



**GOVERNMENT OF THE PUNJAB  
ENVIRONMENT PROTECTION DEPARTMENT**

Dated Lahore, 21<sup>st</sup> October 2017

**Policy Number** – No. xxxx SO(T)/EPD, 10.09.2017

**Effective Date** – This policy shall come into effect immediately upon its approval by the Punjab Environmental Protection Council.

**Policy Title** – Policy and Action Plan for Control, Mitigation, Advisory and Protective Measures in Extreme Weather Conditions of Dense Smog in the Punjab.

**Purpose** – To discuss the reasons behind the formation of dense smog in the Punjab, especially in Lahore and its environs, on the onset of winters each year and provide a short and medium to long term plan, including measure for protection of school going children; minimizing road accidents and creating mass awareness on precautionary measures for citizens at large.

**Authority** – The Punjab Environmental Protection Act 1997, Pakistan Penal Code.

**Scope** – This policy shall apply to the whole of the province.

**Responsibilities** – Due to cross-cutting nature of the problem, air pollution control requires a concerted and long term effort by multiple agencies. Accordingly, the main responsibility to implement this policy shall rest upon Environment Protection, Education, Home, Agriculture, Industries, Local Government, Primary and Secondary Health, Information Departments of the Government of the Punjab, Inspector General Police, Environmental Protection Agency and their field agencies

**Background** – The Punjab experiences periods of low visibility due to fog, mist and smog between November and February each year for an average of 10 to 25 days. In recent years, however, the situation is exacerbating as it causes a sensation of burning of eyes and foul smell. Data shows that this is a regional phenomenon, covering large areas of South Asia from Delhi to Faisalabad and beyond. Various studies have linked it to the burning of rice stubbles in the Indian states of Punjab, Haryana and Uttar Pradesh, during 2016 alone around 32 M tons of rice stubble were estimated to be burnt in Indian Punjab. Local sources of pollution, however, also had their own contribution to this situation.

**Challenges** – Data on air quality in the province is scant. Sporadic monitoring of air pollutants suggests that ambient air standards for particulate matter with size 2.5 micron (PM<sub>2.5</sub>), oxides of Nitrogen (NO<sub>x</sub>) and Sulphur (SO<sub>x</sub>) are exceeded frequently. Industrial units both large and small, many of which use furnace oil high with Sulphur contents, burning of agricultural residual and municipal waste, and vehicular emissions are the main source of these pollutants. 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 the 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.

Being a regional and complex phenomenon, the problem of air pollution and resulting smog can only be dealt with through concerted and planned efforts of various departments of the provincial and federal government spread over a medium to long term framework. However, to achieve the desired results, government efforts need to be supplemented by whole hearted involvement of citizens at large. In view of this limitation, the policy stresses at immediate response to smog episodes confined to measures aimed at adapting to the given conditions to reduce public exposure to its harmful effects.

**Immediate Actions** – Environment Protection Department will closely monitor rice stubble burning activities in the Punjab as well as in the region using inter alia satellite data obtained through various sources including Space and Upper Atmosphere Research Commission (SUPARCO) and timely inform all relevant agencies, including those given below for adopting suitable mitigation measures. This information shall be supplemented with air quality parameters observed through monitoring stations available with the Environmental Protection Agency.

Open burning being the major source of smog, every year, in the early October, Home Department shall impose a complete ban on open burning of rice stubble, solid waste and other hazardous materials. This ban shall be implemented through the respective Deputy Commissioners and District Police Officers. Similar instructions shall be passed to their field offices by Agriculture and Local Government Departments.

In the event of a forecast or actual smog event, immediate advisories shall be issued to in the following manner:

- a. Environment Protection Department shall issue advisory to all concerned departments based on the Air Quality Index (AQI) for PM2.5 and other parameters;
- b. Primary and Secondary Health Care Departments shall issue health advisory and ensure its maximum dissemination including through such means as paper, electronic, and social media.
- c. Additional Inspector General of Traffic shall issue advisory on use of roads, especially highlighting the forecasted or prevailing visibility levels and their likely impact of safe use of roads.

If the situation so demands, masks shall be distributed at schools and selected public places in the most effected districts by respective Deputy Commissioners. Similarly, steel furnaces and other industrial units which are working without emission control equipment or are using substandard fuels shall be shut down by the Environmental Protection Agency with the support of respective Deputy Commissioner and District Police Officer.

Air pollution indices given at “**Annex A**” quantitatively determine potential hazard levels at a given time to trigger a set of specific actions to mitigate harmful effects of smog at that particular level. These include a wide variety of measures which will be advised by Environmental Protection Agency to the respective department for implementation.

**Short to Long Term Action Plan** – An action plan clearly delineating measures to mitigate and control occurrence of smog and responsibilities of each department in this respect is given at “**Annex B**”. Brief explanation of the measures is as under:

**1. Introduction of Low-Sulphur fuels:** Fuels used in Pakistan are high in Sulphur contents. Fuel Sulphur contributes significantly to particulate matter (PM) and Sulphur Dioxide (SO<sub>2</sub>) emissions. Maximum allowable content of Sulphur for all fuels used in the country was originally scheduled to be reduced from 10,000 to 500 ppm by 2008, but it was postponed until 2010, and then again until 2012. The primary reason for such postponements was that oil refineries needed more time to retrofit. The deadline to lower Sulphur contents in fuels has again been extended to December 2017. Accordingly:

- (i) Relevant Ministry in the Federal Government will be approached to ensure implementation of clean fuel regime by this deadline; and
- (ii) Environmental Protection Agency shall not accord Environmental Approval for the establishment of a fuel refinery unless it complies with clean fuel regime, at least vis-à-vis Sulphur contents.

**2. Adopting Euro-II Standards for vehicular emission:** While stringent vehicular emission standards can only be implemented for diesel vehicles once Low-Sulphur diesel is available; these can be extended to petrol vehicles immediately. A preferable standard is Euro II. It is obvious that adoption of such a standard will be meaningless unless it is backed up by a strict vehicle inspection regime. Such standards may be mandated for both new and second-hand imported vehicles. Particulate matter control technologies can effectively be installed on in-use vehicles, such as diesel oxidation catalysts (DOCs) and diesel particulate filters (DPFs). DOCs require a maximum of 500-ppm Sulphur in diesel and DPFs require a maximum of 50 ppm to function effectively. Therefore, for adopting Euro II/Pak II standards:

- (i) Relevant Ministry in the Federal Government will be approached for restricting the import of used gasoline vehicles which do not comply with Euro II standard.
- (ii) In coordination with the Transport Department, Environmental Protection Agency will devise a time bound plan to restrict awarding Environmental Approval to the manufacture of any three and four wheeled vehicles which do not comply with the Euro II standard.

**3. Installation of vehicular pollution control devices:** This measure is closely related to the foregoing measure. Vehicular emissions contain oxides of Nitrogen (NO<sub>x</sub>), oxides of Sulphur (SO<sub>x</sub>) and Carbon Monoxide (CO) which can transform into secondary compounds. These secondary compounds then contribute to what is called the Los Angeles or photo-chemical smog. The aim is to adopt a phased approach towards installation of appropriate devices in the vehicles, such as the Catalytic Converter, to

convert NO<sub>x</sub>, SO<sub>x</sub> and CO into simpler non-harmful forms before escaping the exhaust pipe. With this in view Federal Government will be approached to make it mandatory upon all vehicle manufacturers and importers to install appropriate devices by a mutually agreed cut-off date.

**4. Better traffic management:** Experience indicates that Particulate Matter (PM) emissions can also be reduced by better traffic control, restricting the number of vehicles plying on the roads during high pollution episodes, avoiding road congestion and improvement of road infrastructure. Further, a systematic public awareness campaign focusing the advantages of the use of alternates to motor vehicles, such as bicycles, needs to be carried out consistently. This should be supported by parallel development of supporting infrastructure such as pedestrian walk ways. Therefore, for better traffic management:

- (i) Additional Inspector General of Traffic and other traffic management authorities will work towards better traffic management;
- (ii) Respective municipal administration shall be asked to remove permanent and temporary encroachment for ensuring smooth flow of traffic; and
- (iii) Environmental Protection Agency shall not accord Environmental Approval to any housing society unless it ensures provision of lanes for non-motorized traffic.

**5. Controlling burning of municipal waste and crop residue:** Diffused sources of air pollution in the province include burning of municipal waste and crop residue, and formation of dust clouds due to dry meteorological conditions. Due to their heterogeneity, non-point source pollution is more difficult to monitor and control. Solid waste collection by government-owned and government-operated services in the cities currently averages only a portion of the waste generated; however, for cities to be relatively clean, at least 75% of these quantities should be collected. None of the cities in the province has a complete solid waste management system extending from collection of solid waste up to its proper disposal. So far as crop residue, Agriculture Department needs to launch a systemic campaign for educating farmers on fertility losses suffered due to burning of crop residues and at the same time introduce alternative technologies for quick and environmentally safe disposal of crop residue such as converting it into mulch. Therefore, for controlling burning of municipal waste and of crop residue:

- (i) Agriculture Department shall prepare and execute plan(s) for disposal of crop residue in an environmentally friendly manner;
- (ii) All municipal authorities and waste management agencies shall ensure at least 75% collection efficiency of solid waste; and
- (iii) Environmental Protection Agency shall not accord Environmental Approval to any housing society unless it provides comprehensive solid waste management (collection and disposal) system.

**6. Building capacity to monitor and forecast episodes of high air pollution:** Presently Environmental Protection Agency has only six ambient air quality monitoring systems. The data from such stations helps in identifying the real cause of the problem

and thus is crucial for informed decision making. One of the key constraints to controlling air pollution in the province is lack of an effective program for monitoring air quality emissions from stationary and diffused sources, given the need for regular monitoring of air quality in the Punjab – at least eight large cities, various industrial clusters and diffused sources – a much larger than available number of ambient air quality stations are required. As part of its on-going restructuring process, the Agency is in the process of establishing a network of such stations as well as stations for monitoring the quality of water and soil. These stations will be linked to a central Environmental Monitoring Center where information relayed through them will be analyzed using computer simulations to generate information for operational (such as forecasting episode of high air pollution) and policy level decisions. At the same time, there is also a need to collect air quality data from significant point sources, most importantly large scale industrial units with heavy air pollution foot prints (cement, sugar, large boilers, power plants etc.). There is a need to require them to install continuous air quality monitoring equipment with full access to Environmental Protection Agency. With this in view:

- (i) Environment Protection Department will work closely with the Planning & Development and Finance Department for establishment of Environmental Monitoring Center;
- (ii) While according Environmental Approvals, Environmental Protection Agency shall make it mandatory for industrial units with significant level of gaseous emission to install either continuous emission monitoring analyzers for each criteria pollutant or install an ambient air quality monitoring station with analyzers for each criteria pollutant. Detailed parameters in this regard will be worked out by the Agency and disseminated through its website and otherwise to all project proponents.

**7. Creation of woodlands in and around major cities:** Trees are highly effective, cheap and environmentally safe agents to fix carbon and other noxious elements. At the same time, trees produce oxygen and release moisture through transpiration which helps in controlling temperature, maintaining humidity and bringing rains. It is estimated that a single average tree can fix 20 kg of dioxides every year and can sequester 1 ton of carbon dioxide by the time it is 40 years' old. Unfortunately, trees have been a victim of unplanned urban development. In order to restore this situation:

- (i) Environmental Protection Agency will closely work with the Board of Revenue to identify and earmark state-land wherever available in the vicinity of large cities/towns for tree plantation;
- (ii) Environmental Protection Agency will then work with the Forest Department to identify suitable tree species in view of intended purpose and economic value and establish and maintain woodlands on the indicated pieces of land.

**8. Controlling fugitive dust from road shoulders and construction sites:** Fugitive dust from road shoulders is an important cause of particulate pollution of ambient air. Unfortunately, most paved roads in the province do not have shoulder

designed and constructed for the purpose of controlling fugitive dust. Similarly, construction sites are another important source of fugitive dust. Therefore:

- (i) C&W Department and other relevant agencies shall develop an appropriate engineering design for road shoulders and take measures to implement this design for all existing and new roads.
- (ii) All construction project proponents shall ensure that appropriate measures are undertaken to control fugitive dust. Environmental Protection Agency will ensure that a suitable fugitive dust control plan is prepared and rigorously implemented by all major construction projects in the Punjab.
- (iii) While according Environmental Approvals, Environmental Protection Agency shall make it mandatory, for each new housing colony and road project to implement the recommended road shoulder design for control of fugitive dust.

**9. Planned urban and industrial development:** There is no substitute for planned development. For this purpose, there is a need to develop master land-use plans for cities as well as their adjacent country sides. Such plans should then be strictly followed. These plans should, *inter alia*, indicate industrial zones and a deadline by which all industrial units located within urban areas shall shift to such industrial zones. This is a long term measure and for this purpose:

- (i) Local Government and Housing & Urban Development Departments, shall ensure development of master land-use plans through their respective subordinate offices. In view of resource and capacity constraints, such plans may initially be developed for major cities and eventually encompass intermediate and small cities and then towns as well.
- (ii) At the same time, while according Environmental Approval, Environmental Protection Agency shall make it mandatory for each project to be in accordance with the developed master land-use plan.

**10. Greening of industrial processes:** Industrial processes can be made green by mandating new industries to use such plants, machinery and processes which are environmental friendly. There are a number of barriers to adoption of the green process which include technology, entrepreneurial capacity and financing. These barriers are more pronounced in case of small and medium scale industrial units. Environment Protection to start with, such a plan can be implemented on a limited set of industries which are, etc.

- (i) While according Environmental Approvals, Environmental Protection Agency shall make it mandatory upon major contributors to air pollution such as cement manufacturing plants, steel mills and thermal power plants to install such technologies which are suitable vis-à-vis energy and resource efficiencies and emission reduction.
- (ii) Environment Protection Department shall conceive and implement projects for greening of existing industrial units by removing technological, entrepreneurial capacity and financial barriers.

**11. Regional environmental agreement:** Smog being a regional problem cannot be effectively controlled by eliminating local sources of pollution alone. Comprehensive solution to this and other environmental problems such as contamination of water bodies flowing into the Punjab from across eastern borders requires a cooperative approach at the regional level. For this purpose, Federal Government will be approached to put environmental concerns on agenda of bilateral and multilateral dialogues between India and Pakistan. Although this may prove to be slow and difficult process, there is no way to save environment in the Punjab without such a collaborative agreement. A good example on regional environmental cooperation is the “Agreement on Transboundary Haze Pollution” concluded between ten ASEAN countries in 2002.

**Oversight and Coordination for Implementation** – Punjab Environmental Protection Council shall oversee the implementation of this policy. Coordination in this respect shall be undertaken by Environment Protection Department.

## Annex A

### Air Quality Index

Air Quality Index will be calculated based upon 24 hourly/8 hourly average concentration of those ambient air quality criteria pollutants' concentrations whose measured values are available through Ambient Air Quality Monitoring Stations (AQMSs) namely PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO and O<sub>3</sub>. The basis of Ambient Air Quality Index (AQI) are limit values defined in Punjab Environmental Quality Standards for Ambient Air. Beyond limit interpretations have been proposed keeping in view the regional practice of assigning Air Quality Indices based on multiplication factors in proportion to standard limits and individual tolerance levels. Intermediate values for Air Quality Index for specific pollutant will be computed by interpolation.

PM <sub>10</sub> <sup>1</sup>	PM <sub>2.5</sub> <sup>2</sup>	SO <sub>2</sub> <sup>3</sup>	NO <sub>2</sub> <sup>4</sup>	O <sub>3</sub> <sup>5</sup>	CO <sup>6</sup>	Air Quality Index	Indicator Color	Overall Description
0-150	0-35	0-120	0-80	0-130	0-5	0-100	Green	<b>Good</b> – Minimal Impact
151-200	36-70	121-240	80-160	131-260	5-10	101-200	Light Green	<b>Satisfactory</b> – May cause minor breathing discomfort to sensitive people.
201-250	71-105	241-360	161-320	261-450	11-25	200-300	Yellow	<b>Moderately Polluted</b> – May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
251-350	106-140	361-700	321-560	451-550	26-40	301-400	Orange	<b>Poor</b> – May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease.
351-430	141-300	701-1600	561-800	551-1900	41-50	401-500	Red	<b>Very Poor</b> – May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.
430 +	300 +	1600 +	800 +	1900 +	50 +	500+	Maroon	<b>Severe</b> – 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.

<sup>1</sup> Concentration in ug/m<sup>3</sup> (PEQS Limit =150)

<sup>2</sup> Concentration in ug/m<sup>3</sup> (PEQS Limit = 35)

<sup>3</sup> Concentration in ug/m<sup>3</sup> (PEQS Limit = 120)

<sup>4</sup> Concentration in ug/m<sup>3</sup> (PEQS Limit = 80)

<sup>5</sup> Concentration in ug/m<sup>3</sup> (PEQS Limit = 130)

<sup>6</sup> Concentration in mg/m<sup>3</sup> (PEQS Limit = 5)





## Annex B

### ACTION PLAN TO COMBAT SMOG IN PUNJAB

Ser	Activity	Brief explanation	Responsibility
1	Issuance of health advisory	Issuance of advisory to general public on recommended health-related precautions in smog conditions. Maximum dissemination to be ensured through all possible means including print and electronic media.	<ul style="list-style-type: none"> <li>▪ Primary &amp; Secondary Healthcare Department</li> <li>▪ Specialized Healthcare &amp; Medical Education Department</li> <li>▪ Information Department</li> <li>▪ Environmental Protection Agency</li> </ul>
2	Issuance of traffic advisory	Issuance of advisory to general public on recommended traffic and travel-related precautions in smog conditions. Maximum dissemination to be ensured through all possible means including print and electronic media.	<ul style="list-style-type: none"> <li>▪ Additional IG Traffic</li> <li>▪ Information Department</li> <li>▪ Environmental Protection Agency</li> </ul>
3	Ban on burning of crop residue	Ban to be imposed on burning of crop residue under section 144 of Code of Criminal Procedure. Strict enforcement of ban to be ensured.	<ul style="list-style-type: none"> <li>▪ Home Department</li> <li>▪ Deputy Commissioner and District Police Officer of the respective district</li> </ul>
4	Shutting down of major smoke emitting industries	Shutting down of large smoke emitting industries including foundries, steel re-rolling mills especially in the vicinity of major cities for reduction of emission of pollutants.	<ul style="list-style-type: none"> <li>▪ Environmental Protection Agency</li> <li>▪ Deputy Commissioner and District Police Officer of the respective district</li> </ul>
5	Introduction of low-sulphur fuels	Keeping in view significant contribution of fuel Sulphur to particulate matter (PM) and Sulphur Dioxide (SO <sub>2</sub> ) emission, maximum allowable content of Sulphur for all fuels used in the country to be reduced from 10,000 to 500 ppm by end of 2017. Liaison to be made with Federal Government in this regard	<ul style="list-style-type: none"> <li>▪ Ministry of Petroleum, Islamabad</li> <li>▪ Industries Department</li> <li>▪ Environment Protection Department</li> </ul>
6	Adoption of Euro-II Standards for reduction of vehicular emissions	Fuel efficient Euro II standard to be adopted and backed by a strict vehicle inspection regime, both for new and second-hand imported vehicles. Particulate matter control technologies, such as diesel oxidation catalysts (DOCs) and diesel particulate filters (DPFs) to be installed in the in-use vehicles.	<ul style="list-style-type: none"> <li>▪ Ministry of Industries &amp; Production, Islamabad</li> <li>▪ Industries Department</li> <li>▪ Transport Department</li> <li>▪ Environment Protection Department</li> </ul>
7	Installation of catalytic converters in vehicles for reduction of harmful emissions.	For reduction of harmful vehicular emissions such as NO <sub>x</sub> , SO <sub>x</sub> and CO to simpler non harmful levels, catalytic converters to be installed in motor vehicles. Federal Government to be approached to issue directions to all vehicles manufacturers and	<ul style="list-style-type: none"> <li>▪ Ministry of Industries &amp; Production, Islamabad</li> <li>▪ Industries Department</li> <li>▪ Transport Department</li> </ul>

Ser	Activity	Brief explanation	Responsibility
		importers for the purpose with a clear cut-off date where after no vehicles to be allowed to be manufactured or imported without a suitable converter. At enforcement level, a cut-off date, where no vehicle to be allowed to ply in the Punjab unless it has a catalytic converter installed on it, to be announced.	<ul style="list-style-type: none"> <li>▪ Environment Protection Department</li> </ul>
8	Better traffic management for reduction of vehicular emissions	PM emissions to be reduced by traffic control, restricted circulation of private cars during high pollution episodes, improving traffic flow such as through 'green wave' coordination of traffic signals, and improvement of road infrastructure. Well-orchestrated public awareness campaign, focusing on the advantages of the use of alternates to motor vehicles, such as bicycles and taking short distance walks, to be carried out consistently. Development of complimentary infrastructure such as pedestrian walkways to be made and demarcation of bicycle lanes to be done.	<ul style="list-style-type: none"> <li>▪ Additional IG Traffic</li> <li>▪ C&amp;W Department</li> <li>▪ Transport Department</li> <li>▪ LG &amp; CD Department</li> </ul>
9	Controlling burning of municipal waste and crop residue	Burning of municipal waste and crop residue, which cause formation of dust clouds due to dry meteorological conditions, to be controlled. System of disposal of municipal waste to be put in place. Agriculture Department to carry out vigorous campaign for educating farmers on fertility losses suffered due to burning of crop residues and at the same time introduce alternative technologies for quick and environmentally safe disposal of crop residue such as converting it into mulch.	<ul style="list-style-type: none"> <li>▪ Local Government Department</li> <li>▪ Agriculture Department</li> </ul>
10	Building capacity to monitor and forecast episodes of high air pollution	In order to collect data to identify the real cause of the air pollution and smog and thereby to make informed decisions, a network of air quality monitoring stations to be installed at least in eight large cities and prominent industrial clusters.	<ul style="list-style-type: none"> <li>▪ Environment Protection Department</li> <li>▪ Planning &amp; Development Department</li> <li>▪ Finance Department</li> </ul>
11	Creating woodlands around major cities	For fixing carbon and other noxious elements, cheap and effective tool of creating woodlands around larger cities, to be used. Initially, state land wherever available in the vicinity, to be utilized.	<ul style="list-style-type: none"> <li>▪ Board of Revenue, Punjab</li> <li>▪ Forest Department</li> </ul>
12	Road shoulders design to control fugitive earth	In order to control fugitive dust from the roads, road shoulders to be designed and constructed	<ul style="list-style-type: none"> <li>▪ C&amp;W Department</li> <li>▪ LG &amp; CD Department</li> <li>▪ P&amp;D Department</li> </ul>

Ser	Activity	Brief explanation	Responsibility
13	Planned urban and industrial development	For planned development, master land use plans for cities as well as the adjacent country side to be prepared. Such plans to indicate, inter alia, the location of industrial zones and a dead line by which all industrial units located within urban areas to shift to such industrial zones	<ul style="list-style-type: none"> <li>▪ Industries Department</li> <li>▪ LG &amp; CD Department</li> <li>▪ HUD&amp;PHE Department</li> </ul>
14	Greening of industrial processes	Industrial processes to be made green by mandating new industries to use such plants, machinery and processes which are environmentally friendly. To start with, such a plan to be implemented on a limited set of industries which are major contributors to air pollution such as cement manufacturing plants, steel mills, thermal power plants etc.	<ul style="list-style-type: none"> <li>▪ Industries Department</li> <li>▪ Environment Protection Department</li> </ul>
15	Regional environmental agreements	Smog being a regional problem cannot be effectively controlled by eliminating local sources of pollution alone. Comprehensive solution to this and other environmental problems such as contamination of water bodies flowing into Punjab from across eastern borders requires a cooperative approach at regional level. For this purpose, Federal Government may be approached to put environmental concerns on the agenda of bilateral and multilateral dialogues between India and Pakistan.	<ul style="list-style-type: none"> <li>▪ Ministry of Climate Change</li> <li>▪ Ministry of Foreign Affairs</li> <li>▪ Environment Protection Department</li> </ul>