or fireplaces for cooking and heating purposes. Indoor air pollution is caused by burning mosquito coils, incense sticks, cigarettes, bidis, use of sprays, solvents, and fumes from chemicals used in building interiors etc.

### Air Quality

Air Quality Index (AQI) is a tool based on ambient concentration values of air pollutants and is categorized as Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. Worsening of Air Quality Index especially when in range of 'poor to severe' in an area may result in increase in morbidity and mortality among the exposed people.

www.mohfw.nic.in
 @MoHFW\_INDIA
www.ncdc.gov.in
 @Director\_NCDC

Air Quality Index (AQI)# (Pollution level)	Possible Health Consequences	Advice for	
		General Population	Vulnerable Population*
Good (0-50)	Low risk	No special precautions	No special precautions
Satisfactory (51-100)	Minor breathing discomfort in vulnerable population*	No special precautions	Do less prolonged or strenuous outdoor physical exertion
Moderate (101-200)	Breathing or other health related discomfort in vulnerable population*	Do less prolonged or strenuous outdoor physical exertion	Avoid prolonged or strenuous outdoor physical exertion
Poor (201-300)	<ul style="list-style-type: none"> <li>- Breathing discomfort in healthy people on prolonged exposure</li> <li>- Breathing or other health related discomfort in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical exertion	Avoid outdoor physical activities
Very Poor (301-400)	<ul style="list-style-type: none"> <li>- Respiratory illness in healthy people on prolonged exposure</li> <li>- Pronounced respiratory or other illnesses in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical activities, especially during morning and late evening hours	Remain indoors and keep activity levels low
Severe (401-500)	<ul style="list-style-type: none"> <li>- Respiratory illness in healthy people on prolonged exposure</li> <li>- Serious respiratory or other illnesses in vulnerable population* on short exposure</li> </ul>	Avoid outdoor physical activities	Remain indoors and keep activity levels low

\* Vulnerable population (high risk): Elderly, children under 5 years, pregnant women, pre-existing illnesses like asthma and other airway or lung (respiratory) and heart (cardiovascular) diseases

#AQI= Air Quality Index; daily AQI is available on websites

1.CPCB ([https://app.cpcbccr.com/AQI\\_India/](https://app.cpcbccr.com/AQI_India/)) or

2.MAPAN-SAFAR: <http://safar.tropmet.res.in/>

## Health consequences of Air pollution



The health impacts of air pollution depend on the level of pollution and exposure duration. The individuals' vulnerability to the health impacts of pollution can also differ based on demographic factors and predisposing health conditions.

Short term high level exposures can result in acute health reactions such as irritation to eyes, nose, and throat, along with coughing, wheezing, chest discomfort and acute upper respiratory infections. Vulnerable groups can experience more severe effects such as lower respiratory tract inflammation and infection, exacerbation of asthma, bronchitis or exacerbation of chronic illnesses such as chronic obstructive pulmonary disease, ischaemic heart disease, and cerebrovascular stroke. Long term exposures to even lower level of pollution can result in chronic illnesses of respiratory and cardiovascular systems, lung cancer and premature death.

## Vulnerable Population

Following people may be considered vulnerable to health consequences of air pollution –

1. **Age group** - Individuals who are under five aged children and in old age.
2. **Pregnant women** – Exposure during pregnancy may have consequences for child in womb.
3. **Predisposed health conditions** - Those with pre-existing illnesses of respiratory and cardiovascular system are at high risk.
4. **Low socio-economic conditions** – Those with poor nutritional status and those living in conditions of poor housing, using fossil fuels for cooking, heating and lighting purposes have high risk.
5. **Occupational group** – Those with possibility of prolonged exposures such as traffic policemen, traffic volunteers, construction workers, road sweepers, rickshaw pullers, auto-rickshaw drivers, roadside vendors, and others working outdoors in polluted settings are at high risk. Women burning biomass for cooking, and sweeping dust are vulnerable on account of their household work.

## Recommendations for State Health Department

- A. State authorities need to keep a check on Air Quality Index data, available at CPCB and MAPAN-SAFAR website or obtain the same from State Pollution Control Board

## B. Strengthening of Healthcare services

### 1. Surveillance and Monitoring:

- Initiate sentinel surveillance of acute illnesses attributed to air pollution in the high polluted cities of the state. Record and monitor acute respiratory or coronary events at emergency units of few sentinel hospitals of each city. Monitor this against daily AQI levels reported for the cities.
- Document and maintain statistics of illnesses and their mortality known to be related to air pollution. Statistics should be compiled by healthcare facilities and by cities.
- Identify the hot spots by AQI levels and density of vulnerable population and ensure adequate access for them to essential healthcare services.

### 2. Develop health action plan for air pollution and health:

- Identify State and District/City Nodal Officer for Climate Change and Health related services, who would develop and execute air pollution related health services
- Identify State and District/City Task Force for Climate Change and Health who would provide technical guidance to Nodal officer in air pollution related health services
- Develop State Action Plan on Climate Change and Health, including sub-plans for Districts/Cities, which also has a section on air pollution and health related activities
- The Health Action Plan for state/district/cities will include
  - i. Documentation of month-wise average air pollution levels recorded in districts/cities.
  - ii. Documentation of the vulnerable population in districts/cities.
  - iii. List of operational agencies and stakeholders in districts/cities related to air pollution and associated illnesses.
  - iv. List of available healthcare infrastructure and services available in districts/cities for air pollution associated illnesses.
  - v. Documentation of month-wise average statistics of diseases related to air pollution for districts/cities.

- vi. Strategies to integrate air pollution data with disease surveillance data.
- vii. Details of hot spots based on pollution levels and population vulnerability, and plan for appropriate healthcare services in hot spot localities.
- viii. Roles and responsibilities identified for stakeholders in districts/cities.
- ix. Standard procedures for operational co-ordination among local government and stakeholders.
- x. Identified risk reduction activities in districts/cities.
- xi. List of available resources to handle air pollution and health related issues by districts/cities.
- xii. Details of planned awareness and capacity building activities (IEC, advisories, training).
- xiii. Details of plans to make healthcare institutions environment friendly
- xiv. Details of responsibilities of healthcare facilities towards
  - a. Data surveillance
  - b. Response to address increase burden of illness
  - c. Logistics required at health care facilities
  - d. Preparedness of health personnel
  - e. Develop operational communication channel
  - f. Promote clean air by controlling waste incineration, use of diesel generators, use of vehicles non-compliant to vehicle emission standards etc.

### 3. Generate awareness to prevent unhealthy effects of Air Pollution:

- General Population:

Reduce risk from exposure to air pollutants by

- Avoid places with high pollution like roads with slow & heavy traffic, areas near polluting industries, construction-demolition sites, coal based power plants and brick kilns etc.
- Reschedule outdoor activities as per AQI level, and remain indoors on days with poor to severe AQI.
- On days with poor to severe AQI, avoid outdoor morning and late evening walk, run, jog and physical exercise. Do not open external doors and

windows during morning and late evening hours, may ventilate if necessary between 12 p.m. to 4 p.m. in afternoon.

- Avoid burning biomass such as wood, coal, animal dung, kerosene. Use clean smokeless fuels (gas or electricity) for cooking and heating purposes. If using biomass, use clean cook stoves.
- Avoid burning firecrackers.
- Avoid burning in open any form of wood, leaves, crop residues, and waste.
- Do not smoke cigarettes, bidis and related tobacco products.
- Avoid burning mosquito coils and incense sticks in closed premises.
- Practice wet mopping instead of sweeping or vacuum cleaning inside homes. If you choose to use vacuum cleaner, use those which has High Efficiency Particulate Air (HEPA) filter.
- Keep washing your eyes with running water regularly and do regular gargles with warm water.
- Consult the nearest doctor in case of breathlessness, giddiness, cough, chest discomfort or pain, irritation in eyes (red or watery).
- As a “no-regret” strategy, healthy diet, with fruit and vegetables rich in antioxidants, and adequate amount of hydration by drinking water is advocated.

- **Vulnerable Population – additional measures**

Patients with chronic pulmonary or cardiovascular problems should

- Be more careful to avoid exposure to air pollution.
- Avoid any strenuous activity.
- Keep a check on exacerbations of symptoms.
- Properly follow personal doctor's instructions on healthcare.
- Keep their prescribed medications readily available.
- Seek immediate medical advice if symptoms worsen.

- **Optional choice:**

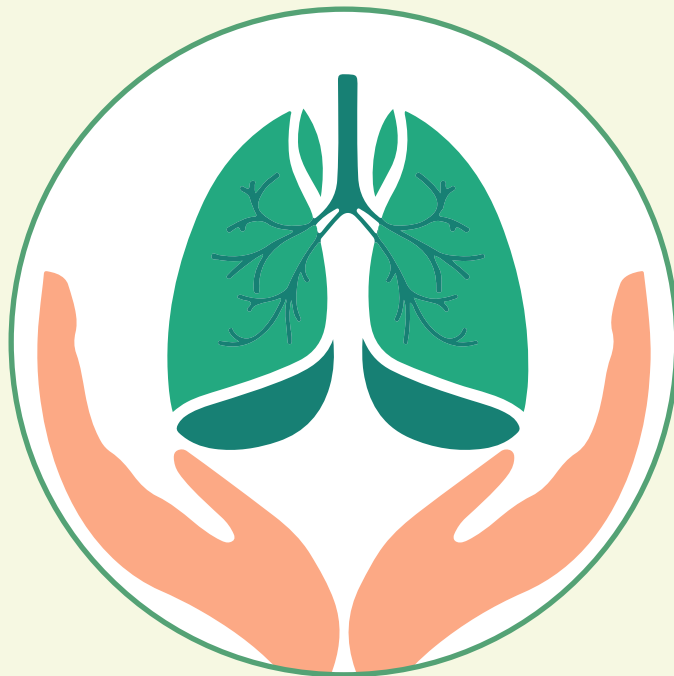
- If you choose to use face mask, the disposable N95 or N99 is useful provided user instructions are followed. These masks may help provided the period of exposure is short. Masks should have proper fitting on users'

mouth and nose. Ensure to replace the masks after usage as instructed. Paper masks, handkerchiefs, scarves and cloth are not effective.

- If you choose to use air purifier, follow manufacturers' guidelines. Ensure to replace and clean filters as instructed. Avoid using an air purifier that works by generating ozone, as it increases pollution inside rooms.
- When operating air conditioners in buildings or vehicle, use in “re-circulate” mode to avoid contact with outside air.

## For further information, please visit:

- [http://www.searo.who.int/india/topics/air\\_pollution/en/](http://www.searo.who.int/india/topics/air_pollution/en/)
- <http://www.who.int/airpollution/en/>
- <http://cpcb.nic.in/National-Air-Quality-Index/>
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