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ANNEXURE

D3



**STANDING INSTRUCTIONS FOR
MANAGEMENT OF
EPISODES OF POOR AIR QUALITY
IN THE PUNJAB**



(2018)

**ENVIRONMENT PROTECTION DEPARTMENT
GOVERNMENT OF THE PUNJAB**

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STANDING INSTRUCTIONS FOR MANAGEMENT OF EPISODES OF POOR AIR QUALITY, 2018

Acronyms

Additional Inspector General of Police	AIG
Aerosol Optical Depth	AOD
Agriculture Department	PAD
Air Quality Index	AQI
Carbon Monoxide	CO
Deputy Commissioner	DC
Environment Protection Department	EPD
Environmental Protection Agency	EPA
Housing, Urban Development & Public Health Engineering Department	HUD&PHED
Industries, Commerce and Investment Department	IC&ID
Information Department	PID
Local Government and Community Development Department	LG&CD
Nitrogen Dioxide	NO ₂
Ozone	O ₃
Parks and Horticultural Authorities	PHA
Particulate Matter size of 10 microns	PM ₁₀
Particulate Matter size of 2.5 microns	PM _{2.5}
Primary and Secondary Health Care Department	P&SHC
Solid Waste Management Company	SWMC
Specialized Health Care and Medical Education Department	SPHC&ME
Sulphur Dioxide	SO ₂
Transport Department	PTD
Oil and Gas Regulatory Authority	OGRA

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STANDING INSTRUCTIONS FOR MANAGEMENT OF EPISODES OF POOR AIR QUALITY, 2018

PRELIMINARIES

Instructions Number:

Title: Standing Instructions for Management of Episodes of Poor Air Quality in the Punjab

Effective Date: The Instructions shall come into effect on xxx.

Applicability: The Instructions shall be applicable to the whole of the Punjab

Authority: The Punjab Environmental Protection Council under section 4 of the Punjab Environment Protection Act, 1997.

Responsibility for Implementation: Due to its cross-cutting nature, management of air pollution, especially the episodes of extremely high air pollution which can potentially cause significant public health risk requires concerted effort on the part of a number of agencies. Among them, Environment Protection Department (EPD) and Environmental Protection Agency (EPA) shall play the lead role. Their main responsibilities shall include round the year monitoring of air quality at selected sites, generating alerts and taking necessary steps for abatement of pollution loads within the ambit of relevant environmental laws.

The main partner agencies include the following:

- (a). Departments of School Education, Home, Agriculture, Industries, Local Government, Housing, Primary and Secondary Health, Specialized Health Care, Transport, Information, and Cooperatives Government of the Punjab and their field offices;
- (b). Inspector General Police and Additional Inspector General of Police in-charge of Traffic and their field offices;
- (c). Divisional Commissioners and Deputy Commissioners;
- (d). Parks and Horticulture Authorities;
- (e). Solid Waste Management Companies;
- (f). Director Pakistan Meteorological Department, Lahore;
- (g). Director, Oil and Gas Regulatory Authority, Lahore;
- (h). Cantonment Boards;
- (i). Chambers of Commerce and Industries; and
- (j). Relevant industrial units.

Other agencies may be included as partner in the implementation arrangements on requirement basis.

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STANDING INSTRUCTIONS FOR MANAGEMENT OF EPISODES OF POOR AIR QUALITY, 2018

1. Purpose

The purpose of these instructions is to establish an appropriate Air Quality Index (AQI) for the Punjab, lay down procedures for reporting AQI related information and determining the existence of poor air quality episode in any given area, as well as provide a hierarchy of actions to prevent further buildup of pollution and to mitigate and reduce, to the maximum possible extent, any public health related impacts during such episode.

These instructions shall supplement the Policy and Action Plan for Control, Mitigation, Advisory and Protective Measures in Extreme Weather Conditions of Dense Smog in the Punjab.¹

2. General Scope of the Instructions

These instructions shall apply to the whole of the Punjab and covers, *inter alia*, the following main areas:

- (a). Determining air pollution levels which can cause significant public health risk in view of the available air quality monitoring and related public health statistics;
- (b). Establishing a system for regular internal episode watch and generating air quality alerts and warnings as and when required;
- (c). Identifying focused activities for vulnerable groups and pollution abatement measures in response to various pollution levels; and
- (d). Putting in place robust inter-agency coordination arrangements on the above mentioned aspects.

The general framework for responding to the episodes of poor air quality under these instructions requires a cascade of measures starting with the most lenient measures and then, if no improvement in air quality is observed or expected, progressively moving to the more stringent ones to prevent public health impact and abate given pollution levels. Essentially, these measures fall into the following three categories:

- (a). Health Advisories for the general public and vulnerable groups;
- (b). Recommended Measures for the general public, various businesses and relevant government agencies; and
- (c). Mandatory and Additional Measures for the general public, various businesses and relevant government agencies.

¹ No. SO(T)EPD/1-1/2016 dated 21.10.2017

Relevant details and inter-agency responsibility for implementation of these measures are given at sections 7 and 10 infra.

3. Background

Historically, the areas comprising Punjab have been experiencing periods of low visibility between November and February each year for an average of 10 to 25 days. In the recent years, however, the situation has exacerbated mainly due to increase in air pollution due to a variety of reasons. The air pollution largely comprises of minute suspended particles. Under favourable meteorological conditions such as high humidity levels, low ambient temperature, stagnant wind and thermal inversion,² these particles provide excellent medium for the water vapours to condense upon. Resultantly, a thick pollution laden fog appears, particularly in the first fortnight of November every year. There is evidence to show that this is a region wide phenomenon, covering large areas of South Asia from Delhi to Faisalabad and beyond in the north and Bahawalpur towards the south. Various studies have linked it to the burning of rice stubble in the Indian states of Punjab, Haryana and Uttar Pradesh. It is estimated that during 2016 alone, around 32 M tons of rice stubble were burnt in these states.³



Local sources of pollution, however, also contribute to this situation. The most important of these are the industrial units both large and small, many of which use furnace oil with high Sulphur contents; burning of agricultural residue, municipal waste and other hazardous materials; vehicular emissions and fugitive dust from construction sites. A wide range of small to medium-scale industries, including brick kilns and steel re-rolling mills make a much larger contribution as compared to the size of their economic activity due to poor state of their technology and use of "waste" fuels such as old tires, paper, wood, and textile waste. At the micro level, air quality is further impaired by the widespread use of small diesel electric generators in commercial and residential areas in response to electricity outages.

A comprehensive five year "Punjab Clean Air Action Plan" has been developed to address air quality problems in the Punjab and bring pollutions levels down by half of those existing at present. At the same time, a comprehensive study to scientifically determine the relative contribution of each of these pollution sources to the problem is underway. It is expected that the results of this study will greatly assist in refining these instructions as well as the long term efforts at improving air quality in the Punjab.

² Under the normal meteorological conditions, atmospheric temperature decrease with increase in altitude which supports vertical circulation of air and hence dispersion of pollutants. Under thermal inversion conditions, this trend reverses.

Hence pollution is confined to a shallow layer close to the earth surface thereby significantly increasing its relative concentration and adverse impact.

³ The New York Times, November 3, 2016

4. Main Challenges

Lack of sufficient and good air quality data is probably the biggest challenge in arriving at an appropriate response mechanism to deal with episodes of poor air quality in the Punjab. There are two main problems with the available data – firstly it is highly inadequate (duration of observation is 188 days and it is confined to three locations in Lahore), and secondly it was recorded mostly in 2007 and hence quite old. This data coupled with the results of sporadic monitoring of air pollutants elsewhere suggests that ambient air quality standards for suspended particulate matter with size of 2.5 and 10 microns (normally termed as $PM_{2.5}$ and PM_{10} respectively) are exceeded during most parts of the year.

In order to fill this void, an attempt has been made to use satellite based Aerosol Optical Depth (AOD) data as a proxy to determine the prevailing concentrations of particulate matter suspended in the air. Highlights of the results illustrated at Figure 3 indicate that the average AOD for Lahore ranges from 0.47 in April to 0.93 in July against the maximum value of 1. This leads to the conclusion that very high pollution concentrations exist even in the Monsoon period. These findings are substantiated by the scanty data available for 2007 given at Figure 4 and Table 1. It is apparent that $PM_{2.5}$ concentrations in Lahore met Punjab Environmental Quality Standard (PEQS) of twenty-four-hour average limit of $35\mu g/m^3$ for only seven days out of 188 days for which the observations are available or for 3.72% of the total observed period. Further, $PM_{2.5}$ concentrations were respectively twice and thrice of the standard limit for almost one-third and one fourth of the observed duration. The highest daily average value was observed as $350\mu g/m^3$ which is ten times the standard limit. In the nut shell, Lahore and by analogy most other large cities of the Punjab, are confronted with beyond standard limit concentrations of suspended particulate matter for most part of the year.

Figure 2: Aerosol Optical Depth, Nov 1, 2016

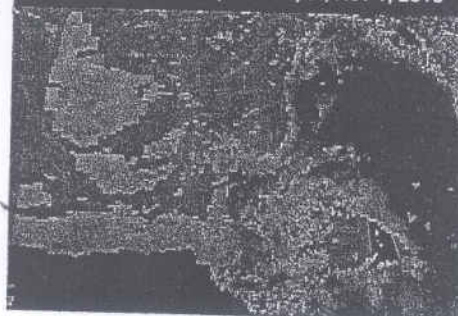


Figure 3: Average AOD AERONET 2011-16, Lahore

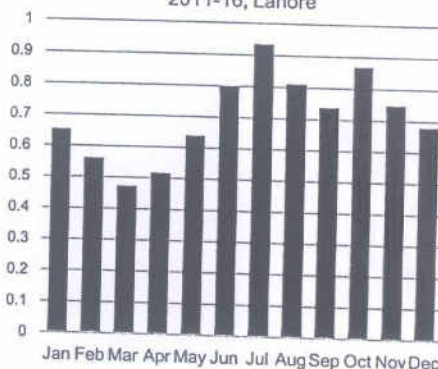
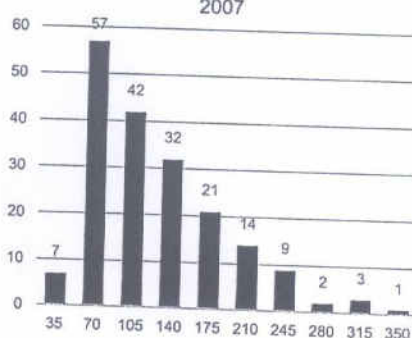


Figure 4: Daily Average $PM_{2.5}$ Concentration Frequency, Lahore, 2007



Being a regional and complex phenomenon, the problem of excessive air pollution can only be dealt with through concerted and planned efforts of various departments of the provincial and federal governments spread over a medium to long term. A strategy in this regard has been prescribed under the Policy and Action Plan for Control, Mitigation, Advisor and Protective Measures in Extreme Weather Conditions of Dense Smog in the Punjab while a detailed five-year action plan to implement this strategy has been prepared separately. To compliment this effort, World

Bank and other international development partners have been approached for technical and financial support and the negotiations are at an advanced stage. At the same time, it is also obvious that the desired results can only be achieved if government efforts are supplemented by whole hearted involvement of citizens at large. With the same in mind, serious efforts are afoot for raising awareness and thereby mobilizing communities through multiple means.

However, it is also understood that while these long term efforts are being put in place, it is necessary to provide for a robust framework for initiating immediate response during the episodes of high air pollution to minimize their impact on the health of citizens with a special focus on the needs of vulnerable groups such as elderly, children and persons suffering from relevant ailments. It requires no explanation that such responses need to be measured and balanced against competing demands of continuation of social and economic life on the one hand and avoiding damage to public health on the other – any disproportionate response on any side can only aggravate the problem. Given the inadequacy of historic data on air quality, arriving at such fine balance remains the biggest challenge. Therefore, as the second best option, an effort has been made to draw upon all available expert advice⁴ as well as international and regional practices in this area.⁵ This fact alone clearly indicates the need for frequent revisit and revision of these instructions as and when sufficient and quality data is acquired through the newly acquired monitoring stations and relationship between exposure to various levels of pollution and related diseases is clearly established through planned epidemiological studies.⁶

5. Air Quality Index and Related Colour Codes

Air Quality Index (AQI) prescribed under these instructions is based on concentration of six criteria pollutants identified in the PEQS⁷ for Ambient Air Quality namely PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO) and Ozone (O₃).

Table 1: Daily Average PM_{2.5} Concentration Frequency, Lahore, 2007

Daily Average PM _{2.5} concentration levels	Frequency	% Time
35 µg/m ³	7 days	3.72%
70 µg/m ³	57 days	30.32%
105 µg/m ³	42 days	22.34%
140 µg/m ³	32 days	17.02%
175 µg/m ³	21 days	11.17%
210 µg/m ³	14 days	7.45%
245 µg/m ³	9 days	4.79%
280 µg/m ³	2 days	1.06%
315 µg/m ³	3 days	1.60%
350 µg/m ³	1 days	0.53%

⁴ Advice received from USEPA, WB, AirNow, WHO and Beijing Bureau of Environmental Protection

⁵ 40 FCR Part 58, Air Quality Index Reporting, USEPA; Revised Air Quality Emergency Episode Plan for the District of Columbia; Air Information

and Response Plan, Ahmedabad, India; and Beijing Air Pollution Emergency Response Plan (Revised 2017)

⁶ Under the upcoming Punjab Green Development Program

⁷ Notification 122 of 2016, dated August 12, 2016

Further, it consists of sub-indices and health break points calculated for each of these criteria pollutants as given at Table 2 below.

Table 2: Ad-Interim Air Quality Index and Indicator Colour Code

PM ₁₀ ⁸	PM _{2.5} ⁹	SO ₂ ¹⁰	NO ₂ ¹¹	O ₃ ¹²	CO ¹³	Air Quality Index	Indicator Color
0-150	0-35	0-120	0-80	0-130	0-5	0-100	Green
151-200	36-70	121-240	80-160	131-260	5-10	101-200	Light Green
201-250	71-105	241-360	161-320	261-450	11-25	200-300	Yellow
251-350	106-140	361-700	321-560	451-550	26-40	301-400	Orange
351-430	141-300	701-1600	561-800	551-1900	41-50	401-500	Red
430 +	300 +	1600 +	800 +	1900 +	50 +	500+	Maroon

The AQI uses five levels indicated through different colours: Green, Light Green, Yellow, Orange, Red and Maroon respectively representing good, satisfactory, moderate, poor, very poor and extremely poor quality of ambient air. Each of these levels is based on likely health impacts of the concentration levels of criteria pollutants and hence provide a proxy for break points for initiating a host of health advisories laid out in section 7 infra. The "Green" level indicates conditions where concentration of all criteria pollutants are within the PEQS limits. Break points beyond this limit have been established as multiples of the standard limits and expected tolerance levels against them. If required, intermediate AQI values for a specific pollutant could be computed through interpolation.

The AQI is calculated in two stages. At the first stage, AQI sub-index for each criteria pollutant is identified based on raw concentration measurements received from air quality monitoring stations in the related area. Then in the second stage, the overall AQI value for a given day will be determined on the basis of highest value of the sub-index AQI value for any criteria pollutant on that day. For example, if raw concentration measurements for PM_{2.5} and O₃ for a given area are 140ug/m³ and 260 ug/m³, then the respective AQI sub-index for these pollutants shall work out as 301-400 and 101-200. Since, in this case, the AQI sub-index for PM_{2.5} is higher, therefore the AQI value for that day would be announced as 301-400 and disseminated as "Orange".

The main purpose of the colour code is to provide a quick and simple indication of the potential public health risk associated with the corresponding pollution levels. It is hoped that this indication will underscore the need for taking appropriate preventive measures on the part of general public and trigger required measures, including positive action to abate pollution, on the part of relevant government agencies.

⁸ Twenty-four hour average concentration in ug/m³ (PEQS limit is 150 ug/m³)

⁹ Twenty-four hour average concentration in ug/m³ (PEQS limit is 35 ug/m³)

¹⁰ Twenty-four hour average concentration in ug/m³ (PEQS limit is 120 ug/m³)

¹¹ Twenty-four hour average concentration in ug/m³ (PEQS limit is 80 ug/m³)

¹² Hourly average concentration in ug/m³ (PEQS limit is 130 ug/m³)

¹³ Eight hour average concentration in mg/m³ (PEQS limit is 5 ug/m³)

In addition, it is also understood that higher than standard concentrations of different air pollutants pose a range of health risks to various sensitive groups.¹⁴ Therefore, along with the overall AQI colour, concentration levels of criteria pollutants exceeding the PEQS limits will also be announced along with appropriate instructions for related vulnerable groups such as children, elderly, pregnant women and persons suffering from asthma or heart disease

6. Reporting Air Quality Index

The AQI values, concentration levels of criteria air pollutants and related health and general advisory will remain available at EPD website in the interest of wider information of general public. Existing format for presenting this important information is being improved drawing inspiration from the one followed by Mexico City given at Figure 5. In addition, an air quality App is also under development which will be made available for use on personal phones and computers through the App Store free of cost. At the same time, all effort will be made to use other social media tools including Twitter to ensure even wider dissemination. Further, arrangements will also be put in place to allow any concerned citizen to register with the EPA and access AQI values through e-mail twice daily.

At the same time, EPA is in the process of building capacity to forecast air quality. Once acquired, air quality forecast will again be disseminated through the website, under development App and e-mail. This is likely to help general public in planning their outdoor activities for times when air quality is better.

In addition, EPA will officially communicate the AQI values to all relevant government agencies including departments of Schools Education, Home, Agriculture, Industries, Local Government, Housing, Primary and Secondary Health, Specialized Health Care, Information, Cooperatives, AIG Traffic, concerned PHAs, SWMCs, Commissioners, Deputy Commissioners and Cantonment

Figure 5: Air Quality Reporting, Mexico City

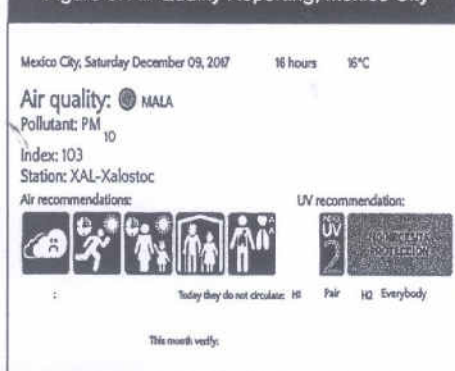
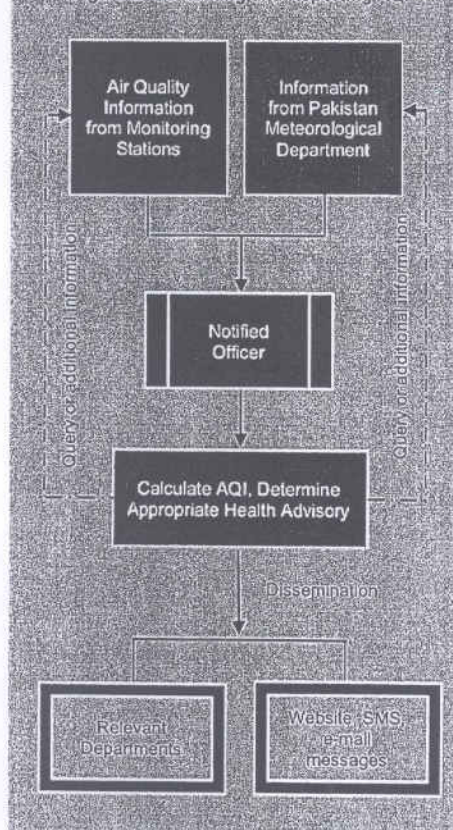


Figure 10: Generating and Reporting AQI



¹⁴ See Appendix I

Boards in the province, as well as the Chambers of Commerce and Industries and various industrial associations on need basis.

7. Air Quality Index related Health Advisories

Pending completion of epidemiological studies to scientifically establish the degree and extent of relationship between beyond standard limit concentration levels of criteria air pollutants on the health of local population, relevant literature remains the only plausible mean to define health impacts at various AQI levels. Hence, as an ad-interim arrangement, health impacts at various AQI levels shall be taken as under:¹⁵

Table 3: Ad-Interim Air Quality Index and Relevant Health Impacts

Air Quality Index	Indicator Color	Overall Associated Health Impact
0-100	Green	Good – Minimal impact
101-200	Light Green	Satisfactory – May cause minor breathing discomfort to sensitive people.
200-300	Yellow	Moderately Polluted – May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
301-400	Orange	Poor – May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease.
401-500	Red	Very Poor – May cause respiratory illness to people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.
500+	Maroon	Extremely Poor – May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity.

Literature further indicates that beyond the standard limit rise in concentration of criteria air pollutants impacts certain sensitive groups as mentioned below and therefore, they need to be kept continuously informed whenever such circumstances arise or are expected to arise:¹⁶

- Particulate Matter (PM_{2.5} and PM₁₀): People with heart or lung disease, older adults, children, and people of lower socioeconomic status.
- Ozone (O₃): People with lung disease, children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients.
- Carbon Monoxide (CO): People with heart disease.
- Nitrogen Dioxide (NO₂) and Sulphur Dioxide (SO₂): People with asthma, children, and older adults.

¹⁵ USEPA, Air Quality Index Reporting; Final Results

¹⁶ Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality

Index (AQI), Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina

Pollutant-specific sub-indices, health effects statements as well as cautionary statements to be issued by Primary and Secondary Health Care and Specialized Health Care and Medical Education Departments are given at Appendix I.

In view of the need to balance physical activities at schools against possible adverse health impact of poor air quality on students, including teenagers, Air Quality and Outdoor Activity Guidelines for Schools are given at Appendix II. Schools Education Department will circulate these Guidelines to all schools for prominent display, dissemination among students and strict implementation.

Among other measures for general dissemination of Appendix I and II, these shall be made available on the web site of EPD.

8. Poor Air Quality Episode and its Levels

An air pollution episode is an unusual combination of emissions and meteorology that gives rise to high levels of air pollution over a large area. These instructions establish four benchmark pollution concentration values for the most important criteria pollutants (SO₂, PM_{2.5}, CO, O₃) and corresponding Episode Levels viz Poor Air Quality Episode Alert, Warning, Emergency and Significant Harm with the main purpose of triggering a range of appropriate response actions corresponding to the expected impact of pollution.

Table 5: Pollutant Concentrations at Various Episode Levels¹⁷

Pollutant	Alert Level	Warning Level	Emergency Level	Significant Harm Level
Sulphur Dioxide ¹⁸	800 µgm/m ³	1600 µgm/m ³	2100 µgm/m ³	2620 µgm/m ³
Particulate Matter ¹⁹	300 µgm/m ³	350 µgm/m ³	450 µgm/m ³	600 µgm/m ³
Carbon Monoxide ²⁰	17 µgm/m ³	34 µgm/m ³	46 µgm/m ³	57.5 µgm/m ³
Ozone ²¹	400 µgm/m ³	800 µgm/m ³	1000 µgm/m ³	1200 µgm/m ³

Significant Harm Level represents the pollution concentrations which shall be avoided from being reached through a series of measures mentioned at section 10 infra.

9. Episode Watch and Promulgation of Episode Levels

The Director General, EPA, shall appoint a Notified Officer to continuously monitor air quality and meteorological conditions on daily basis and to perform other functions under these instructions. As soon as the Notified Officer observes that the concentration of any criteria air pollutant has reached Alert Level,²² he shall immediately inform the Director General in writing. The Director General shall, in turn, immediately hold the meeting of Advisory Committee constituted under section 11 infra. After examining all relevant

¹⁷ Based on Revised Air Quality Emergency Episode Plan for the District of Columbia, values for PM slightly reduced in view of local situation
¹⁸ 24 hour average concentration

¹⁹ 24 hour average concentration

²⁰ 8 hour average concentration

²¹ 2 hour average concentration

²² See Table 5 supra

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material and appertaining circumstances, if the Advisory Committee considers that the concentration of any criteria air pollutant in a given area has reached Alert Level and if these levels are sustained or exceeded, can lead to a threat to public health, the Director General shall issue an Air Quality Alert. Issuance of the Air Quality Alert shall mark formal commencement of Poor Air Quality Episode.

In the same manner, the Advisory Committee shall consider up-grading the episode level to Warning and Emergency Levels or vice versa down-grading the level if pollution concentrations are declining or other conditions have become or are likely to become favourable. The decision to declare if a particular level has been achieved will be made, *inter alia* when, it is considered by the Advisory Committee that:

- (a). Concentration of any criteria pollutant at any monitoring site exceeds from the values given under the relevant column of Table 5 supra;
- (b). The meteorological conditions are likely to be such that pollutant concentrations are expected to remain at these levels or higher for the next twelve hours or more unless control actions are taken; and
- (c). The accumulative impact of pollution and meteorological conditions is likely to lead to a threat to public health:

In addition, Warning Status and Emergency Levels will be declared only if air quality is observed to be continually degrading for the past 48 hours and additional control actions are considered necessary.

No upgradation or lowering of Episode Level shall be made without approval of Inter-Agency Coordination Committee constituted under section 11. The Advisory Committee shall make all recommendations in this regard as well as for adopting Additional Measures for abating pollution given at Appendix III to them in a timely manner. Such recommendation of the Advisory Committee shall be based on, *inter alia*, the following factors:

- (a). Observable health impact of given and forecasted levels of air pollution;
- (b). Potential pollution abatement impact versus economic and social loss associated with the implementation of a particular measure; and
- (c). Prevailing and forecasted meteorological conditions.

Upon commencement of Poor Air Quality Episode, Inter-Agency Coordination Committee shall assemble immediately and take a thorough review of the situation and take necessary decisions for preventing harm to public health and abatement of pollution on the recommendation of the Advisory Committee *inter alia* concerning declaration of Episode Level and invoking an Additional Measure. Inter-Agency Coordination Committee shall also ensure that the adopted recommendations are expeditiously and effectively implemented through the relevant agencies. Thereafter, the Inter-Agency Coordination Committee shall meet at such frequency as may be required, however this shall not be in any case less than two meetings in any given week.

When pollution concentration falls below the Alert Level, the Director General shall, on the recommendation of the Advisory Committee, declare the end of Poor Air Quality Episode. Such declaration shall, among other things, mark termination of any recommended and mandatory measures introduced under section 10 infra.

Experience indicates that rice-stubble burning, which remains an important source of air pollution, picks up in the first week of October and ends towards the last week of November every year. Depending upon the prevailing wind direction and speed, the smoke from these fires spreads over large areas in the region. The suspended smoke particles provide a good medium for the condensation of atmospheric water vapours under high humidity and low temperature conditions. Since these conditions are frequently met at that time of the year, a thick smog blankets large areas of the region for several days. Apart from concerns relating to high pollution loads, smog severely impairs visibility which leads to additional problems relating to safe use of roads and other means of transport including air. In order to respond to this periodic phenomenon, the schedule of preparatory and monitoring activities given at Table 6 below shall be followed each year:

Table 6: Schedule of Preparatory and Monitoring Activities for Episodes of Smog

Timeline	Activity	Responsible Agency
First week of August	<ul style="list-style-type: none"> (a). Circulation of instructions to all relevant agencies including the Divisional Commissioners to take necessary protective and abatement measures as given in these instructions as well as the Policy and Action Plan for Control, Mitigation, Advisory and Protective Measures in Extreme Weather Conditions of Dense Smog (b). Alert farmers' associations to avoid open burning of rice stubble (c). Alert all Chambers of Commerce and Industries as well as respective industrial associations to request their members to use clean fuel and avoid emissions (d). Increase number of regulatory inspections in respect of major polluting units 	EPD, all other relevant agencies
First week of September	<ul style="list-style-type: none"> (a). All relevant departments to hold meeting(s) with their field offices to review status of preparedness and extent of compliance with aforementioned instructions (b). First meeting of Inter-Agency Coordination Committee to review status of <ul style="list-style-type: none"> • preparedness of relevant agencies, extent of compliance with aforementioned instructions, long term weather forecast and other relevant matters 	EPD, all other relevant agencies

Timeline	Activity	Responsible Agency
Second week of September	(a). Meetings with Chambers of Commerce and Industries and relevant industrial and farmers' association	EPD, Industries, Agriculture Departments
	(b). Meetings of relevant field offices under Divisional Commissioners to review status of preparedness of relevant agencies and extent of compliance with aforementioned instructions, and other relevant matters	
Last week of September	(a). Imposing ban on burning of rice stubble, municipal waste and other hazardous material under section 144 of the Code of Criminal Procedure	Home Department, respective DCs
	(b). Wide dissemination of ban	
	(c). Coordination with Space and Upper Atmosphere Research Commission (SUPARCO), Pakistan Meteorological Department and other relevant agencies for setting up continuous monitoring arrangements through all possible means including satellite imagery.	EPD
	(d). Raising public awareness on health impacts of smog and possible protective measures through various mediums including print and electronic	P&SHC, SPHC&ME, PID and other relevant agencies
First week of October to last week of November	(a). Monitoring activities commence, reports shared with all relevant agencies	EPD,
	(b). Sharing of outdoor and indoor patient load with complaints of related diseases on daily basis from selected hospitals	P&SHC, SPHC&ME
	(c). Meetings of Inter-Agency Coordination Committee at such frequency as may be decided, however, it shall not be less than two meetings in a week	Minister Environment, EPD, all other relevant agencies
	(d). Regular press briefing to explain extent of problem, protective and pollution reduction measures being undertaken as per requirement	EPD, PID
First week of December	(a). Meeting of Inter-Agency Coordination Committee to review smog monitoring, protective and pollution control arrangements and identify areas for improvement	Minister Environment, EPD and other agencies

10. Recommended, Mandatory and Additional Measures and their Triggering

These are the three sets of specific measures given at Appendix III which aim at providing protection to the public and various sensitive groups against adverse health impact on the

one hand and arresting the rise in and bringing down, to the maximum possible level, air pollution levels on the other.

As a matter of general principle, Recommended and Mandatory Measures shall become effective automatically on the pronouncement of Air Quality Alert and other Episode Levels by Inter-Agency Coordination Committee and continue till the Poor Air Quality Episode is declared to be over under section 9 supra. However, Additional Measures will only come into effect and to such extent only after a decision in this regard is made by Inter-Agency Coordination Committee on the recommendation of Advisory Committee.

Appendix III also identifies specific government agencies responsible for announcement, dissemination and encouragement for the adoption of Recommended Measure as well as ensuring compliance of Mandatory and Additional Measure decided by the Inter-Agency Coordination Committee.

11. Implementation and Inter-Agency Coordination Arrangements

Due to its cross-cutting nature, management of air pollution and episodes of poor air quality requires concerted effort on the part of a number of agencies.

EPD and EPA shall play the lead role in this effort. Their main responsibilities shall include year around monitoring of air quality at selected sites, generating alerts and take necessary steps for abatement of pollution loads within the ambit of relevant environmental laws. The main partner agencies shall include:

- (a). Departments of Schools Education, Home, Agriculture, Industries, Local Government, Housing, Primary and Secondary Health, Specialized Health Care, Transport Information, and Cooperatives Government of the Punjab, and their field offices;
- (b). Inspector General Police, Additional Inspector General of Police in-charge of Traffic and their field offices;
- (c). Divisional Commissioners and Deputy Commissioners;
- (d). Parks and Horticulture Authorities;
- (e). Solid Waste Management Companies;
- (f). Director Pakistan Meteorological Department, Lahore;
- (g). Director, Oil and Gas Regulatory Authority, Lahore;
- (h). Cantonment Boards;
- (i). Chambers of Commerce and Industry; and
- (j). Relevant industrial associations.

Other agencies may be included as partner in the implementation arrangements on requirement basis. *

An Inter-Agency Coordination Committee shall be responsible for necessary oversight and coordination for the implementation of this policy. Inter-Agency Coordination Committee

shall be headed by Minister Environment and its composition and detailed tasks are given at Appendix IV.

An Advisory Committee, with the following composition, shall among other things, advise the Director General on declaring the commencement and termination of Poor Air Quality Episode, as well as make recommendations to the Inter-Agency Coordination Committee on the existence of various Episode Levels in view of the given and likely concentration of critical pollutants and rolling out corresponding Additional Measures to control pollution:

(a).	Director General, Environmental Protection Agency, Punjab	Chairperson
(b).	Director General, Health, Punjab	Member
(c).	Director, Pakistan Meteorological Department, Lahore	Member
(d).	Director, Environmental Protection Agency, Punjab responsible for air quality monitoring	Secretary
(e).	Two or more experts appointed by Secretary, Environment Protection Department	Member

12. Review and Improvement

These instructions will be implemented during 2018 on trial basis and will be reviewed and improved in light of experiences gained through extensive consultations with the partner agencies, Chambers of Commerce and Industries, relevant industrial associations, experts and other stakeholders.

HEALTH IMPACT AND CAUTIONARY STATEMENTS AT VARIOUS CONCENTRATIONS OF CRITERIA AIR POLLUTANTS

HEALTH IMPACT AND CAUTIONARY STATEMENTS AT VARIOUS CONCENTRATIONS OF CRITERIA AIR POLLUTANTS		Corresponding Health Statement	Corresponding Cautionary Statement
Pollutant, Concentrations			
O ₃ , 0-0.054 ppm (8 hour)		None	None
O ₃ , 0.055-0.070 ppm (8 hour)		Unusually sensitive individuals may experience some respiratory symptoms	Unusually sensitive people should consider reducing prolonged or heavy outdoor exertion.
O ₃ , 0.071-0.085 ppm (8 hour)		Increasing likelihood of respiratory symptoms, breathing discomfort in people with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients	People with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients should reduce prolonged or heavy outdoor exertion.
O ₃ , 0.086-0.105 ppm (8 hour)		Greater likelihood of respiratory symptoms and breathing in people with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients; possible respiratory effects in general population.	People with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients should avoid prolonged or heavy outdoor exertion; everyone else should reduce prolonged or heavy outdoor exertion.
O ₃ , 0.106-0.200 ppm (8 hour)		Increasingly severe symptoms and impaired breathing likely in people with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients; increasing likelihood of respiratory effects in general population.	People with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients should avoid all outdoor exertion; everyone else should reduce outdoor exertion.
O ₃ , 0.405-0.604 ppm (8 hour)		Severe respiratory effects and impaired breathing likely in people with lung disease (such as asthma), children, older adults, people who are active outdoors (including outdoor workers), people with certain genetic variants, and people with diets limited in certain nutrients; increasingly severe respiratory effects likely in general population.	Everyone should avoid all outdoor exertion
PM _{2.5} , 0-12.0 µg/m ³		None	None

Pollutant, Concentrations	Corresponding Health Statement	Corresponding Cautionary Statement
PM ₁₀ , 0-54 µgm/m ³ (24 hour)		
PM _{2.5} , 12.1-35.4 µgm/m ³ PM ₁₀ , 55-154 µgm/m ³ (24 hour)	Respiratory symptoms possible in unusually sensitive individuals; possible aggravation of heart or lung disease in people with cardiopulmonary disease and older adults.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
PM _{2.5} , 35.5-55.4 µgm/m ³ PM ₁₀ , 155-254 µgm/m ³ (24 hour)	Increasing likelihood of respiratory symptoms in sensitive groups including older adults, children, and people of lower socioeconomic status; aggravation of heart or lung disease and premature mortality in people with heart or lung disease	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should reduce prolonged or heavy exertion
PM _{2.5} , 55.5-150.4 µgm/m ³ PM ₁₀ , 255-354 µgm/m ³ (24 hour)	Increased aggravation of respiratory symptoms in sensitive groups including older adults, children, and people of lower socioeconomic status; increased aggravation of heart or lung disease and premature mortality in people with heart or lung disease; increased respiratory effects in general population.	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should avoid prolonged or heavy exertion; everyone else should reduce prolonged or heavy exertion
PM _{2.5} , 150.5-250.4 µgm/m ³ PM ₁₀ , 355-424 µgm/m ³ (24 hour)	Significant aggravation of respiratory symptoms in sensitive groups including older adults, children, and people of lower socioeconomic status; significant aggravation of heart or lung disease and premature mortality in people with heart or lung disease; significant increase in respiratory effects in general population.	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.
PM _{2.5} , 250.5-500.4 µgm/m ³ PM ₁₀ , 425-604 µgm/m ³ (24 hour)	Serious aggravation of respiratory symptoms in sensitive groups including older adults, children, and people of lower socioeconomic status; serious aggravation of heart or lung disease and premature mortality in people with heart or lung disease; serious risk of respiratory effects in general population.	Everyone should avoid all physical activity outdoors; people with heart or lung disease, older adults, children, and people of lower socioeconomic status should remain indoors and keep activity levels low.
CO, 0- 4.4 ppm (8 hour)	None	None
CO, 4.4-9.4 ppm (8 hour)	None	None

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Pollutant, Concentrations	Corresponding Health Statement	Corresponding Cautionary Statement
CO, 9.5-12.4 ppm (8 hour)	Increasing likelihood of reduced exercise tolerance due to increased cardiovascular symptoms, such as chest pain, in people with heart disease.	People with heart disease, such as angina, should limit heavy exertion and avoid sources of CO, such as heavy traffic.
CO, 12.5 -15.4 ppm (8 hour)	Reduced exercise tolerance in people with heart disease. due to increased cardiovascular symptoms, such as chest pain	People with heart disease, such as angina, should limit moderate exertion and avoid sources of CO, such as heavy traffic
CO, 15.5-30.4 ppm (8 hour)	Significant aggravation of cardiovascular symptoms, such as chest pain, in people with heart disease	People with heart disease, such as angina, should avoid exertion and sources of CO, such as heavy traffic.
CO, 30.5-50.4 ppm (8 hour)	Serious aggravation of cardiovascular symptoms, such as chest pain, in people with heart disease; impairment of strenuous activities in general population.	People with heart disease, such as angina, should avoid exertion and sources of CO, such as heavy traffic; everyone else should limit heavy exertion.
SO ₂ , 0-35 ppb (1 hour)	None	None
SO ₂ , 36-75 ppb (1 hour)	None	None
SO ₂ , 76 -185 ppb (1 hour)	Increasing likelihood of respiratory symptoms, such as chest tightness and breathing discomfort, in people with asthma.	People with asthma should consider limiting outdoor exertion.
SO ₂ , 186-304 ppb (1 hour)	Increased respiratory symptoms, such as chest tightness and wheezing in people with asthma; possible aggravation of other lung diseases	Children, people with asthma, or other lung diseases, should limit outdoor exertion.
SO ₂ , 305-604 ppb [24-hour]	Significant increase in respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; aggravation of other lung diseases.	Children, people with asthma, or other lung diseases should avoid outdoor exertion; everyone else should reduce outdoor exertion
SO ₂ , 605-1004 ppb [24-hour]	Severe respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; increased aggravation of other lung diseases; possible respiratory effects in general population.	Children, people with asthma, or other lung diseases, should remain indoors; everyone else should avoid outdoor exertion.
NO ₂ , 0-53 ppb (1 hour)	None	None
NO ₂ , 54-100 ppb (1 hour)	None	None

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Pollutant, Concentrations	Corresponding Health Statement	Corresponding Cautionary Statement
NO ₂ , 101-360 ppb (1 hour)	Increasing likelihood of respiratory symptoms, such as chest tightness and breathing discomfort, in people with asthma.	Unusually sensitive individuals should consider limiting prolonged exertion especially near busy roads.
NO ₂ , 361-649 ppb (1 hour)	Increased respiratory symptoms, such as chest tightness and wheezing in people with asthma; possible aggravation of other lung diseases.	People with asthma, children and older adults should limit prolonged exertion especially near busy roads.
NO ₂ , 650-1249 ppb (1 hour)	Significant increase in respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; aggravation of other lung diseases.	People with asthma, children and older adults should avoid prolonged exertion near roadways; everyone else should limit prolonged exertion especially near busy roads.
NO ₂ , 1250-2049 ppb (1 hour)	Severe respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; increased aggravation of other lung diseases; possible respiratory effects in general population.	People with asthma, children and older adults should remain indoors; everyone else should avoid all outdoor exertion.

Appendix II

AIR QUALITY AND OUTDOOR ACTIVITY GUIDANCE FOR SCHOOLS²³

Air Quality Index	Outdoor Activity Guidance
	Great day to be active outside
	Great day to be active outside Students who are unusually sensitive to air pollution could develop symptoms (see the box below)
	It is all right to be active outside, especially for short activities such as recess and physical education For longer activities, take more breaks and do less intense activities Watch for symptoms and take actions as needed Students with asthma shall keep quick relief medicine at hand
	For all outdoor activities, take more breaks and do less intense activities Consider moving longer or more intense activities indoors or rescheduling them to another day or time Watch for symptoms and take actions as needed Students with asthma shall keep quick relief medicine at hand
	For all outdoor activities, take more breaks and do less intense activities Consider moving longer or more intense activities indoors or rescheduling them to another day or time Watch for symptoms and take actions as needed Students with asthma shall keep quick relief medicine at hand
	Move all activities indoors or reschedule to another day

Watch for Symptoms	If Symptoms Occur
Air pollution can make asthma symptoms worse and trigger attacks. Symptoms of asthma include coughing, wheezing, difficulty in breathing and chest tightness. Even students who do not have asthma could experience these symptoms	The student developing symptoms might need to take a break, do a less intense activity, stop all activity, go indoors, or use quick-relief medicine as prescribed. If symptoms don't improve, inform your teacher to get medical help.

²³ Based on USEPA-456/F-14-003 August, 2014

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Appendix III

RECOMMENDED, MANDATORY AND ADDITIONAL MEASURES FOR VARIOUS EPISODE LEVELS

Episode Level: Alert; Colour Code: Blue		
Protective and Pollution Abatement Measures		Responsibility for Implementation
Recommended Measures		
(a). All persons in the relevant areas shall, to the maximum possible extent: (i) make effort to travel by public transport; (ii) reduce idle running of vehicles while waiting at junctions or in road congestion conditions; (iii) discourage open-air barbecue; (iv) use specified masks when outdoors for long durations, especially while riding a motorcycle; and (v) avoid traveling, especially at night, when poor air quality episode is accompanied with serious impairment of visibility.	Reducing adverse health impact Emissions reduction especially from transport Travel related safety	General public of relevant area(s) Dissemination, assistance and mobilization by PTD, PID, P&SHC, SPHC&ME, EPD and AIG Traffic in their respective fields
(b). Children, elderly and persons suffering from respiratory, cardiovascular and other chronic diseases to reduce outdoor activities		
Mandatory Measures		
(a). Increased frequency and intensity of regulatory measures for controlling air pollution inter alia in the following areas: (i) Priority industrial units; (ii) Construction sites and generating sets; (iii) Vehicular emissions and reduction of traffic congestions; and (iv) Fuel adulteration	Emissions reduction	EPA and other relevant agencies including Industries Department, OGRA and AIG Traffic,
(b). Promote popular knowledge on air pollution, emergency response, health protection measures and travel advisories in case poor air quality episode is accompanied by severe impairment of visibility, including issuance of General Health Advisory at Appendix IV	Awareness raising	EPA, P&SHC, SPHC&ME, AIG Traffic, and other relevant agencies
(c). In case air pollution episode is accompanied by impairment of visibility, mandate use of fog lights and luminescent warning signs on back end and sides of trailers, ensure proper functioning of tail lights and other appropriate safety measures	Travel related safety	PTD, AIG Traffic

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Protective and Pollution Abatement Measures		Objective	Responsibility for implementation
(d). Increased scope and intensity of dust control measures on construction sites, bare grounds and material stacking sites by respective owners (including government agencies), operators and contractors		Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(e). Strengthened cleaning, especially sweeping and solid waste collection; road cleaning and sprinkling to reduce traffic dust; in particular respective SWMC(s) to add one sweeping and washing service daily to key roads of relevant area(s) on regular basis.		Controlling fugitive dust	Respective local government(s), Cantonment Boards, housing societies and SWMC(s)
(f). Open burning of municipal waste, plant residue, plastics and other hazardous material, especially in and in the vicinity of urban areas, avoided completely		Emissions reduction	Respective local government(s), Cantonment Board(s), housing societies and PHA(s)
(g). Impose a ban under section 144 of the Code of Criminal Procedure on crop residue burning and open burning of municipal waste, plant residue and other hazardous materials;		Controlling contribution from agricultural sources	Home Department, Agriculture Department, local government (s) respective Deputy Commissioner
(h). Primary schools and kindergartens (both government and private) instructed to reduce outdoor activities		Reducing adverse health impact	Schools Education Department
(i). Establish facilitation counters at selected health care institutions for access to air pollution related information and medical services		Reducing adverse health impact	P&SHC, SPHC&ME
Additional Measures			
(a). Stop outdoor construction site spray painting, slope construction and other activities involving earth work within and in the vicinity of relevant urban area(s)		Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(b). Mandate appropriate dust control activities at large construction site(s) within and in the vicinity of relevant urban area(s)		Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(c). Prohibit entry of diesel, rubbish, muck, sand and gravel transport in the selected urban area(s)		Emissions reduction from transport	TD, AIG Traffic
(d). Restrict or prohibit plying of inter-city transport and other appropriate precautionary measures on relevant links where episode of poor air quality is accompanied with severe impairment of visibility		Travel related safety	TD, AIG Traffic

²⁴ To be prescribed by Advisory Committee in view of relevant factors under section 9 supra

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Protective and Pollution Abatement Measures		Objective	Responsibility for Implementation
Recommended Measures (over and above the Recommended Measures prescribed for Alert Level)		Reducing adverse health impact	General public of relevant area(s)
(a). All persons in the relevant area(s) shall reduce use of raw materials and products containing volatile organic compounds such as paints, paints and solvents.		Emissions reduction	Dissemination, assistance and mobilization by EPD, PID, P&SHC, SPHC&ME in their respective fields
(b). Children, elderly and persons suffering from respiratory, cardiovascular and other chronic diseases shall, to the maximum possible extent stay indoors			
Mandatory Measures (over and above the Mandatory Measures prescribed for Alert Level)		Emissions reduction especially from transport	EPA and other relevant agencies including Industries Department, OGRA and AIG Traffic.
(a). Further increase the frequency, intensity and scope of regulatory measures for controlling air pollution including road denial to vehicles discharging excessive smoke		Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(b). Further increase the scope and intensity of dust control measures on construction sites, bare grounds and material stacking sites by respective owners (including government agencies), operators and contractors		Controlling fugitive dust	Respective local government(s), Cantonment Boards, housing societies and SWMC(s)
(c). Further strengthen cleaning, especially sweeping and solid waste collection; road cleaning and sprinkling to reduce traffic dust; in particular respective SWMC(s) to add one sweeping and washing service daily to key roads and other important roads of relevant area(s) on regular basis.		Awareness raising	Health Department
(d). Further strengthen publicity and medical guidance for patients with respiratory diseases		Reducing adverse health impact	Schools Education Department
(e). Instructions to primary schools and kindergartens (both government and private) to stop outdoor sports classes, games and other activities			
Additional Measures (over and above the Additional Measures prescribed for Alert Level)		Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(a). Prohibit or reduce to an appropriate extent outdoor construction works having large environmental signature within and in the vicinity of relevant urban area(s)		Emissions reduction especially from transport	TD, AIG Traffic
(b). Prohibit or reduce to an appropriate extent the entry of diesel based heavy transport in selected urban area(s)			

²⁵ To be prescribed by Advisory Committee in view of relevant factors under section 9 supra

Prohibitive and Restrictive Measures	Objective	Responsibility for Implementation
(c). Prohibit or reduce to an appropriate extent the use of products containing volatile organic compounds such as paints, paints and solvents	Emissions reduction	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(d). Prohibit or reduce to an appropriate extent the operation of most polluting industrial units such as brick kilns, furnaces, smelting units, pyrolysis plants, industrial boilers etc.	Emissions reduction	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies

Episode Level: Emergency; Colour Code: Purple

Protective and Pollution Abatement Measures		Responsibility for Implementation
Recommended Measures (over and above the Recommended Measures prescribed for Warning Level)		Objective
(a). Children, elderly and persons suffering from respiratory, cardiovascular and other chronic diseases to avoid outdoor activities	Reducing adverse health impact	General public of relevant area(s)
(b). General population to reduce outdoor activities		Dissemination, assistance and mobilization by EPD, PID, P&SHC, SPHC&ME in their respective fields
Mandatory Measures (over and above the Mandatory Measures prescribed for Alert Level)		
(a). Further increase the frequency, intensity and scope of regulatory measures for controlling air pollution including road denial to vehicles discharging excessive smoke	Emissions reduction	EPA and other relevant agencies including Industries Department, QGRA and AIG Traffic,
(b). Further increase the scope and intensity of dust control measures on construction sites, bare grounds and material stacking sites by respective owners (including government agencies), operators and contractors	Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(c). Further strengthen cleaning, especially sweeping and solid waste collection; road cleaning and sprinkling to reduce traffic dust; in particular respective SWMC(s) to add one sweeping and washing service daily to key roads and other important roads of relevant area(s) on regular basis.	Controlling fugitive dust	Respective local government(s), Cantonment Boards, housing societies and SWMC(s)
Additional Measures (over and above the Additional Measures prescribed for Alert Level)		
(a). Prohibit all outdoor construction works within and in the vicinity of relevant urban area(s)	Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(b). Implement traffic control measures for limiting vehicles on road volume at peak hours	Emissions reduction from transport	PTD, AIG Traffic

²⁶ To be prescribed by Advisory Committee in view of relevant factors under section 9 supra

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EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies	Emissions reduction	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(c). Prohibit use of products containing volatile organic compounds such as paints, paints and solvents	Emissions reduction	-do-
(d). Prohibit the operation of most polluting industrial units such as brick kilns, furnaces, smelting units, pyrolysis plants, industrial boilers etc.	Emissions reduction	-do-
(e). Prohibit discharge of fireworks and open-air barbecue	Reducing adverse health impact	P&SHC, SPHC&ME, respective DCs
(f). Distribute specified masks free of charge at public places		

Episode Level: Significant Harm; Colour Code: Black		
Protective and Pollution Abatement Measures		
Recommended Measures (over and above the Recommended Measures prescribed for Emergency Level)		Responsibility for Implementation
(a). General population to avoid outdoor activities	Reducing adverse health impact	General public of relevant area(s)
(b). Persons employed on outdoor duties or otherwise exposed for longer duration to wear specified masks		Dissemination, assistance and mobilization by EPD, PID, P&SHC, SPHC&ME in their respective fields
Mandatory Measures (over and above the Mandatory Measures prescribed for Emergency Level)		
(a). Further increase the frequency, intensity and scope of regulatory measures for controlling air pollution including road denial to vehicles discharging excessive smoke	Emissions reduction especially from transport	EPA and other relevant agencies including Industries Department, OGRA and AIG Traffic,
(b). Further increase the scope and intensity of dust control measures on construction sites, bare grounds and material stacking sites by respective owners (including government agencies), operators and contractors	Controlling fugitive dust	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(c). Further strengthen cleaning, especially sweeping and solid waste collection; road cleaning and sprinkling to reduce traffic dust; in particular respective SWMC(s) to add one sweeping and washing service daily to key roads and other important roads of relevant area(s) on regular basis.	Controlling fugitive dust	Respective local government(s), Cantonment Boards, housing societies and SWMC(s)
(d). Consultation with experts on special health protection measures required under given circumstances, strengthening of health watch	Reducing adverse health impact	P&SHC, SPHC&ME
(e). Free distribution of specified masks	Reducing adverse health impact	P&SHC, SPHC&ME, respective DCs

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PROPOSED AND REGULATORY ADOPTED MEASURES		CONSEQUENCES	
Additional Measures / Government have the Additional Measures prescribed for the State Level		TD, AIG Traffic	
(a). Further limit vehicles on road volume at peak hours on the basis of last digit in registration number – even and odd registration number carrying vehicles allowed to ply on alternate days		Emissions reduction especially from transport	EPA (for regulatory purpose), respective local government(s), DC(s), other government agencies
(b). Prohibit use of power generators within relevant urban area(s) and coordinate increase in grid based electric power or load management		Emissions reduction	EPA, Schools Education Department
(c). Close primary schools and kindergartens (both government and private)		Reducing adverse health impact	

²⁷ To be prescribed by Advisory Committee in view of relevant factors under section 9 supra

Appendix V

General Health Advisory Very Poor or Extremely Poor Air Quality Index²⁸

This advisory provides a general set of measures that could be taken to reduce personal exposure to high levels of air pollution and, in particular, if Very Poor or Extremely Poor levels are achieved on the Air Quality Index.

General Recommendations

In order to minimize the impact on those exposed to high concentrations of air pollutants, following measures are advised for general public:

- (a). **Remain indoors as much as possible:** During high-pollution episodes, everyone, particularly those more vulnerable, such as children, pregnant women and older people, or those with pre-existing illness, should stay indoors as much as possible and avoid roads with heavy traffic. External doors and windows should remain closed to reduce the penetration of pollution from outside. Keep washing your eyes with running water regularly and do regular gargles with warm water.
- (b). **Limit driving cars, scooters and other motorized vehicles:** Share a ride or take public transportation to work and postpone errands until another day. This will not only prevent additional personal exposure but will prevent adding to the existing high levels of pollution.
- (c). **Prevent additional sources of indoor air pollution:** Avoid using wood burning stoves, candles and incense inside the home. Do not smoke tobacco products.
- (d). **Keep rooms inside homes clean:**
 - (i) Wet mopping and dusting is preferable to sweeping or vacuuming, as sweeping and vacuuming can stir up additional dusts and particles. However, vacuums with a High Efficiency Particulate Air (HEPA) filter can be used.
 - (ii) Various types of air purifiers exist, including HEPA filters, and electronic air cleaners, such as electrostatic precipitators. All air purifiers need to be used according to manufacturers' guidelines. Avoid using an air purifier that works by generating ozone, as this will increase the pollution levels. If the room has windows, keep them closed during high air pollution episodes. Run an air conditioner or central air conditioning system if you are certain that the air conditioner does not draw air from outdoors and has an appropriate filter.

²⁸ Adopted from WHO guidelines for Delhi on November 9, 2017

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- (iii) Prioritize the cleaning of rooms used for sleeping, particularly for vulnerable groups. This could mean more regular cleaning, assigning an air purifier to these rooms, sealing windows to prevent outdoor air coming inside.
- (e). **Use masks if required for further protection:** Disposable masks known as N95 may help, if people must be outdoors for a long period of time. N95 masks can filter most of the PM2.5 particles, but sensitive persons can consider using N99 version, which can filter more than 99% of airborne particles. If masks are used, they must be fitted properly with a tight seal around the users' mouth and nose. Paper "comfort" or "dust" masks are designed to trap large particles only, such as sawdust. These masks will not protect the lungs from small particles such as PM2.5. Scarves or bandanas are not helpful.
- (f). Do not burn leaves, garbage, crop residue or other materials.

Advisory for Workplace

Proper building operations and routine maintenance are critical to ensuring healthy indoor air quality of workplaces. Some preventive measures to reduce the health impact of air pollution in the workplace include:

- (a). Maintaining building heating, ventilation, and air conditioning system
- (b). Routinely cleaning office spaces and common areas by a vacuum cleaner with High Efficiency Particulate Air (HEPA) filter
- (c). Properly storing cleaning materials and chemicals that are used in the workplace
- (d). Maintaining the air purifiers and ensuring regular cleaning and replacement of filters
- (e). curtains installed at main entry/exit doors of the building to prevent entry of outside air when outside doors are open
- (f). Silicon sealing of all window gaps and installation of door dust brush underneath the doors, to prevent dust from coming into the building
- (g). Installation of air pollution monitoring devices for improved, regular monitoring of the indoor air quality
- (h). Air purifier installation in all official vehicles
- (i). Reduction in the electricity usage

In addition, the workplace staff shall also be encouraged to:

- (a). Use N95 masks especially for those working outdoors and travelling for long hours. For the intended benefits, the proper procedure to wear the masks and replacement of masks after usage for certain period should be followed

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- (b). Use air purifiers at the office and at home. Use of air conditioners may also help to reduce the concentration of particulate in the indoor environment
- (c). Avoid prolonged or heavy exertion outside

Seek Medical Advice

Please visit the nearest hospital/dispensary in case of any breathlessness, giddiness, chest pain, chest constriction, and irritation in eyes. Persons who are taking medications to help manage existing illness should take care not to miss their medication.