

Action Plan for Clean Air, Ludhiana



14th Feb 2019

**Directorate of Environment and Climate Change
Department of Science, Technology and Environment,
Government of Punjab**

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Chapter 1 – Introduction

1.1. About Air Pollution

- 1.1.1** Air pollutant means any solid, liquid or gaseous substance present in the atmosphere in such concentration as may be or tend to be injurious to human being or other living creatures or plant or property or environment. Air pollution means the presence of air pollutants in the atmosphere. The most common sources of air pollution include particulates, oxides of nitrogen, sulphur dioxide and ozone.
- 1.1.2** The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and worsening of existing respiratory and cardiac conditions.

1.2. About Ludhiana

1.2.1 Brief

Geographically, Ludhiana is the most centrally located district which falls in the Malwa region of the State of Punjab. It lies between North Latitude 30°-34' and 31°-01' and East longitude 75°-18' and 76°-20'. It is bounded on the north by River Sutlej which separates it from Jalandhar district. The River also forms its northern boundary with Hoshiarpur district. On other sides it shares common boundaries with Roopnagar district in the East, Moga district in the West and Sangrur, Fatehgarh Sahib & Patiala districts in the South and South east.

1.2.2 Area and Population

Ludhiana has predominantly mixed land use especially in residential, industrial and commercial sectors. The expansion of residential population has come up because of the development of industrial belts in the outskirts of city and massive commercialization in city centre.

Ludhiana is a Municipal Corporation and India's largest city north of Delhi, with an area of 310sq. km and an estimated population of 1,618,879 as of the 2011 census. The present population of Ludhiana city is about 24 Lacs.

1.2.3 Industry and Trade

Ludhiana, the first metropolitan city of the State of Punjab, located on National Highway-I, has emerged as the most vibrant and important business centre of Punjab. Being the hub of Indian small-scale Industry especially hosiery & Cycle parts, it is popularly known as “Manchester of India.”

1.2.4 Topography

The topography of the District is typical representative of an Alluvial plain, it owes its origin to the aggravation work of the Sutlej River. The alluvium deposited by the river has been worked over by the wind which gave rise to a number of small dunes and sand mounds. Most of these

dunes have been levelled by the brave hard working agriculturists of the district. The District can be divided into the flood plains of the Sutlej and the Up land plains.

1.2.5 Meteorology of the study area

Meteorological data of Ludhiana city for the year 2015 and 2016 have been collected from Punjab Agricultural University, Ludhiana and is shown in Table 1 and Table 2.

1.2.6 Summer season

Table 1 depicts the summary of weather parameters in summer season. From the table it is clear that during the summer season, the monthly average temperature was found to be in the range of 27.0°C and 32.7°C and the monthly average temperature was found to be maximum in June and minimum in April. The relative humidity during this season varied between 39.9% and 75.0%. Wind speed in the study area varies in between 5.1 km/h and 6.3 km/h and the maximum wind speed was observed in the month of June. Rain was observed for all the months and the maximum rain was observed in the month of July (9.2 mm).

1.2.7 Summary of weather parameters during summer season

Month	Temperature (oC)	RH (%)	Wind Speed (km/h)	Rainfall (mm)
April	27.0	50.8	5.1	0.5
May	32.0	39.9	5.7	0.7
June	32.7	51.8	6.3	1.7
July	30.3	75.0	5.2	9.2

1.2.8 Winter season

During the winter season the monthly average temperature varied from 11.8°C to 20.3°C. The maximum temperature in this season was found to be in March and the minimum temperature was found to be in January. The relative humidity for the winter season was found to be in the range of 62.1% - 82.0%. The average wind speed in the study area was found to be maximum in March (4.6 km/h) and the minimum monthly average value of wind speed was observed in the month of November (2.1 km/h). Table 2 represents the summary of weather parameters during monitoring. Rainfall was observed for the months Jan, Feb and March in this season and no rainfall observed during November and December months. Table 2 represents the summary of weather parameters. It is clear from figure 3 that the predominant wind direction in the study area is towards South-East from North-West.

1.2.9 Summary of weather parameters during winter season

Month	Temperature (C)	RH (%)	Wind Speed (km/h)	Rainfall (mm)
Jan	11.8	82.1	3.3	1.1
Feb	16.2	73.7	3.9	0.8
March	20.3	71.0	4.6	2.0
November	19.8	62.1	2.1	0.0
December	14.7	70.0	2.4	0.0

1.2.10 Meteorological Monitoring:

Figure-1 : Wind Rose:Post monsoon

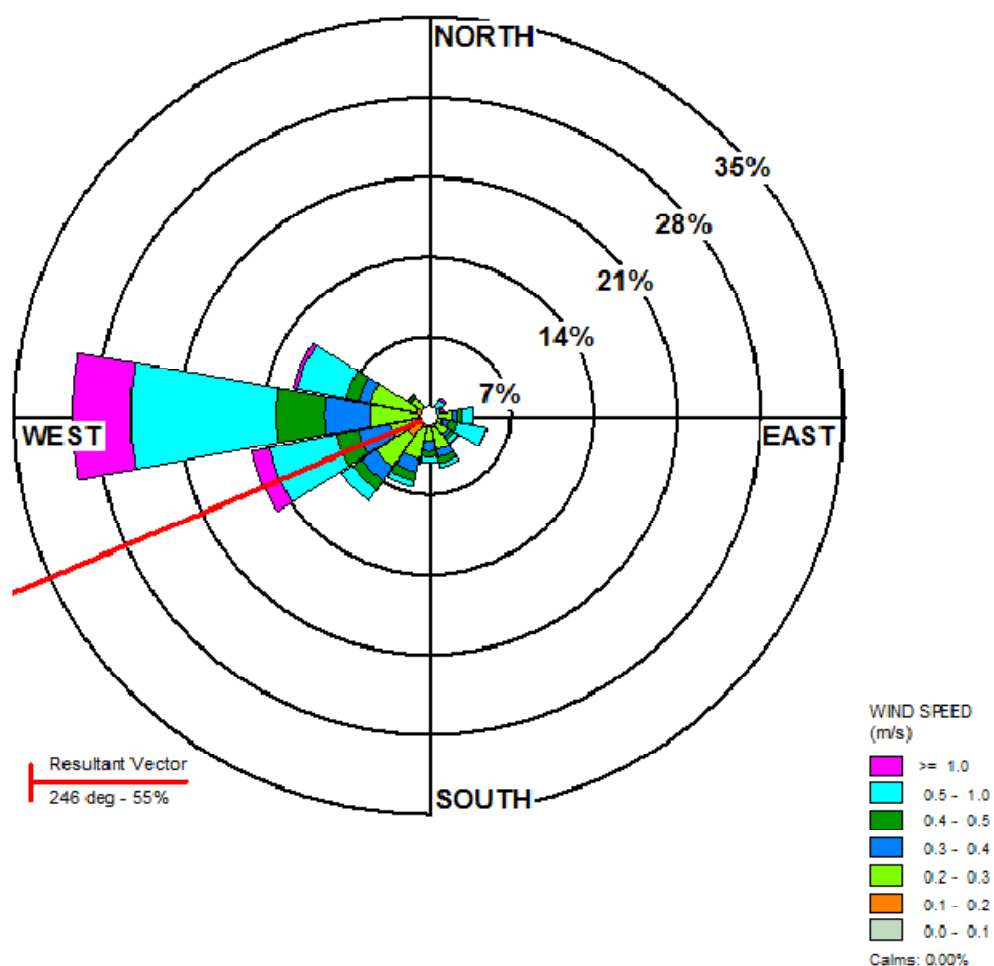


Figure 2-Wind Rose :Winter Season

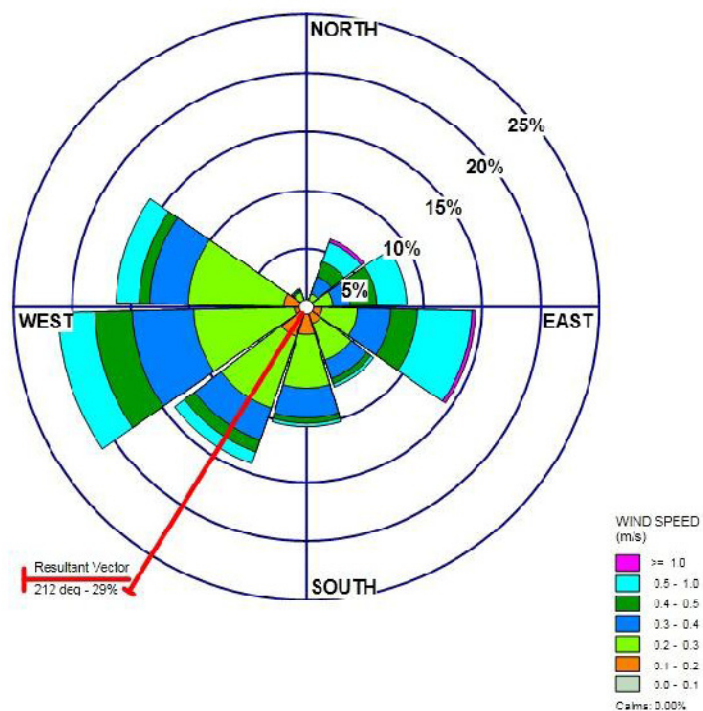


Figure-3- Wind Rose :Summer Season

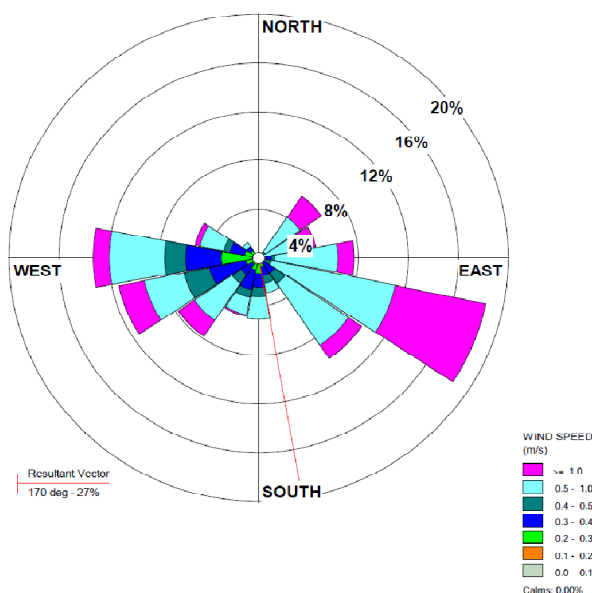


Figure 1, 2, 3- Wind rose diagram for post monsoon, winter & summer seasons

Source:-Interim Report II-Source Apportionment Study to prepare Action Plan to improve Air Quality of Ludhiana prepared by PSCST, Chandigarh

The wind rose plotted for three seasons are shown in figure 1. Figure shows that the predominant wind direction during post-monsoon, winter and summer seasons was towards South South-Westerly, South-Westerly and South-Easterly respectively. Calm condition was observed to be 0% for all the three seasons. Wind speeds were comparatively higher in summer (ranging from 0.1 to 2.23 m/s with an average of 0.64 m/s) followed by winter season (ranging from 0.1 -1.3 m/s with an average wind speed of 0.44 m/s) and post monsoon season (ranging from 0.07-1.61 m/s with an average wind speed of 0.3 m/s). Temperature for post-monsoon, winter and summer seasons varied between 5.1 – 31.5 (20.3) oC, 5.6 – 25.4 (13.9) oC and 21.3 – 43.6 (33.4) oC respectively whereas the relative humidity ranged between 25.4-95 (66.5) % 15.6-99 (76.8) % and 4.4 – 98.9 (38.2) % for post-monsoon, winter and summer seasons respectively

1.2.11 Land Use and Land Cover

Ludhiana has predominantly mixed land use especially in residential, industrial and commercial sectors. The expansion of residential population has come up because of the development of industrial belts in the outskirts of city and massive commercialization in city centre. The land use distribution in the city does not follow a definitive pattern. The only definite concentration is of the industries. Commercial activity is virtually spread throughout the city.

Population density of Ludhiana Municipal Corporation (LMC) is expanding for the past decades i.e. 5519 persons per Square kilometres in 1981 which was further increased to 7743, 8775 and 10127 persons per Square kilometres in years 1991, 2001 and 2011 respectively (Census of India various years). Correspondingly there was a remarkable increase in Municipal Corporation area as well, i.e 41.7 sq.km. in 1971 to 110 sq.km. in 1981 and 159.37 sq.km in 2011 (Municipal Corporation of Ludhiana).

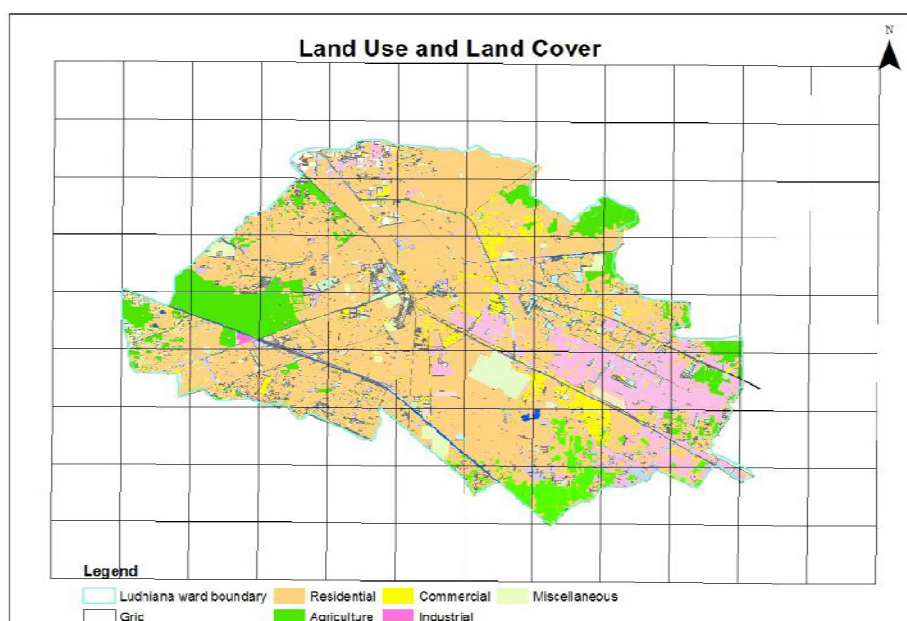


Figure 4: Land Use Land Cover pattern in Ludhiana City

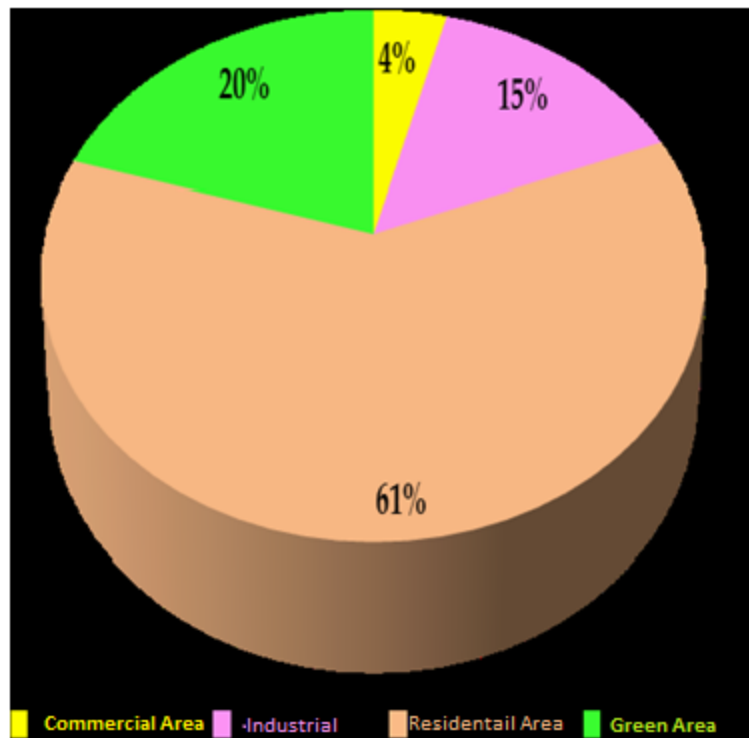


Figure 5: Land Use Land Cover distribution in Ludhiana City

Ferozepur Road, Delhi Road, GT Road Bypass, Matarani Chowk Area, Chaura Bazar, Focal Point Area, Malerkotla Road, Pakhowal Road and Fountain Chowk Area will continue to attract a large number of people for their employment, shopping, trading, medical, education, tourism and other requirements. Ludhiana is the first metropolitan centre of Punjab. Ludhiana was envisaged as a business-oriented city of State of Punjab.

The Land Use Land Cover (LULC) of Ludhiana city as per the details provided by Municipal Corporation, Ludhiana (Figure 5) indicates that 61% of the city area is residential followed by green area (20%), industrial area (15%) and commercial area (4%). The land use pattern and its distribution in Ludhiana city is shown in Figure 4 & 5 respectively.

The City is spread over an area of 159.37 sq km and is divided into 75 wards which accommodate approximately 16.18 lacs population as per 2011 Census.

1.2.12 Existing Road network of Ludhiana

The existing road network of Ludhiana is radial in pattern converging in to the heart of the city. As per Ludhiana Municipal Corporation report on “Comprehensive Mobility Plan for Ludhiana”, the present road network is spread over 12.72 sq km of area, which accounts for 8% of the total municipal area. Further all the roads were classified into one of the three categories, namely: arterial, connector and local based on their properties. The total road length of arterial, sub arterial (connecting road) and minor (local) roads in the study domain is 102.3 km, 234.4 km and 1844.4 km respectively thereby making a total road length of 2181.1

km comprising of all the three categories of roads in the study area. The city is very well connected with other areas of the state. The major road network connecting the city with other parts of the state/country is Ludhiana-Ambala, Ludhiana-Amritsar, Ludhiana-Chandigarh, Ludhiana-Ferozepur, Ludhiana-Malerkotla and Ludhiana-Bathinda.

1.3. Government's past and current efforts for control of Air pollution:

- 1.3.1** The environment of Ludhiana has degraded a lot during the last few years due to rapid urbanization, industrialization, increase in population, vehicles and commercialization of land available within the town. The industrial cluster of Ludhiana had been identified as one of the critically polluted clusters by the Ministry of Environment & Forests vide office memorandum J-11013/5/2010-IA II (I) dated 13/1/2010. This had resulted in imposition of a temporary restriction of 8 months for establishment of new industrial units, which were covered in Schedule-I appended to the EIA notification dated 14/9/2006.
- 1.3.2** Punjab Pollution Control Board had taken this as a challenge and also as an opportunity in order to achieve significant improvement in environmental quality and pave the way for sustainable development in the area. A comprehensive remedial environmental action plan was prepared in consultation with all the stakeholders, including Industrial Associations. The multi-disciplinary action plan was based on Prevention, Promotion and Mitigation (PPM) principles emphasizing on a time bound implementation of effective measures.
- 1.3.3** The Action Plan was monitored by high level steering committee, to ensure collaborative efforts among various implementing agencies and industries. Regular meetings are conducted to review the progress made by various departments. After fresh monitoring of Ludhiana area, the moratorium imposed was lifted by MoEF&CC in year 2011 due to improvement in the environmental parameters.
- 1.3.4** A source apportionment study for controlling Air Pollution in Ludhiana city is being carried out by Punjab State Council for Science & Technology, Chandigarh along with The Energy & Resource Institute, New Delhi. They have submitted Interim Report-I (June-November, 2017) and Interim Report-II (June, 2017- May, 2018). The final report is yet to be submitted in the Board.
- 1.3.5** The Interim Report-I completed the following tasks: -
- (i) Collection and compilation of secondary data
 - (ii) Digitization of road network in the study domain
 - (iii) First season ambient air quality monitoring
 - (iv) Preparation of questionnaires for primary surveys

As per the, Interim Report-I, the results of the ambient air quality monitoring carried out at different locations within the city limit of Ludhiana indicated that the levels of particulate matter (both PM₁₀ and PM_{2.5}) were found to be higher than the prescribed standard. So there is an urgent need to address the PM problem in the city. Though there are different major sources like industries, vehicular movements, road dust re-suspension, construction

activities, etc. are contributing to the air quality problem in the city, burning of agricultural crop residues in Ludhiana and nearby areas is the primary source of air pollution in the study domain.

1.3.6 The key observations found in the source apportionment study mentioned in the Interim Report-II is as under: -

- (i) The results showed that PM (both PM₁₀ and PM_{2.5}) is a matter of concern and exceeds the standard at all the locations throughout the study period for both the seasons
- (ii) The average PM₁₀ levels across different locations during post-monsoon varied between 146-452 µg/m³, whereas the corresponding levels during winter ranged between 142-277 µg/m³.
- (iii) The average PM_{2.5} levels across different locations during winter varied between 92-309 µg/m³, whereas the corresponding levels during winter ranged between 95-158 µg/m³
- (iv) PM₁₀ at different locations are approx. 2.5-4.5 times the standard while PM_{2.5} are 2-5 times the standard for post monsoon
- (v) Both PM₁₀ and PM_{2.5} at different locations are approx. 1.5-3 times the standard during winter
- (vi) The average PM levels at all the locations were higher in post-monsoon than in winter season indicating the impact of stubble burning during monsoon season.
- (vii) Highest levels of PM observed at one of the residential locations during post monsoon, probably because of the construction activities, frequent vehicular movements and refuse burning occurred during the monitoring period coupled with unfavourable meteorology
- (viii) PM_{2.5} to PM₁₀ ratio was found to be more than 0.5 at all the locations for both the seasons indicating the dominance of combustion sources in the study area.

1.3.7 In general, the results of the ambient air quality monitoring carried out at different locations within the city limit of Ludhiana for both post-monsoon and winter seasons indicated that the levels of particulate matter (both PM₁₀ and PM_{2.5}) were found to be higher than the prescribed standard. So, there is an urgent need to address the PM problem in the city. Though there are different major sources like industries, vehicular movements, road dust re-suspension, construction activities, etc. contributing to the air quality problem in the city. The burning of agricultural crop residues in Ludhiana and nearby areas is the primary source of air pollution in the study domain. However, the detailed modeling exercise needs to be undertaken to precisely attribute the present PM load in the study region to each existing source.

1.3.8 The next report to be submitted by PSCST, Chandigarh shall include the following tasks:-

- (i) Analysis of summer season ambient air quality monitoring data.
- (ii) Chemical characterization of collected samples.
- (iii) Finalization of emission inventory
- (iv) Dispersion and Receptor model set up

1.4. About National Green Tribunal directions:

1.4.1 Nine cities of Punjab namely DeraBassi, Nangal, Patiala, Mandi Gobindgarh, Khanna, Ludhiana, Jalandhar, Pathankot and Ludhiana were declared non-attainment cities by Central Pollution Control Board (CPCB) on the basis of Ambient air data for the period of 2011-2015 for not meeting the annual average of 60 µg/m³ for PM₁₀. Directions were issued to the Board by CPCB to prepare action plans for the above stated non-attainment cities of Punjab.

1.4.2 Subsequently, National Green Tribunal has taken cognizance of draft National Clean Air Program and passed directions in the matter of application no. 681 of 2018 dated 8/10/2018. The important points of the said directions given as under:

- (i) Action plans to be prepared within two months aimed at bringing the standards of air quality within the prescribed norms within six months from date of finalization of the action plans.
- (ii) The action plans may be prepared by six-member committee comprising of Director of Environment, Transport, Industries, Urban Development, Agriculture and Member Secretary, State Pollution Control Board under the overall supervision of Principal Secretary, Environment and further supervised by Chief Secretary.
- (iii) The Action plans may take into account the GRAP, the CAP and the action plan prepared by CPCB as well as all other relevant factors.
- (iv) The Action Plan will include components like identification of source and its apportionment considering sectors like vehicular pollution, industrial pollution, dust pollution, construction activities, garbage burning, agricultural pollution including pollution caused by burning of crop residue, residential and indoor pollution etc.
- (v) The Action plan shall also consider measures for strengthening of Ambient Air Quality (AAQ) monitoring and steps for public awareness include issuing of advisory to public for prevention and control of air pollution and involvement of schools, colleges and other academic institutions and awareness programmes.
- (vi) The Action plan will indicate steps to be taken to check different sources of pollution having speedy, definite and specific timelines for execution.
- (vii) The Action plan should be consistent with the carrying capacity assessment of the non-attainment cities in terms of vehicular pollution, industrial emissions and population density, extent of construction and construction activities etc. The carrying capacity assessment shall also lay emphasis on agricultural and indoor pollution in rural areas. Depending upon assessed carrying capacity and source apportionment, the authorities may consider the need for regulating, number of vehicles and their parking and plying, population density, extent of construction and construction activities etc. Guidelines may accordingly be framed to regulate vehicles and industries in non-attainment cities in terms of carrying capacity assessment and source apportionment.
- (viii) The CPCB and SPCBs shall develop a public grievance redressal portal for redressal of public complaints on air pollution along with a supervisory mechanism for its disposal in

a time bound manner. Any visible air pollution can be reported at such portal by email/SMS.

- (ix) The CPCB and all SPCBs shall collectively workout and design a robust nationwide ambient air quality monitoring programme in a revised format by strengthening the existing monitoring network with respect to coverage of more cities / towns. The scope of monitoring should be expanded to include all twelve (12) notified parameters as per notification no. B-29016/20/90/PCI-L dated 18th November of CPCB. The Continuous Ambient Air Quality Monitoring Stations (AAQMS) should be preferred in comparison to manual monitoring stations. The CPCB and States shall file a composite action plan with timelines for its execution which shall not be more than three months.

1.4.3 Earlier, NGT had also issued various directions in OA No. 21 of 2014 titled as Vardhaman Kaushik V/s Union of India and Others for combating air pollution.

Chapter 2- Vision, Mission and Strategy

2.1. MissionTandarust Punjab

The Government of Punjab envisions to make Punjab the healthiest State with healthy people by ensuring the quality of air, water, food and a good living Environment.

2.2. Vision for Clean Air, Ludhiana

To restore the quality of air in Ludhiana tothe prescribed standards to ensure health of the people, ecological balance and socio-economic well-being of the people.

2.3. Mission Clean Air, Ludhiana

To prepare and implement a comprehensive action plan for clean Ludhiana:

- (i) Creating awareness about the adverse impact of air pollution
- (ii) Identifying the sources of air pollution, their apportionment
- (iii) Setting up facilities for treating the pollutants
- (iv) Ensuring effective operations of the facilities
- (v) Ensuring effective monitoring of the quality of air
- (vi) Mitigating adverse impact on health of the people due to air pollution

2.4. Strategy for Clean Air, Ludhiana

The key elements of strategy for Clean Air campaign for Ludhiana will include:

- (i) Identification of Government Stakeholders
- (ii) Identification of Non-Government Stakeholders
- (iii) Integration of Departmental plans – Creating synergies
- (iv) Nodal Department
- (v) Citizen Participation
- (vi) Monitoring and Governance

2.5. Identification of Government Stakeholders

In order to combat the challenges of air pollution, all the Stakeholders will have to make concerted efforts. Following Departments and agencies have been identified along with their responsibilities:

- (i) **Punjab Pollution Control Board**
 - (a) Ensure necessary regulatory action under Air Act, 1981
 - (b) Monitoring of air pollution control devices installed by industries
 - (c) Up-gradation of existing air pollution control devices
 - (d) Monitoring of ambient air quality and stack emissions
 - (e) Providing canopies on the existing D.G sets in Industrial sector

- (ii) **Department of Local Government/ MC, Ludhiana**
 - (a) Handling and disposal of municipal solid waste effectively
 - (b) Improvement of Road infrastructure for smooth traffic movement
 - (c) Upgrading traffic lights for smooth traffic movement
 - (d) Promotion of green buildings
 - (e) Increasing green cover in city
 - (f) Provide canopies on the existing D.G sets in commercial and residential buildings
 - (g) Regular and mechanical cleaning of roads
 - (h) Sprinkling of treated wastewater in the parks and maintenance of fountains.
 - (i) Imposing ban on burning of garbage or other materials.
 - (j) Handling construction and demolition waste
 - (k) Blacktopping and pothole free roads
 - (l) Mechanicals sweeping and water sprinkling
 - (m) Road design improvement
- (iii) **Department of Transport**
 - (a) Plan for introduction of battery-operated E-Rickshaws/three wheelers
 - (b) Plan for effective traffic management
 - (c) Plan for phasing out old polluting vehicles
 - (d) Monitoring of vehicles without PUC certificate
 - (e) Banning of pressure horns
- (iv) **Department of Police**
 - (a) Checking of vehicles running without PUC certificate
 - (b) Planning and Implementation of traffic management plan
 - (c) Impounding and challan of vehicles running without permission/ registration.
 - (d) Control of noise from D.G. sets and other non-point sources.
- (v) **Department of Forests**
 - (a) Preparation of afforestation plan
 - (b) Organizing awareness camps for Greener City
 - (c) Providing green belt around the industrial areas and along the roads.
 - (d) Inventory of flora and fauna in the City
- (vi) **Deptt. of Industries and Commerce / Punjab Small Industries & Export Corporation**
 - (a) Shifting of industries from non-designated areas
 - (b) Provision of environment infrastructure in Industrial Areas
 - (c) Good mining practices
- (vii) **PWD (B&R)**
 - (a) Improving road conditions for smooth movement of traffic
 - (b) Increasing green cover on roadside under their jurisdiction
 - (c) Road design improvement
- (viii) **Punjab State Council for Science and Technology**
 - (a) Evolving cost-effective cleaner technologies
 - (b) Providing training for effective operation of APCD's.

- (ix) **Department of Agriculture**
 - (a) Promotion of bio-methanization and compost facilities for agri waste
 - (b) To provide Machinery for in-situ management
 - (c) To create awareness about ill-effects of stubble burning
 - (d) To create awareness regarding alternative crops to break wheat-rice cycle.
- (x) **District Administration**
 - (a) Coordination with all the Stakeholders promoting collaboration and resolving local issues
 - (b) Public Awareness Campaign
- (xi) **National Highway Authority**
 - (a) Construction of express ways /bypasses
 - (b) Mechanical sweeping of roads
 - (c) Providing green area
 - (d) Road design improvement

2.6. Non-Government Stakeholders

2.6.1 There is need to involve various Industry associations of Ludhiana in this plan. Following Industry Associations of Ludhiana will be associated with the plan:

- (i) The President, Chamber of Industrial & Commercial Undertaking, Ludhiana
- (ii) The President, Ludhiana Textile Dyeing & Processors Association
- (iii) The President, United Cycle Parts manufacturing Association
- (iv) The President, Ludhiana Machine Tool Manufacturers Association
- (v) The President, Ludhiana Foundries Association
- (vi) The President, Ludhiana Induction Furnace Association
- (vii) The President, Ludhiana Re-rolling mills Association

2.6.2 These association will help in the following activities:

Generic

- (i) To stabilize the vehicular movement area within premises of the industries
- (ii) To persuade the member industries to comply with emission norms by PPCB
- (iii) To evolve more efficient machinery, boiler furnace and air pollution control devices which may be adopted by all the industries for better environment

Specific

- (i) To shift over the industries from coal / pet coke to PNG.
- (ii) To modify the existing APCD.

2.6.3 Apart from Industry Associations, the support of various NGOs in the city will be sought. The NGOs will assist in the following:

- (i) To create awareness among the public regarding ill-effects of air pollution

- (ii) To motivate residents of city Ludhiana for adopting the practices to minimize the use of fresh water, planting more trees, to promote pooling by minimal use of private vehicles. Parking of vehicles in the designated zones, minimum use of electricity etc
- (iii) To give suggestions to District Level Committee to control or minimize the air pollution.
- (iv) To give feedback on enforcement activities

2.7. Nodal Department

The clean air plan for Ludhiana is part of State-wide campaign to control air pollution in non-attainment cities. In order to bring necessary impetus, support from other stakeholder departments, uniformity and consistency, there is need to have a Nodal Department. The Department of Science, Technology and Environment will be the nodal department for coordinating and monitoring activities of the plan. The Department has recently set up Directorate of Environment and Climate Change, which will provide necessary support at the headquarter for coordination and oversight and PPCB will provide necessary technical and field support.

2.8. Integration of Departmental plans

The Nodal department will integrate plan of individual department for control of pollution from various sources and prepare a comprehensive plans.

2.9. Citizen participation

Citizen participation will be key to the success of the plan. Effort will be made to seek citizen participation in various public awareness activities, feedback and support in various enforcement related activities. A strong social media and technology driven platform will be set up to seek citizens particularly youth participation.

2.10. Design of Monitoring System

2.10.1 Various measures envisaged under the action plan for control of pollution can be classified in the following categories:

- (i) Public Awareness
- (ii) Effective Enforcement
- (iii) Creation of new infrastructure
- (iv) Maintenance related activities
- (v) Policy Advocacy
- (vi) Technology Support

2.10.2 Monitoring of various activities of the Action Plan will be key to achieve the outcomes envisaged under the Action Plan. Different kind of monitoring systems will be required for different categories of activities:

- (i) Design of effective online platform including social media to disseminate air pollution related information and seek citizen feedback and participation in the campaign. It will

have a monitoring mechanism to see the level of participation and measures to increase the same.

- (ii) Design of effective online system to capture various enforcement activities by various agencies to monitor them, evaluate them and provide feedback and enforce accountability.
- (iii) Design of an effective monitoring system to monitor the progress of various infrastructure related activities as envisaged under the plan.
- (iv) Design of an effective monitoring system for policy advocacy within the Government for expediting formulation of various policies.
- (v) Design of an effective monitoring system for various technological interventions to reduce the air pollution.

2.10.3 Directorate of Environment and Climate Change and PPCB will set up a dedicated team for design of monitoring system and setting up of IT platform for tracking progress of the plan.

2.11. Governance

The Monitoring of progress, coordination of various activities, corrective measure required and fixing of accountability will be done by Air Monitoring Committee at the District level under Deputy Commissioner, State Level under Principal Secretary, Environment and Apex committee under Chief Secretary.

Chapter 3 – Current Status and Trends of Air Quality in Ludhiana

3.1. Parameters of Air pollution

Depending upon the various activities mentioned above and type of fuels being used in the industries. The pollutants impacting the quality of air in Ludhiana are as under:

3.1.1 PM₁₀

Coarse dust particles (PM₁₀) are 2.5 to 10 micrometers in diameter. Sources include crushing or grinding operations and dust stirred up by vehicles on roads. These tiny particles which are about 30 times smaller than the width of a hair on your head are small enough to get inhaled past our defensive nose hairs and into our lungs.

3.1.2 PM_{2.5}

Fine particles (PM_{2.5}) are 2.5 micrometers in diameter or smaller, and can only be seen with an electron microscope. Fine particles are produced from all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes.

3.1.3 NO_x

NO_x is produced from the reaction of nitrogen and oxygen gases in the air during combustion, especially at high temperatures. In areas of high motor vehicle traffic, such as in large cities, the amount of nitrogen oxides emitted into the atmosphere as air pollution can be significant. NO_x react with ammonia, moisture, and other compounds to form nitric acid vapor and related particles. Human health concerns include effects on breathing and the respiratory system, damage to lung tissue, and premature death.

3.1.4 SO_x

It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores (aluminum, copper, zinc, lead, and iron) that contain sulfur. Sulfur dioxide dissolves easily in water to form sulfuric acid. Sulfuric acid is a major component of acid rain. Sulfur dioxide affects human health when it is breathed in. It irritates the nose, throat, and airways to cause coughing, wheezing, shortness of breath, or a tight feeling around the chest.

3.2. Monitoring of Air Quality

The ambient air quality monitoring is being carried out regularly at 4 no. manually operated stations installed at Ludhiana under National Air Monitoring Programme (NAMP). The year wise data of PM₁₀, SO₂ and NO_x for the period 2014-18 is placed at **Annexure-A**. Further, the Board has also commissioned one Continuous Ambient Air Quality Monitoring Station (CAAQMS) at Ludhiana and the real time data of the same is being displayed at Gate of Punjab Agriculture University, Ludhiana. The AQI data of 2017 and 2018 has been given in **Annexure-B**.

3.3. CPCB's norms for Air Quality

The CPCB on 18/10/2009 has revised National Ambient Air Quality Standards (NAAQS) which are reproduced as under:

S.N.	Pollutants	Time weighted average	Concentration of Ambient Air	
			Industrial, Residential, Rural and other areas	Notified Ecologically sensitive area
1	Sulphur Dioxide (SO ₂) µg/m ³	Annual	50	20
		24 hours	80	80
2	Nitrogen Dioxide (NO ₂) µg/m ³	Annual	40	30
		24 hours	80	80
3	Particulate Matter (size<10 µm) or PM ₁₀ µg/m ³	Annual	60	60
		24 hours	100	100
4	Particulate Matter (size<2.5 µm) or PM _{2.5} µg/m ³	Annual	40	40
		24 hours	60	60
5	Ozone (O ₃) µg/m ³	8 hours	100	100
		1 hour	180	180
6	Lead (Pb), µg/m ³	Annual	0.50	0.50
		24 hours	1.0	1.0
7	Carbon Monoxide (CO), mg/m ³	8 hours	02	02
		1 hour	04	04
8	Ammonia (NH ₃), µg/m ³	Annual	100	100
		24 hours	400	400
9	Benzene (C ₆ H ₆) µg/m ³	Annual	05	05
10	Benzo (a) Pyrene (BaP)- particulate phase only ng/m ³	Annual	01	01
11	Arsenic (As) ng/m ³	Annual	06	06
12	Nickel (Ni) ng/m ³	Annual	20	20

3.4. Air Quality Index (AQI)

3.4.1 Awareness of daily levels of air pollution is important to the citizens, especially for those who suffer from illnesses caused by exposure to air pollution. Further, success of a nation to improve air quality depends on the support of its citizens who are well-informed about local and national air pollution problems and about the progress of mitigation efforts. Thus, a simple yet effective communication of air quality is important. The concept of an air quality index (AQI) that transforms weighted values of individual air pollution related parameters into a single number is widely used for air quality communication and decision making.

3.4.2 The AQI system is based on maximum operator of a function (i.e. selecting the maximum of sub-indices of individual pollutants as an overall AQI). The objective of an AQI is to quickly disseminate air quality information (almost in real-time) that entails the system to account for pollutants which have short-term impacts. Eight parameters (PM₁₀, PM_{2.5}, NO₂, SO₂, CO, O₃, NH₃ and Pb) having short-term standards have been considered for near real-time dissemination of AQI.

3.4.3 The AQI has further been classified in six categories as shown below:

AQI	Quality	Impact on health
0-50	Good	Minimal impact
51-100	Satisfactory	Minor breathing discomfort to sensitive people
101-200	Moderately polluted	Breathing discomfort to people with lungs, asthma and heart diseases
201-300	Poor	Breathing discomfort to most people on prolonged exposure
301-400	Very poor	Respiratory illness on prolonged exposure
>401	Severe	Affects healthy people and seriously impacts those with existing diseases.

3.4.4 Based on this, the CPCB evolved a Graded Response Action plan (GRAP) which is implemented in the NCR, Delhi when the air quality deteriorates and various steps have been mentioned in GRAP to be taken to immediately control the deterioration of the air quality.

3.5. Trends of Quality of Air

3.5.1 The Board has commissioned one no. Continuous Ambient Air Quality Monitoring Station (CAAQMS) at Ludhiana and the real time data of the same is being displayed at Gate of Punjab Agriculture University, Ludhiana. Annual average of AQI for the last 2 years is given as under:

Year	PM₁₀ (µg/m³)	PM_{2.5} (µg/m³)	SO₂ (µg/m³)	NO_x (µg/m³)	AQI
2017	159.64	73.34	5.24	58.04	147
2018	112.57	51.86	7.92	29.53	114

3.5.2 The trend of AQI in the ambient air quality shows that the concentration of NO_x and SPM in the ambient air has decreased in 2018 as compared to 2017.

3.6. Major Parameters of concern

The major concern of air quality is PM_{10} . All other parameters are within prescribed limits. The perusal of the data in **Annexure-B** clearly indicates that air quality index of Ludhiana generally remains moderate (101-200) and sometimes remains satisfactory (51-100). The sources of pollution and their apportionment is given in the next chapter.

Chapter 4 – Sources of Air Pollution in Ludhiana

4.1. Major Sources

4.1.1 The following are the major identified sources of air pollution:

- (i) Vehicular Emissions
- (ii) Road Dust
- (iii) Burning of Bio-mass & Garbage
- (iv) Industrial Emissions
- (v) Mining
- (vi) Construction and Demolition Activities
- (vii) Other Sources

4.1.2 As per the Source Apportionment Study carried out by Punjab State Council For Science & Technology (PSCST) jointly with The Energy Resource Institute (TERI), the apportionment of various sources w.r.t PM_{10} , is as under: -

Sr. No.	Source	Contribution of PM_{10}
1.	Industries	35 %
2.	Road Dust	28%
3.	Vehicular Pollution	16%
4.	Biomass & Garbage burning	16 %
5.	Others	5 %

4.2. Vehicular Emissions

4.2.1 Transport sector is one of the significant contributors to air pollution in Ludhiana due to movement of heavy goods vehicles carrying raw materials and products of the industries and commercial establishments located in and around the city. With the rapid growth of urban population, there is an ever-increasing demand on the city's infrastructure to serve the population. The rapid motorization rates have further complicated issues. The trips per household have increased over the years, with increasing per capita incomes and increase in vehicle ownership. As per Ludhiana Municipal Corporation report on "Comprehensive Mobility Plan for Ludhiana", the city has been sub-divided into 3 cordon areas by inner, middle and outer cordon lines. A total traffic volume which enters the city at the outer cordon is about 55,000 vehicles. At middle cordon, it increases to 1,50,000 vehicles and at the inner cordon it is 1,05,000 vehicles. This indicates that the local traffic mixes with through traffic as soon as it enters the city and further densifies towards the central part of the city. The peak hours of traffic normally 9 AM to 10 AM and 5.30 PM to 6.30 PM comprise 8% to 10% of average daily traffic volume. The city has roads ranging from 6 to 35 m width with total road length as 1356 km. The data w.r.t. different type of registered vehicles in Ludhiana has been collected from the office of State Transport Commissioner, Chandigarh. The year wise registration of different type of vehicles from 2001-02 to 2016-17 with annual growth rate is as shown below:

4.3. Total registered vehicles in Ludhiana

Sr. No.	Year	Registered Vehicles	Annual Growth Rate (%)
1	No. of registered vehicles up to March, 2001 as per CMP report	680494	---
2	2001-02	719702	5.76
3	2002-03	762552	5.95
4	2003-04	805672	5.65
5	2004-05	859921	6.73
6	2005-06	921370	7.14
7	2006-07	983125	6.70
8	2007-08	1041191	5.90
9	2008-09	1090651	4.75
10	2009-10	1172759	7.52
11	2010-11	1257574	7.23
12	2011-12	1371753	9.07
13	2012-13	1497278	9.15
14	2013-14	1621191	8.27
15	2014-15	1746325	7.72
16	2015-16	1875646	7.40
17	2016-17	2003252	6.80

Source:- Interim Report II- Source Apportionment Study to prepare Action Plan to improve Air Quality of Ludhiana prepared by PSCST, Chandigarh

4.4. Year wise registered vehicles in Ludhiana

Sr No	Year	Commercial Vehicles (Goods)	Heavy Vehicles (Passenger)	Four Wheelers (Passenger)	Three Wheeler (Passenger)	Two Wheeler	Others	Total
1	2001-02	913	32	7255	953	29713	342	39208
2	2002-03	1231	76	7801	832	32597	313	42850
3	2003-04	1255	84	7848	840	32773	320	43120
4	2004-05	2009	160	10565	1021	40136	358	54249
5	2005-06	2723	168	12287	1158	44431	682	61449
6	2006-07	3440	227	12170	1105	44258	556	61756
7	2007-08	3574	142	11887	1192	40631	640	58066
8	2008-09	3078	163	10910	984	33672	653	49460
9	2009-10	2512	191	11041	56	67496	812	82108
10	2010-11	2530	184	11291	78	69882	850	84815
11	2011-12	4946	273	25679	1452	80764	1065	114179
12	2012-13	5500	290	28036	1189	87999	2511	125525
13	2013-14	4748	548	24270	609	90803	2935	123913

14	2014-15	4229	530	25250	548	91781	2796	125134
15	2015-16	4301	519	22633	620	99392	1856	129321
16	2016-17	3728	383	21148	633	100323	1391	127606

Source:- Interim Report II- Source Apportionment Study to prepare Action Plan to improve Air Quality of Ludhiana prepared by PSCST, Chandigarh

- 4.4.1** The registered vehicles in Ludhiana have increased significantly over the years. The number has climbed from 6.80 to 20.03 lakhs in sixteen years from 2001 to 2017. The share of two wheelers registration is highest about 78.6% in 2016-17. The sharp increase of two-wheelers could be attributed to deficient public transport system and dense concentration of traffic on roads.

There are about 17500 registered three wheelers. However, the total numbers of three wheelers are estimated to be about 1 lakh which are plying in the city.

4.5. Category wise share (%) of total vehicles in respective year

Sr. No.	Year	Comm. Vehicles (Goods)	Heavy Vehicles (passenger)	Four Wheeler (passenger)	Three Wheeler (passenger)	Two Wheeler	Others
1	2001-02	2.3	0.1	18.5	2.4	75.8	0.9
2	2002-03	2.9	0.2	18.2	1.9	76.1	0.7
3	2003-04	2.9	0.2	18.2	1.9	76.0	0.7
4	2004-05	3.7	0.3	19.5	1.9	74.0	0.7
5	2005-06	4.4	0.3	20.0	1.9	72.3	1.1
6	2006-07	5.6	0.4	19.7	1.8	71.7	0.9
7	2007-08	6.2	0.2	20.5	2.1	70.0	1.1
8	2008-09	6.2	0.3	22.1	2.0	68.1	1.3
9	2009-10	3.1	0.2	13.4	0.1	82.2	1.0
10	2010-11	3.0	0.2	13.3	0.1	82.4	1.0
11	2011-12	4.3	0.2	22.5	1.3	70.7	0.9
12	2012-13	4.4	0.2	22.3	0.9	70.1	2.0
13	2013-14	3.8	0.4	19.6	0.5	73.3	2.4
14	2014-15	3.4	0.4	20.2	0.4	73.3	2.2
15	2015-16	3.3	0.4	17.5	0.5	76.9	1.4
16	2016-17	2.9	0.3	16.6	0.5	78.6	1.1

Source:-Interim Report II-Source Apportionment Study to prepare Action Plan to improve Air Quality of Ludhiana prepared by PSCST, Chandigarh

4.6. Road Dust

4.6.1 The particles of dust that deposit from the atmosphere and accumulate along road sides are called road dust particles and originates interaction of solid, liquid and gaseous metals. Two main sources of road dust are deposition of previously suspended particles (atmospheric aerosols) and displaced soil. Some other common factors are enlisted as under:

- (i) Emissions from the vehicular traffic
- (ii) Construction and demolition activities, corrosion of metals structures etc.
- (iii) Presence of potholes on the road.
- (iv) Absence of metalled roads / stabilized roads / un-stabilized movement area within industries.
- (v) Presence of un-stabilized berms along the roads.
- (vi) Movement of overloaded transport vehicles.

4.7. Burning of Biomass and Garbage

4.7.1 There are only small patches of agricultural land within the Ludhiana city, however, the city is surrounded by agricultural area and a lot of biomass is generated during post harvesting paddy and wheat seasons. During wheat season biomass burning is lesser than paddy season as the farmers use the wheat crop residue as cattle fodder. The effect of biomass burning in the paddy season is augmented due to the climate conditions.

4.7.2 Around 1100 TPD Municipal Solid Waste is being generated from city Ludhiana and is shifted to Municipal Solid Waste dumping site at Jamalpur. For the disposal of Municipal Solid Waste being generated from the City Ludhiana, one RDF plant of capacity 60 TPH has been commissioned at Municipal Solid Waste Dumping site situated at Village Jamalpur, Tajpur Road, Ludhiana. The reject-derived fuel generated from this plant is being used in the power plant situated at Nakodar, for the production of electricity.

4.8. Industrial Emissions

Ludhiana city is one of the highly industrialized towns in the north India, having all categories of industries located within the city limits. But the predominant industries operating in the city are electroplating and dyeing having high pollution potential. The Punjab Pollution Control Board has identified following 10 industrial clusters within the jurisdiction of critically polluted area of Ludhiana city. The identified clusters are as under:

Cluster No.	Name of industrial cluster	Critically Polluted area of Ludhiana
I	Focal point along with NH-1 Total Eight Phase	<p style="text-align: center;">Map showing the clusters of critically polluted area of Ludhiana</p>
II	Industrial Area-B from Sherpur Chowk to Gill Road and Gill Road to Malerkotla Road (left side of the road)	
III	Mixed Industrial Area-Right side of Gill Road	
IV	Industrial Area-C (near Jugiana Village)	
V	Industrial Area-A and Extension: Area between old G.T. Road and Ludhiana bye pass road	
VI	Industrial Estate : Near Dholewal Chowk	
VII	Mixed Industrial Area (MIA) Miller Ganj	
VIII	Mixed Industrial Area (MIA) Bye Pass road	
IX	Bahadurke Industrial Area	
X	Tajpur Industrial Complex	

Figure-6 -Location of industries on Ludhiana city map

4.8.1 The main stationary sources of air pollution are the industrial units, which are emitting particulate matter, sulphur di-oxide and oxides of nitrogen etc. All the dyeing, cupola furnaces, rolling mills etc. are using pet coke coal / furnace oil as fuel in their furnaces emitting the aforesaid pollutants, besides the process / fugitive emissions.

4.8.2 The category wise detail of air polluting industries situated in Ludhiana area are given as under:-

Sr. No.	Category wise detail of air polluting industries	Number of units up to 5 Km of Municipal limits of Ludhiana
1.	Brick kilns	8
2.	Textile/Dyeing /printing	319
3.	Pulp & Paper Mills	2
4.	Forging (using fuel)	155
5.	Heat treatment (using fuel)	48
6.	Steel Rolling Mills	27
7.	Cupola Furnaces	90
8.	Induction Furnaces	74
9.	Arc furnaces	4
10.	Milk plants	2
11.	Waste Oil Reprocessing units	5
12.	Tyre & tubes units	27
13.	Pyrolysis plants	1
14.	Plywood manufacturing (with boilers)	13
15.	Beverages/Soft drink plants	2
16.	Rice shellers	7
17.	Other air polluting industries using fuel	231
	Total	1015

4.8.3 It is pertinent to mention here that emission standards for most of the above said industries falling within MC limits varies with the capacity of the boiler being used and type of fuel etc. As per the wind rose diagrams shown at figure 01, 02 & 03 wind directions are south-east in summer season and south-west in winter & monsoon season.

4.9. Mining

Mining activities also contribute to the AQI. Major sand mining activities are undertaken along the bed of Sutlej River. The Sutlej river channel does not pass through/within the limits of Municipal Corporation but the impact of mining activities being carried out on the quality of air cannot be ruled out.

4.10. Construction and Demolition Activities

4.10.1 Ludhiana is a large city having population about 24 lakhs. Many major construction projects are being set up in the city. Further, small construction activities are being carried out by the individual house holders / industrial units / commercial units etc.

4.11. Others

4.11.1 Other than above mentioned sources, episodic incidents like Holi, Dushera, Diwali, Gurupurab, New Year etc. are celebrated by bursting crackers, spraying colours etc. which also contribute to the ambient air quality.

Chapter 5 –Control of Vehicular Emissions

5.1. Key Activities

5.1.1 The vehicles are major pollution contributor, producing significant amount of nitrogen oxides, carbon monoxides and other polluting gases and particulate matter. To minimize the pollution generated from the vehicles, various actions have to be taken, which have been classified into following categories:

- (a) Public Awareness related,
- (b) Enforcement related,
- (c) Infrastructure related,
- (d) Policy related

5.1.2 Some activities may have more than one category but they have been kept in the category where it has the major requirement. Following are the key activities for control on vehicular emissions:

Public Awareness

- (i). CVE 1 - Public awareness campaign for control of vehicular emissions

Enforcement Related

- (ii). CVE 2 -Remote sensor-based PUC system
- (iii). CVE 3 - Extensive drive against polluting vehicles
- (iv). CVE 4 - Prevent parking of vehicles in non-designated areas
- (v). CVE 5 - Check fuel adulteration

Infrastructure Related

- (vi). CVE 6 - Widening of road and infrastructure for decongestion of road
- (vii). CVE 7 - Introduce intelligent traffic systems
- (viii). CVE 8 - Install weigh in motion bridges at the borders of cities
- (ix). CVE 9 - Construction of expressways/ bypasses to avoid congestion

Policy Related

- (x). CVE 10 – Phasing of vehicles more than 15 years old
- (xi). CVE 11 – Promotion of battery-operated vehicles
- (xii). CVE 13 – Retrofitting of particulate filters in diesel vehicles for BS-V fuels

5.1.3 Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in **Annexure – C**.

5.2. CVE 1 - Public awareness campaign for control of vehicular emissions

Public support is essential for clean air mission to be successful. As part of overarching mission of clean air, Ludhiana, the public must be made aware of ill effects of air pollution on health and contribution of vehicular emissions in the same. The public has to be motivated to play their role in curbing the air pollution. Following action shall be taken:

- (i). Public awareness campaign in print and electronic media
- (ii). Use of Social Media Facebook, Twitter, Instagram
- (iii). Jingles on air pollution on local radio and tv
- (iv). Awareness drives in educational institutions
- (v). Public meetings
- (vi). Nukarnataks

5.3. CVE 2 - Remote sensor-based PUC system

To check the health of the engine, PUC has been made mandatory. The PUC is being issued to the vehicles by pollution check centres manually, which may be forged and cannot be verified. Therefore, there is need to install centralized online system for issuing of online PUCs to the vehicles avoid malpractices.

The Department of Transport will implement remote sensor-based PUC system to eliminate the malpractices in the existing system of issuing PUCs. All PUC centers will be made online.

5.4. CVE 3 - Extensive drive against polluting vehicles

There is need to strictly enforce checking of PUC certificates so that unauthorized vehicles could be penalized. The traffic police shall place check points (Nakas) at differed locations and the performance of such check points shall be monitored. A whatsapp number shall be dedicated and publicized among general public so that complaints of public regarding polluting vehicles may be received and action taken.

Traffic Police and Department of Transport will be responsible for the activity.

5.5. CVE 4 - Prevent parking of vehicles in non-designated areas

Presently, vehicles are being parked in a haphazard manner and on the roads as well, which leads to traffic congestion, thus, causing vehicular pollution. Traffic police shall impound vehicles parked in non-designated areas. Traffic police shall compile the list of prominent areas of such violations and special attention shall be paid. CCTV cameras shall be installed in such areas to capture the evidence. Number of challans shall be monitored.

5.6. CVE 5 - Check fuel adulteration

Regular monitoring will be carried out to check adulteration of fuel and heavy fines may be imposed on the violators. Department of Food and Civil Supplies will be responsible and number of inspections carried out and action taken against the violators will be monitored on regular basis.

5.7. CVE 6 - Widening of road and improvement of infrastructure to decongest roads

The major air pollution caused by dust emission along road sides as the condition of roads is very pathetic. Due to the movement of heavy goods vehicles like Trucks, tippers etc. carrying raw materials and final products of the industries, lot of dust / vehicular emissions are generated, which is affecting the ambient air quality of the city. The over-bridges should also

be constructed, wherever possible, for smooth and speedy flow of traffic and the pending construction work should be completed in the time bound manner

The roads constructed within the city having traffic congestion shall be identified by the MC. The concerned department like NHAI, PWD (B&R) and Municipal Corporation shall widen these roads suitably to decongest the traffic.

5.8. CVE 7 - Construction of expressways/ bypasses to avoid congestion

Municipal Corporation, Ludhiana, NHAI and PWD (B&R) shall examine the need for expressways/by-passes to avoid congestions.

5.9. CVE 8 - Introduce intelligent traffic systems

The traffic lights installed in the area shall be synchronized in such a way so as to achieve minimal stoppage of vehicles for a stretch of at least 2 Kms. The traffic lights shall be placed at various intersections, so as to avoid traffic jams and smooth operation of the vehicles. Municipal Corporation in consultation with Traffic Police shall identify such places and provide traffic lights.

5.10. CVE 9 - Install weigh in motion bridges at the borders of cities

Municipal Corporation shall set up weigh bridges at each entry and exit of the city to avoid entry of overloaded vehicles to prevent generation of excess emissions of gases and dust.

5.11. CVE 10 – Phasing of vehicles more than 15 years old

The Department of Transport will ensure phasing out of vehicles which are more than 15 years old.

5.12. CVE 11 - Promotion of Battery-operated vehicles

Battery operated vehicles being named e-rickshaw are now available. A handsome number of vehicle agencies are in operations who sell such vehicles. A Promotional and awareness campaigns about battery operated vehicles is a regular feature of these companies. Ludhiana city is gradually being shifted to battery operated e-rickshaws and diesel auto rickshaws are being replaced by these vehicles though replacing pace is yet slow but in coming time these battery-operated autos will become major mode of transportation. Gradual phasing out old Diesel operated Auto rickshaws and Public transport vehicles with CNG or Battery-operated vehicles is an important city specific goal which needs to be achieved to improve the Air Quality of Ludhiana.

5.13. CVE 12 - Retrofitting of particulate filters in diesel vehicles for BS-VI fuels

The Department of Transport shall bring the policy for the same, once BS-VI fuels are introduced.

Chapter 6—Control of Road Dust

6.1. Key Activities

- 6.1.1** The particles of dust that deposit from the atmosphere accumulate along road sides are called road dust particles originates by interaction of solid, liquid and gaseous metals. Two main sources of road dust are deposition of previously suspended particles (atmospheric aerosols) and displaced soil. Additionally, the emissions from the vehicular traffic, building construction and renovation, corrosion of metals structures etc. contribute directly to the road dust. To minimize the pollution generated from the dust emissions, following key activities are proposed:

Maintenance Related

- (i) CRD1— Maintain potholes free roads for free-flow of traffic
- (ii) CRD 2 – Water sprinkling
- (iii) CRD 3 – Mechanical sweeping

Infrastructure Related

- (i) CRD4 -Creation of green buffers along the traffic corridors
- (ii) CRD5 - Water fountains at major traffic intersections
- (iii) CRD 6 - Greening of open areas, community places, schools and housing societies
- (iv) CRD 7 - Blacktopping of metalled road including pavement of road shoulders
- (v) CRD 8- Road design improvement

- 6.1.2** Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in **Annexure-D**.

6.2. CRD 1 – Maintain potholes free roads for free-flow of traffic

All the agencies such as MC/ PWD/ NHAI will put in place a system of regular inspections to identify the potholes and ensure that these are filled up immediately. It shall be monitored on regular basis. A web based/ mobile app shall be set up for Public to lodge complaint against the pothole and it shall be monitored for prompt repair.

6.3. CRD 2 – Water sprinkling:

Municipal Corporation shall identify the dust prone roads and shall prepare schedule for regular sprinkling of water on these roads to suppress dust emissions. This activity shall be started immediately. In order to save the water, the Municipal Corporation shall utilize the treated wastewater of STPs installed in the city.

6.4. CRD 3 – Mechanical sweeping:

Municipal Corporation shall procure adequate number of automatic sweeping machines for efficient and fast sweeping of the road / streets. The frequency of the sweeping shall be fixed appropriately by the Municipal Corporation.

6.5. CRD 4 – Creation of green buffers along the traffic corridors:

The Municipal Corporation, Ludhiana and NHAI shall undertake a special drive to identify the areas and make plantation thereby increasing the green belt in and around the industrial areas, residential areas and road sides etc. in collaboration with the Deptt. of Forests. The possibility may also be explored for provide vertical gardening along the pillars / sides of the bridges.

Municipal Corporation, Ludhiana and NHAI shall identify the trees with the help of Deptt. of Horticulture which may be grown along the roads without any obstruction to the traffic. These trees shall be planted at the suitable places. The maintenance of these trees shall be done by the Municipal Corporation, Ludhiana and NHAI on their respective areas of jurisdiction. After one year, survival rate of the plants be calculated and new plants be planted.

6.6. CRD 5 – Water fountains at major traffic intersections:

Municipal Corporation shall explore the possibility of setting up of the water fountains at important traffic junctions to reduce the emission level including dust at these points.

6.7. CRD 6 –Greening of open areas community places, schools and housing societies:

In order to increase greenery in the city, the Municipal Corporation shall identify open areas/ lawns/ vacant lands including community places and schools in the city and these places be allocated to the NGOs or Industrial Associations for tree plantation and their maintenance. The activity of identification of the suitable sites shall be completed in a time bound manner and shall be allotted to the NGOs or Industrial Associations.

6.8. CRD 7 – Blacktopping of metalled road including pavement of road shoulders:

Some of the roads of Ludhiana are not properly metalled, which are the source of dust and gaseous emissions. These roads shall be converted into metalled road and the berms along these roads shall be stabilized with interlocking tiles or any other method. Municipal Corporation shall undertake this activity in a time bound manner.

6.9. CRD 8 – Road design improvement

Traditionally, road infrastructure has focused mainly on motorized transport - often at the expense of safety for pedestrians, cyclists and motorcyclists. Today most countries, while promoting walking and cycling, have not developed infrastructure that reduces the risk of road traffic injuries. Pedestrians and cyclists are forced to use automobiles then get injured while sharing the road with high-speed vehicles.

NHAI, PWD (B& R) and Municipal Corporation should prioritize updating road design standards and ensure that new roads are planned, designed and operated according to safety standards. The respective Authorities shall identify the roads which need improvement and submit a concrete action plan regarding the same.

Chapter 7—Control on Burning of Garbage and Biomass

7.1. Key Activities

- 7.1.1** There are only small patches of agricultural land within the Ludhiana city, however, the city is surrounded by agricultural area and a lot of biomass is generated during post harvesting paddy and wheat seasons. During wheat season biomass burning is lesser than paddy season as the farmers use the wheat crop residue as cattle fodder. The effect of biomass burning in the paddy season is augmented due to the cold climate conditions. To minimize the pollution generated from burning of garbage and biomass, following key activities are proposed:

Enforcement Related

- (i). CBGB 1 –Control of open burning of bio-mass in City
- (ii). CBGB 2 – Control of burning of municipal solid wastes
- (iii). CBGB 3 –Control of burning of agriculture waste and crop residue
- (iv). CBGB 4- Proper collection of horticulture waste (bio-mass) and its disposal following composting–cum-gardening approach.

Public Awareness

- (v) CBGB 5 - Public Awareness campaign against open burning of bio-mass, crop residue, garbage, leaves, etc.

- 7.1.2** Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in **Annexure-E**.

7.2. CBGB 1 –Control of open burning of bio-mass in City:

- 7.2.1** The burning of biomass like leaves of the trees creates lot of smoke in the area particularly during winter season, as such, the open burning of these biomass must be stopped. Municipal Corporation shall deploy its staff to have a check on various areas so as to forbid the inhabitants for open burning of the biomass.

- 7.2.2** A whatsapp number shall be generated and publicized by Municipal Corporation along with the setting up of the dedicated control room for receiving complaints of public through this system.

- 7.2.3** CCTV cameras shall be installed at the important locations to monitor such incidents.

7.3. CBGB 2 – Control of burning of municipal solid wastes:

- 7.3.1** Around 1100 TPD Municipal Solid Waste is being generated from city Ludhiana and is shifted to Municipal Solid Waste dumping site at Jamalpur. For the disposal of Municipal Solid Waste being generated from the City Ludhiana, one RDF plant of capacity 60 TPH has been commissioned at Municipal Solid Waste Dumping site situated at Village Jamalpur, Tajpur Road, Ludhiana. The reject-derived fuel generated from this plant is being used in the power plant situated at Nakodar, for the production of electricity.

7.3.2 It has been observed that municipal solid waste has been become the source of burning of waste. Lot of smoke is generated which contribute to the air pollution index.

7.3.3 Municipal Corporation shall collect the municipal solid waste properly for carrying the same to the disposal sites in the scientific way in closed vehicles.

7.3.4 Municipal Corporation shall comply with the provisions of Municipal Solid Waste Rules, 2016.

7.4. CBGB 3 – Control of burning of agriculture waste and crop residue:

7.4.1 There are only small patches of agricultural land within the Ludhiana city, however, the city is surrounded by agricultural area and a lot of agricultural waste is generated during post harvesting paddy and wheat season. During wheat season stubble burning is lesser than paddy season as the farmers use the wheat crop residue as cattle fodder.

7.4.2 Punjab Pollution Control Board shall engage Punjab Remote Sensing Centre, Ludhiana for real time monitoring and reporting of stubble burning incidents. The District Administration shall constitute Sub-Divisional Level Committees to verify the reported sites and issue challans to the violators besides filing of proceedings u/s 133 CrPC necessary directions / instructions shall be issued by the District Administration u/s 144 IPC to restrict harvesting of crops after 6.00 pm to 6.00 am during crop harvesting seasons and attaching of the super SMS with the combine harvesters. The department of Agriculture shall make necessary awareness in the farmers to use the stubble either as manure or to use the same for other useful purposes. The farmers should also be provided with adequate machinery for in-situ management of stubble in the fields.

7.5. CBGB 4 - Proper collection of horticulture waste (bio-mass) and its disposal.

7.5.1 Municipal Corporation shall provide education to the educational institutions, government offices, residents welfare associations regarding horticulture waste collection and its benefits by way of disposing the waste in the form of composting and encouraging the organic farming in the gardens and fields.

7.6. CBGB 5 -Public Awareness campaign against open burning of bio-mass, garbage, leaves, etc.

7.6.1 Punjab Pollution Control Board, Deptt. of Agriculture, Deptt. of Horticulture and Municipal Corporation shall move publicity vans in the city to aware the public about the ill-effects of burning of biomass / crop residue / garbage / leaves etc.

7.6.2 These Departments shall distribute pamphlets indicating the level of air pollution in the area of Ludhiana and steps to be taken to carry out various activities to bring the air quality index within the norms. The pamphlets shall also contain the type of diseases which are caused due to burning of biomass / crop residue / garbage / leaves etc. These pamphlets shall also be affixed on city buses and auto rickshaws.

7.6.3 Punjab Pollution Control Board has installed online continuous ambient air quality monitoring station at Ludhiana and the gaseous emissions like SO₂, NO_x, PM₁₀ and PM₂₅ etc. are

monitored on real time basis. The high level of these gaseous generated during the burning of crop residue shall be disseminated through SMS system through the SAMEER app.

- 7.6.4** Punjab Pollution Control Board and Deptt. of Agriculture shall prepare jingles highlighting the activities relating to the ill-effects of the high level of emissions generated during crop residue burning. District Administration shall direct the local cable TV operator, FM radios and owners of the cinema hall to play these jingles during the starting and interval of the movies.
- 7.6.5** Municipal Corporation, Ludhiana shall distribute pamphlets indicating the ill-effects of burning of municipal solid waste in the city besides fixing of these pamphlets on city buses and auto rickshaws for awareness of the public.
- 7.6.6** CCTV cameras shall be installed on the municipal waste dumping sites and secondary collection centers to check the burning of waste in these places having the control center with Municipal Corporation.
- 7.6.7** The Sanitary Inspector of the Municipal Corporation shall educate the sweepers of the area regarding ill-effects of burning of municipal solid waste and also check the sites randomly for verification. The sweepers of the area shall ensure that the solid waste must be shifted from the secondary collection center to the dumping sites on daily basis to avoid the burning of municipal solid waste at these places.

Chapter 8 – Control of Industrial Emissions

8.1. Key Activities

- 8.1.1** The main stationary sources of air pollution are the industrial units, which are emitting Particulate Matter, Sulphur Di-Oxide and Oxides of Nitrogen etc. All the dyeing units, rolling mills etc. are using coal / furnace oil/pet coke as fuel in their furnaces emitting the aforesaid pollutants, besides the process / fugitive emissions. To minimize the pollution generated from the industries, following key activities are proposed:

Technology Intervention

- (i). CIE 1 – Conversion to side hood suction in furnaces
- (ii). CIE 2 – Conversion to cleaner fuels from pet coke/coal.
- (iii). CIE 3- Development of cleaner technologies to control fugitive emissions

Enforcement Related

- (iv). CIE 4–Conversion of natural draft brick kilns to induced draft
- (v). CIE 5 – Action against non-complying industrial units
- (vi). CIE 6- Training for effective operation of Air Pollution Control Devices

Infrastructure Related

- (vii). CIE 7 – Shifting of industries from non-designated areas to industrial areas

- 8.1.2** CIE 6 - Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in **Annexure-F**.

8.2. CIE 1 – Conversion to side hood suction in furnaces

PPCB with the technical support from Punjab Council for Science and Technology has improvised technology to provide for side hood suction in furnaces to reduce the emissions. The side hood suction shall be implemented in a time bound manner and shall be monitored by the Board monthly.

8.3. CIE 2 – Conversion to CNG/PNG from pet coke/coal

A large number of units in Ludhiana are using coal/pet coke as source of energy. PPCB will motivate the industry to convert from pet coke and coal to biomass based fuels or CNG (whenever the pipeline is laid up to Ludhiana Industrial area). Jai Madhok Energy Pvt Ltd. The company is awaiting for approval of NHAI for laying of pipeline to supply PNG in Focal Points of Ludhiana. The first phase of laying of pipeline shall be completed within 06 months till Jiwan Nagar Chowk.

8.4. CIE 3- Development of cleaner technologies to control fugitive emissions.

In the modern era, the manufacturing activities of various goods have become technologically advanced where the operations have become automatic with minimal human intervention. In such time it becomes imperative on the part of the industrial units to upgrade their APCDs as per latest technologies available. For this PSCST, Chandigarh shall be entrusted to carry out

studies in various air polluting industries and suggest cleaner and latest technologies to improve the air quality.

8.5. CIE 4 - Conversion of natural draft brick kilns to induced draft

Punjab Pollution Control Board has issued directions to the existing brick kilns of the State to convert their conventional brick kilns to induced draft technology with zig-zag pattern of setting of bricks. The Brick kilns located in the District shall be monitored for conversion to the new technology in a time bound manner.

8.6. CIE 5 – Action against non-complying industrial units:

The regular monitoring of industries is being carried out as per the policy of the Board. In case, any industry is found violating the provisions of the Air Act, 1981, action under the provisions of the said Act is initiated against the violating industries. The number of inspections carried out and action taken will be monitored regularly.

8.7. CIE 6 – Shifting of industries from non-designated areas to industrial areas

There are certain industries, which are located in non-designated areas and the PSIEC/ Department of Industries and Commerce shall develop new areas to shift the industries from non-designated areas.

8.8. CIE 7- Training for effective operation of Air Pollution Control Devices.

PSCST, Chandigarh to provide training to various industrial units for effective operation of air pollution control devices.

Chapter 9 – Control on Construction and Demolition activities

9.1. Key Activities

9.1.1 Ludhiana area is a major city of Punjab having population about 24 lacs. Many major construction projects are being set up in the city. Further, small construction activities are being carried out by the individual house holders / industrial units / commercial units etc. To minimize the pollution generated from the construction and demolition activities, following key activities are proposed:

- (i). CCDA 1 – Enforcement of Construction & Demolition Rules.
- (ii). CCDA 2 – Control measures for fugitive emissions
- (iii). CCDA 2 – Ensure carriage of construction material in closed/covered vessels.

9.1.2 Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in **Annexure-H**.

9.2. CCDA 1 – Enforcement of Construction & Demolition Rules

The necessary provisions of the C&D Rules, 2016 shall be implemented in the city to ensure proper management of these wastes. Municipal Corporation shall identify suitable land for effective disposal of C&D waste. Municipal Corporation shall frame mechanism for challaning the violators found dumping the C&D waste on non-designated areas. The enforcement will be monitored through the use of technology and regular review.

9.3. CCDA 2 – Control measures for fugitive emissions

Municipal Corporation and GLADA shall develop a site for scientific disposal of C&D waste within six months. Municipal Corporation shall ensure that

- (i). The builders provide proper curtains / sheets on the construction sites to avoid spreading of dust emissions into the environment.
- (ii). No dust should be emitted during demolition.
- (iii). No construction materials should be kept on the roads. The construction material inside the plots should also be kept in covered conditions and labour should be provided with all anti-pollution gears during the course of construction.

9.4. CCDA 3– Ensure carriage of construction material in closed/covered vessels

The relevant enforcement authorities will ensure that the construction material to be transported through trucks / vehicles shall be covered with tarpaulin to avoid the dust emissions.

Chapter 10 – Control on Other Sources

10.1. Key Activities

10.1.1 Apart from various measures being taken to control various sources of pollution, following activities will also be undertaken to control the pollution:

Public Awareness

- (i). COS 1–Dissemination of Air Quality Index

Infrastructure

- (ii). COS 2 – Establish an Air Quality Management Division at SPCB HQ
- (iii). COS 3 – Setup helpline in each city/town as well as SPCB HQ
- (iv). COS 4- Provisions of electricity-based crematorium

Policy

- (v). COS 5 - Coverage of LPG for domestic and commercial cooking

Enforcement

- (vi). COS 6 - Monitoring of DG sets and action against violations

10.1.2 Various actions to be taken for the above activities are given below. Further, the details such as baseline, target, timeline, milestones have been given in Annexure-I.

10.2. COS 1 – Dissemination of Air Quality Index

Punjab Pollution Control Board shall display the air quality index of the city at its prominent places for the awareness of the public including website, social media and print media.

10.3. COS 2 – Establish an Air Quality Management Division at SPCB HQ

There is need to strengthen technical capability pertaining to air pollution. The Board will identify the requisite skill sets and number of technical staff required along with future roadmap for the Board's activities

10.4. COS 3 – Setup helpline in each city/town as well as SPCB HQ

The Board shall set up a helpline system at headquarter and each city to receive the complaints from public and have effective feedback system.

10.5. COS 4- Provisions of electricity-based crematorium

Municipal Corporation shall setup an electricity-based crematoriums in order to reduce burning of wood.

10.6. COS 5 - Coverage of LPG for domestic and commercial cooking

Municipal Corporation shall identify the sources where the coal / wood are used as fuel at domestic and commercial cooking level. Municipal Corporation, Ludhiana shall formulate a mechanism to eliminate the use of coal / wood in these activities. Ujwala Yojna of the Central Government shall be facilitated to the beneficiaries.

10.7. COS 6 - Monitoring of DG sets and action against violations

Municipal Corporation, Ludhiana shall identify the commercial activities where the DG sets have been set up without fulfilling the norms for control of emissions and noise. Time bound action plan shall be prepared by the Municipal Corporation, Ludhiana for removal of these DG sets. Punjab Pollution Control Board shall identify the illegal DG sets manufacturers and necessary directions for their non-operation / closure shall be issued. Punjab Pollution Control Board shall identify the industries where the DG sets have been set up without fulfilling the norms for control of emissions and noise.

Chapter 11–GradedResponse Action Plan for Ludhiana

11.1. Graded Responses

In order to mitigate the impact of higher level of pollution when AQI crosses satisfactory level, Graded Response Action Plan has been prepared for Ludhiana for implementation under different Air Quality Index (AQI) categories namely, Moderate & Poor, Very Poor and Severe.

11.2. Agency Responsible for Graded Response

The concerned authorities responsible for taking action when AQI reaches various levels have been indicated against the proposed action. The authorities will work in coordination with and under the overall supervision of the District Level Committee.

11.3. Action in case of Severe AQI (Value between 401 to 500)

Following action shall be taken by the concerned authorities:

Sr. No.	Activity	Agency responsible / Implementing Agency
1	Temporary closure of brick kilns, hot mix plant, induction furnaces, rolling mills etc.	PPCB
2	Stop construction activity	MC, Ludhiana
3	Alert in newspapers / local cable TV to advice people with respiratory and cardiac patients to avoid polluted areas and restrict outdoor movement.	MC, Distt. Administration & PPCB
4	Sprinkling of water at the various dust emission points	MC, Ludhiana
5	Deploy Traffic police for smooth traffic flow at the identified vulnerable areas	Traffic Police
6	Stringently enforce / stop garbage burning in landfills and other places and impose heavy fines on person responsible.	MC, Ludhiana
7	To increase the frequency of mechanized sweeping on roads with heavy traffic and water sprinkling also on unpaved roads.	MC, Ludhiana
8	Stop entry of heavy good vehicles except essential commodities into Mandi Gobindgarh	Traffic Police
9	To take decision regarding closing of schools	District Administration

11.4. Action in case of Very Poor AQI (Value between 301 to 400)

Following action shall be taken by the concerned authorities:

Sr. No.	Activity	Agency responsible / Implementing Agency
1	Restraining the operation of air polluting industries i.e. induction furnaces, rolling mills, brick kilns etc. for 8 hours/day	PPCB
2	Banning of construction activities	MC, Ludhiana
3	Stop of garbage burning in the landfill areas or in the open fields	MC, Ludhiana
4	Water sprinklings at the dust emission points etc.	MC, Ludhiana
5	Strict vigil and enforcement of PUC norms	Traffic Police
6	Strict vigil and no tolerance for visible emissions from the vehicles and industries	PPCB and Traffic Police.
7.	Strictly enforce Supreme Court ban on fire crackers	MC, Ludhiana and Distt. Administration
8	Strictly enforce all pollution control regulations in the air polluting industries like induction furnaces, rolling mills, brick kilns etc.	PPCB

11.5. Action in case of Poor AQI (Value between 201 to 300)

S.N.	Activity	Agency responsible / Implementing Agency
1	Strictly enforce garbage burning in landfill and other places and impose heavy fines on person responsible	MC, Ludhiana
2	Increase frequency of mechanized cleaning of road and sprinkling of water on roads. Identify road stretches with high dust generation.	MC, Ludhiana
3	Stop use of coal / firewood in open eateries	MC, Ludhiana
4	Strictly enforce rules for dust control in construction activities and close non-complaint sites.	MC, Ludhiana
5	Close / Strictly enforce all pollution control regulations in the air polluting industries like induction furnaces, rolling mills, brick kilns etc.	PPCB
6	Restricting air polluting industries i.e. induction furnaces, rolling mills, brick kilns etc. for 12 hours/day	PPCB

11.6. Action in case of moderately polluted AQI (Value between 101 to 200)

Following action shall be taken:

S.N.	Activity	Agency responsible / Implementing Agency
1	Increasing the frequency of mechanized cleaning the roads etc.	MC, Ludhiana
2	Sprinkling of water at the dust emitting points	MC, Ludhiana
3	To stop open burning of garbage and municipal solid waste	MC, Ludhiana
4	Close / strictly enforce all pollution control regulations in the air polluting industries like induction furnaces, rolling mills, brick kilns etc.	PPCB

Chapter 12–Monitoring Requirements and Formats

12.1. Monitoring Requirements

12.1.1 Following are the key components of monitoring requirements of the Plan:

- (i). Monitoring of activities for control on Vehicular Emissions
- (ii). Monitoring of activities for control on Road Dust
- (iii). Monitoring of activities for control on Burning of Garbage and Biomass
- (iv). Monitoring of activities for control on Industrial Emissions
- (v). Monitoring of activities for control on Mining activities
- (vi). Monitoring of activities for control on Construction and Demolition activities
- (vii). Monitoring of activities for control on other sources

12.1.2 Further, various activities can be classified into one of the following categories:

- (i). Public Awareness
- (ii). Enforcement
- (iii). New Infrastructure
- (iv). Maintenance activities
- (v). Policy Advocacy
- (vi). Technology Support

12.2. Development of Monitoring System

12.2.1 To work out detailed formats and setting up online system to track progress of various activities, a dedicated team of PPCB and NIC is working on it.

12.2.2 The system will ensure that information is captured at source and transmitted to the System and the system will be able to analyse and report it in the prescribed format. The system will generate different reports for use at different levels. The System will also have dashboard to present the key indicators and metrics.

Chapter 13–Governance and Supervision

13.1. Three Tier Monitoring

13.1.1 Monitoring will be done by the Departments concerned, which are executing or responsible for particular activities. In addition, there will be three level of Air Quality Monitoring Committees (AQMC) to review and monitor the status:

- (i). AQMC at District Level under the Deputy Commissioner.
- (ii). AQMC at State level under the Principal Secretary, Department of Science, Technology and Environment, Punjab.
- (iii). Steering Committee under Chief Secretary, Punjab.

13.1.2 PPCB will set up a dedicated team for supporting coordination and monitoring of the Action Plan. It will also develop suitable IT platform for monitoring purposes.

13.2. AQMC at District Level

13.2.1 District Level Committee will be constituted under the chairmanship of Deputy Commissioner, Ludhiana and the monthly meeting of the District Level Committee will be conducted to discuss / monitor the progress of the activities to be performed under the Action plan. The committee shall involve civil society organization and their participation will be ensured for achieving various targets mentioned in the Action plan.

13.2.2 The district level committee shall constitute the followings:

1.	The Deputy Commissioner, Ludhiana	Chairman
2.	The Senior Superintendent of Police, Ludhiana	Member
3.	The Commissioner, Municipal Corporation, Ludhiana	Member
4.	The Chief Administrator, GLADA Ludhiana	Member
5.	The Senior Environmental Engineer, Punjab Pollution Control Board, Ludhiana	Convener
6.	The Executive Director, Punjab State Council for Science and Technology, MGIPA Complex, Sector 26, Chandigarh	Member
7.	The Secretary, Regional Transport Authority, Ludhiana	Member
8.	The Divisional Forest Officer, Ludhiana	Member
9.	The Superintending Engineer, PWD (B & R), Ludhiana	Member
10.	The Executive Engineer, Punjab Small Industries & Export Corporation, 18, Himalya Marg, Udyog Bhawan, Sector-17-A, Chandigarh	Member
11.	The General Manager, District Industries Centre, Ludhiana	Member
12.	The Project Manager, National Authority of India, PIU, 17-N, Model Town, Ambala City.	Member
13.	The Chief Agriculture Officer, Deptt. of Agriculture, Ludhiana	Member

14.	The District Food Supply Controller, Ludhiana	Member
15.	The President, Chamber of Industrial & Commercial Undertaking, Ludhiana	Member
16.	The President, Punjab Dyers Association, Ludhiana	Member
17.	The President, Ludhiana Induction Furnace Association, Ludhiana	Member
18.	The Executive Engineer-cum-District Mining Officer, Ludhiana	Member

13.3. AQMC at State Level

13.3.1 State Level Air Quality Monitoring Committee (AQMC) will comprise of the following:

1	Administrative Secretary, Department of Environment	Chairman
2	Director, Local Government	Member
3	Director, Transport	Member
4	Director, Industries and Commerce	Member
5	ADGP, Traffic	Member
6	Director, Environment	Member
7	Chairman, PPCB	Member
8	Representatives of NGO/ Expert Members	Member
9	Representatives of NGO/ Expert Members	Member
10	Joint Director, Environment	Convener

13.3.2 The State level Committee would meet every month to review the progress of the action plan and take corrective measures and also escalate issued to the Steering committee for intervention.

13.4. Steering Committee

13.4.1 There will be a Steering Committee under the Chief Secretary to Govt. of Punjab and comprising of Administrative Secretaries of relevant administrative departments for monitoring the progress, resolving issues and enforcing accountability.

13.4.2 The Committee will comprise of the following:

1	Chief Secretary	Chairman
2	Administrative Secretary, Environment	Member
3	Administrative Secretary, Local Government	Member
4	Administrative Secretary, Industries and Commerce	Member
5	Administrative Secretary, Transport	Member
6	Administrative Secretary, PWD	Member
7	ADGP, Traffic	Member
8	Director, Environment	Member
9	Chairman, PPCB	Member
10	Additional Secretary, Environment	Convener

Chapter 14 – Risk Mitigation Plan

14.1. Identification of Major Risks

14.1.1 Following are the major risks

- (i) Final report of source apportionment study.
- (ii) Accuracy and completeness of baseline data, targets and milestones
- (iii) Lack of formal analysis of implementation barriers.
- (iv) Lack of formal analysis of costs and efforts for various control options.

14.1.2 Source Apportionment Study

It is important to have the assessment of various sources and their contribution to the air pollution and accordingly focus on controlling those sources. Currently source apportionment study is being carried out by Punjab State Council for Science & Technology, Chandigarh along with TERI. They have submitted two interim reports in the PPCB and the relevant data available have been obtained from the said reports. PSCST have yet to submit the complete final study report which shall be approved by the Board. Whenever, the complete report is submitted by PSCST and approved by the Board, the same shall be incorporated in the Action Plan, if need be.

14.2. Accuracy and completeness of baseline data, targets and milestones

The baseline data, targets and milestones have been incorporated after discussions with the stake holders. During the course of implementation detailed surveys and analysis will be carried out, accordingly, targets and milestones will be suitably updated.

14.3. Lack of formal analysis of implementation barriers

Various activities included in the action plan need to be carefully analysed with respect to implementation challenges so that suitable remedial measures could be envisaged. Efforts will be made to study various barriers and improving the efficacy and effectiveness of the proposed activities by overcoming the shortcomings in the present system.

14.4. Lack of formal analysis of costs and efforts for various control options

The formal cost and efforts of various control options needs to be explored by various stake holders.

Annexure-A – Trends in Air Quality of Ludhiana

1. Station at Milk Plant, Ludhiana

Month	PM ₁₀ (µg/m ³)					NO _x (µg/m ³)					SO ₂ (µg/m ³)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
January	157	116	119	114	138	21	27	25	22	26	8	10	8	10	5
February	155	114	118	118	108	21	29	22	22	34	9	10	10	8	7
March	86	61	99	99	103	16	26	23	23	36	8	9	10	8	10
April	65	98	105	107	119	19	26	23	23	31	7	10	10	8	8
May	117	107	142	107	106	26	31	22	22	33	9	10	11	9	9
June	137	84	166	108	190	24	29	20	25	34	8	9	10	8	9
July	76	110	107	101	102	17	23	17	24	28	6	8	8	8	8
August	56	119	109	91	105	19	20	18	22	29	7	8	8	7	8
September	58	108	105	98	96	23	18	20	23	26	8	9	9	8	10
October	122	148	122	150	152	26	31	22	25	23	10	10	11	8	8
November	113	160	187	222	287	27	29	28	36	36	10	11	14	7	12
December	112	119	143	143	156	26	25	21	21	23	9	12	11	11	8
Annual Avg.	105	112	127	122	139	22	26	22	24	30	8	10	10	8	9

2. Station at R.O. (Earlier Zonal Office Building), Ludhiana

Month	PM ₁₀ (µg/m ³)					NO _x (µg/m ³)					SO ₂ (µg/m ³)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
January	187	120	78	117	195	30	27	26	23	44	12	10	11	14	8
February	120	98	98	133	116	25	29	25	22	49	10	11	10	12	7
March	82	66	93	150	118	22	27	26	20	50	9	9	10	11	8
April	93	71	144	125	121	24	26	28	25	40	10	9	12	9	7
May	129	92	137	134	96	29	27	28	23	30	12	11	10	10	8
June	163	83	168	162	165	27	26	28	28	29	11	10	10	11	8
July	116	45	130	127	55	26	21	28	22	22	10	8	8	10	7
August	111	105	93	119	84	27	23	19	20	21	11	13	7	9	7
September	147	134	101	123	89	23	26	19	23	22	10	13	8	11	7
October	123	161	131	199	140	27	27	28	24	30	12	11	10	9	9
November	132	167	166	286	131	33	27	33	46	35	12	11	13	10	11
December	242	102	137	185	129	28	25	24	42	28	13	8	11	8	13

Annual	137	104	123	155	120	27	26	26	27	30	11	10	10	10	8
Avg.															

3. Station Name at Nahar Spinning Mills (Earlier Rita Sewing Machine), Ludhiana

Month	PM ₁₀ (µg/m ³)					NO _x (µg/m ³)					SO ₂ (µg/m ³)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
January	227	208	203	131	162	31	30	28	23	48	14	13	16	10	10
February	196	212	168	120	158	30	31	28	22	47	13	13	20	9	7
March	161	231	170	102	180	29	31	27	21	53	13	13	16	7	9
April	158	167	170	127	241	31	30	29	23	45	14	13	19	9	7
May	215	205	181	122	188	32	32	28	23	34	14	12	15	9	8
June	186	138	158	131	252	31	29	25	24	32	14	13	9	11	10
July	169	142	124	131	126	29	24	24	23	16	13	10	8	9	6

August	132	102	108	119	73	30	27	22	22	11	13	11	8	7	5
September	100	126	114	158	96	28	23	19	23	17	11	13	8	11	9
October	159	228	180	209	177	27	30	22	25	33	12	20	9	10	11
November	224	167	204	326	209	31	33	25	48	25	13	23	12	13	13
December	183	197	141	251	183	35	32	24	43	31	13	20	11	10	13
Annual	176	177	160	161	170	30	29	25	27	33	13	15	13	10	9
Avg.															

4. Station at Vishvakarma Chowk, Ludhiana

Month	PM ₁₀ (µg/m ³)					NO _x (µg/m ³)					SO ₂ (µg/m ³)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
January	220	173	226	158	212	29	28	30	27	33	11	10	12	9	7
February	248	176	157	183	201	21	29	30	26	39	10	10	10	8	9
March	197	128	107	189	254	26	27	28	28	44	9	10	9	9	11

April	186	142	126	211	292	26	28	27	31	38	11	9	8	10	10
May	230	236	116	220	267	28	32	29	33	39	11	10	9	10	11
June	186	165	157	177	166	29	33	30	30	37	12	11	9	10	11
July	185	111	91	160	126	24	22	28	28	31	7	7	8	9	10
August	167	154	75	141	169	25	23	26	23	30	9	10	8	7	11
September	124	208	109	230	146	25	30	26	27	23	9	12	9	8	10
October	216	197	186	306	237	30	30	32	31	31	11	11	12	10	12
November	161	169	211	322	294	30	29	33	42	35	11	10	13	8	14
December	176	264	197	232	194	26	28	26	42	25	10	10	9	8	10
Annual Avg.	191	177	147	211	213	27	28	29	31	34	10	10	10	9	11

Annexure B – AQI data from 2017 to 2018 depicting the air quality in Ludhiana

Month	AQI	Category	Month	AQI	Category
Jan-17	104	Moderate	Jan-18	162	Moderate
Feb-17	99	Satisfactory	Feb-18	94	Satisfactory
Mar-17	162	Moderate	Mar-18	96	Satisfactory
Apr-17	81	Satisfactory	Apr-18	130	Moderate
May-17	99	Satisfactory	May-18	185	Moderate
Jun-17	131	Moderate	Jun-18	153	Moderate
Jul-17	102	Moderate	Jul-18	74	Satisfactory
Aug-17	119	Moderate	Aug-18	58	Satisfactory
Sep-17	113	Moderate	Sep-18	59	Satisfactory
Oct-17	281	Poor	Oct-18	121	Moderate
Nov-17	277	Poor	Nov-18	118	Moderate
Dec-17	190	Moderate	Dec-18	121	Moderate
2017 annual Avg.	146.5	Moderate	2018 Annual avg.	114	Moderate

Annexure C – Action Plan for Control on Vehicular Emissions

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	CVE 1 - Public awareness campaign for control of vehicular emissions.	Department of Transport	Under Sadak Surakhya Abhiyan, activity is regularly being carried out. 17 camps held in year 2018-19.	The public has to be motivated to play their role in curbing the air pollution. 24 camps will be organized in this year.	One year	<ol style="list-style-type: none"> 1. Public awareness campaign in print and electronic media-Twice a month 2. Use of Social Media Facebook, twitter, Instagram-Regular 3. Jingles on air pollution on local radio and TV-Local FM Radio will be hired 4. Awareness drives in educational institutions-Monthly 5. Public meetings-Monthly 6. Nukarnataks-Quarterly
		Traffic Police.	Awareness camps were held jointly with Department of Transport. 02 Camps were held in last quarter of 2018-19 by Traffic Police.	03 Camps shall be organized in each quarter.	One year	Monthly awareness programme as above.
2	CVE 2 - Remote sensor based PUC system	Department of Transport	Currently manual system exists	All PUC Centres to be online	One year	<ol style="list-style-type: none"> 1. Policy Decision that online system is to be installed. 2. Tendering to select the agency 3. Transition to the online system 4. Commissioning of the online system

3	CVE 3 - Extensive drive against polluting vehicles	Department of Transport	Pollution Checking of 6798 vehicles (6 months)	Pollution checking of 9000 vehicles	30.09.2019	Monthly -1000 vehicles
		Traffic Police.	18-20 challans/day	25-30 challans/day	Six months	Monthly -700-800 Challans
4	CVE 4 - Prevent parking of vehicles in non-designated areas	Municipal Corporation	12 nos. of designated parkings exists in Ludhiana City. Multi level parking provided near Mata Rani Chowk, Municipal Office, Zone-A.	MC Ludhiana envisaged for construction of 3 nos. of multi-storey car parkings near: 1. Feroze Gandhi Market 2. Books Market 3. Ghumar Mandi- March under Smart City Mission	30.06.2021 30.06.2021 30.03.2022	1. For Feroze Gandhi Market & Books Market: DPR—6 month Tendering – 3 month Work allotment—1 month Completion— By June 2021 2. For Ghumar Mandi : DPR—6 month Tendering – 3 month Work allotment—1 month Completion— By March 2022
		Traffic Police.	85-90 challans/day	100-110 challans/day	One year	Quarterly-7500-7800
5	CVE 5 - Check fuel adulteration	Department of Food and Civil Supplies	16 nos. Of samples collected	54 nos. Of samples will be collected	One year	Monthly 05 samples will be collected
6	CVE 6 - Widening of road and infrastructure for decongestion of road	Municipal Corporation	About 70 Kms of main roads already widened under MC Limit	About 04 Kms of Sua road i.e. from Canal to Passi Chowk is to be widened.	Six months	DPR—Completed Tendering -- Completed Work allotment—Completed Completion—06 month
		GLADA	Roads allotted by GLADA from time to time to PWD/other agencies for various projects.	About 05 Kms of metalled roads will be widened in various Urban Estates under GLADA	Eight months	DPR—Completed Tendering – One month Work allotment – One month Completion—06 months

		NHAI	<p>Widening of 35 Kms of road length (Ferozepur Road, Chandigarh Road)</p> <p>The stretch from Samrala Chowk to Municipal limit on Ferozepur road is under NHAI PIU Ludhiana.</p> <p>It has many congestion points including at Cheema Chowk, Bus Stand location & Bharat Nagar Chowk, Aarti chowk etc.</p>	<p>About 35 Kms of road length (Ferozepur Road, Chandigarh Road) is being widened by NHAI for decongestion of roads</p> <p>It is targeted to construct flyover between Cheema Chowk and Bus Stand location</p> <p>To construct elevated corridor between Bharat Nagar Chowk to Aarti Chowk</p>	<p>March 2022</p> <p>April 2020</p>	<p>DPR-Complete, Tendering-Complete Work Allotment-Complete Completion by March 2022</p> <p>DPR-Complete Tendering-Complete Work Allotment-Complete Completion by April 2020.</p>
7	CVE 7 - Introduce intelligent traffic systems	Municipal Corporation	MC Ludhiana has already installed 42 nos. of traffic signals at different intersections in the City.	<p>14 nos. (6+8) of chowks and junctions in the city are to be realigned and redesigned under smart city mission.</p> <p>1. 6 nos. of chowks 2. 8 nos. of chowks</p>	<p>June 2020 Dec.2020</p>	<p>6 nos. of chowks DPR—Completed Tendering—6 months Work allotment—1 month Completion— Upto 30.06.2020</p> <p>8nos. of Chowks DPR—Completed Tendering—6 months Work allotment—1 month Completion— upto Dec 2020</p>
8	CVE 8 - Install weigh in motion bridges at the borders of cities	NHAI, MC and PWD (B&R)	At present no weigh bridge has been installed by MC Ludhiana at entry points of the city.	Weigh bridge can be installed at the entry points on Jalandhar road, Chandigarh road, Ferozepur Road and Gill Road	One year	Explore the possibility and finances to install the weigh bridges

9	CVE 9 - Construction of expressways/ bypasses to avoid congestion	Municipal Corporation	Southern by-pass (Doraha, NH44- Ferozepur Road, Ludhiana NH95) has already be constructed by PWD B & R to avoid congestion.	<p>The work of Laddowal bypass from Ferozepur Road (NH-95) to Laddowal connecting NH-44 is in progress..</p> <p>The MC is going to construct flyover at Pakhowal Road railway crossing with an estimate cost of Rs. 74.30 crore. The length of Railway Under Bridge portion is 600 meters and the length of Railway Over Bridge is 800 meters.</p>	<p>March 2022</p> <p>June 2021</p>	<p>DPR-Complete, Tendering-Complete , Work Allotment-Complete, Completion by March 2022</p> <p>DPR-1 month , Tendering-6 months, Work Allotment-1 month, completion-June 2021</p>
		GLADA	Roads allotted by GLADA from time to time to PWD/other agencies for various projects.	GLADA is constructing 200' wide road of length 1635 meters from Malerkotla Road to Dugri Road.	31.12.2019 (Tentative)	<p>1.Work allotted</p> <p>2.Completion by 31.12.2019.</p>
		NHAI	On the stretch from NH-95 within city limit, the city local traffic and through traffic from Doraha side and Ferozepur side merges at all crossing points through the stretch and creates traffic congestion.	Laddowal bypass is under construction which would divert the NH-1 bound traffic coming from Ferozepur side & Doraha. Elevated corridor is also under construction	<p>December 2019</p> <p>April 2020</p>	To achieve the respective targets as scheduled.
10	CVE 10 – Phasing out of vehicles more than 15 years old	Department of Transport.	No policy for phasing out of vehicles more than 15 years old.	Phasing of vehicles more than 15 years old.	One year.	<p>1. Creating policy</p> <p>2. Strict implementation of the phasing out policy</p>

11	CVE 11 – Promotion of Battery operated vehicles (E-rickshaws)	Department of Transport.	357 based on LPG and 22 based on battery registered last year	To introduce more electric passenger vehicles	One year	<ol style="list-style-type: none"> 1. Creating policy for battery operated vehicles. 2. Awareness among public regarding benefits of battery operated vehicles. 3. To ensure availability of electric passenger vehicles on subsidized rates. 4. Providing public charging points for battery operated vehicles. 5. To waive of taxes on eco friendly vehicles and provisions of loans.
12	CVE 12 – Retrofitting of particulate filters in diesel vehicles for BS-VI fuels	Department of Transport.	Presently, India is implementing BS-IV standards for diesel vehicles	To implement latest BS standards for all the vehicles	One year	<ol style="list-style-type: none"> 1. Awareness among public regarding latest BS standards and requesting public not to buy vehicles which are not complying with the BS standards. 2. To stop passing of vehicles which are not meeting with the BS standards.

Annexure D – Action Plan for Control on Road Dust

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	CRD 1 – Maintain potholes free roads for free-flow of traffic	Municipal Corporation	MC Ludhiana is maintaining about 2680 Kms of Blacktop roads and 1010 Kms of concrete roads. Out of 2680 Kms about 1100 Kms road length is pothole free, the patch work of about 70 % roads i.e. about 1200 Kms has already been completed by MC Ludhiana.	The patch work on balance 30 % of roads i.e. about 400 Kms will be completed after winter season. It is a continuous process.	Nov 2019	1. 20% work upto 30.06. 2019 2. Balance 10% work upto Nov 2019. The patch work is an ongoing process & is done as per the estimate & finances available.
		PWD/GLADA	Roads allotted by GLADA from time to time to PWD/other agencies for various projects.	About 05 Kms of patch work will be carried out.	Four months	1. DPR—Completed 2. Tendering -- Completed 3. Work allotment – Two months 4. Completion- two months
		NHAI	Potholes on road surface are developed due to stagnant water, rain and due to ravelling and abrasion with passing of time.	Potholes are repaired regularly when and where required.	As and when required.	Monthly inspection of the roads.
2	CRD 2 – Water sprinkling	Municipal Corporation	Two nos. of sprinklers are being used for sprinkling of roads.	Two more sprinklers will be deputed for sprinkling of roads to make them dust free. Regular sprinkling of water to suppress dust emissions.	June 2019	1. Hiring of one sprinkler by March 2019 2. Hiring of Second sprinkler by June 2019

3	CRD 3 – Mechanical sweeping	Municipal Corporation	Manual sweeping is being done.	To procure mechanical sweepers for cleaning of roads within M.C. limits.	9 months	<ol style="list-style-type: none"> 1. House approval – Completed 2. DPR- 03 months 3. Tendering- 1.5 months 4. Purchasing- 03 months 5. Commissioning-01 months
4	CRD 4 - Creation of green buffers along the traffic corridors	Municipal Corporation	32 Kms of green belts has already been developed along old GT Road from Sherpur Chowk to Vishavkarma Chowk, Lodhi Club Road, Ishmeet Road, Dugri Road, Ferozepur Road, Metro Road and GLADA Road etc.	<p>Green belts along: Lodhi Club Road- 800 meters</p> <p>Ambedkar Chowk- 500 meters</p> <p>Ishmeet road - 02 Kms are to be developed under Smart city scheme.</p>	<p>Dec 2019.</p> <p>March 2020</p> <p>Dec 2020</p>	<p>DPR-Complete, Tendering-Complete , Work Allotment-1 month, Completion –By Dec 2019.</p> <p>DPR-2 months, Tendering-6 months, Work Allotment-1 month, Completion-By March 2020.</p> <p>DPR-2months, Tendering- 6 months, Work Allotment-1 month, Completion- By Dec 2020.</p>
		GLADA	19,000 plants planted in Urban Estate, Sector 32-A, 39-A, 39, 40, 33, Phase-I, Phase-II, Phase-III Dugri.	Plantation shall be done before on set of Monsoon.	Regular Activity	<ul style="list-style-type: none"> • Identification – 01 months • Plantation-July-August • Maintenance –Continues
		NHAI	Stretch from Samrala Chowk to Municipal limit, there are some patches with presence of trees along the road. The stretch passes through densely populated city limits and there is no continuous green buffer.	<p>In view of green buffer,</p> <ul style="list-style-type: none"> - Shifting of Service road is proposed to save trees. - Transplantation of trees at the edge of ROW has been proposed. - Median plantation is also planned. 	April 2020	Completion by April, 2020

5	CRD 5 - Water fountains at major traffic intersections	Municipal Corporation	Installed fountains at fountain chowk on mall road near Guru Nanak Dev Stadium, Vishavkarma Chowk and Sherpur Chowk intersections.	No immediate proposal to install any fountain.	-	Will explore the possibility
6	CRD 6 - Greening of open areas community places, schools and housing societies	Municipal Corporation	Rakh Bagh, Rose Garden, Leisure Valley, Basant Park, Mini Rose Garden, Kidwai Nagar near Old Jail are being maintained by MC Ludhiana. Besides this 665 nos. (100 +565) of parks in Ludhiana city are being maintained by MC Ludhiana and Park Management Committees respectively.	Sarabha Nagar Green belts along Sidhwan Canal (1500 Sq. Meters) to be developed under Smart City Mission Satguru Ram Singh Park (700 Sq. Meters) to be developed under Amrut Scheme	30.06.2019 March 2020	DPR-2months, Tendering- 6 months, Work Allotment-1 month, Completion-Dec 2020. 1. DPR-Completed, Tendering-Completed, Work Allotment-1 month, Completion-Dec 2019
		GLADA	Currently Appx. 40806 plants are being looked after by GLADA in various Urban Estates under GLADA.	Plantation shall be done before on set of Monsoon.	Regular Activity	Identification – 01 month Plantation- July-August Maintenance
		DFO	Vacant land available for plantation.	1) 5000 plants will be planted on Kasabad Forest under NPV scheme.	01.04.2019 to 31.03.2020	1. Ist Quarter 2019: Earth work will be done 2. IInd Quarter: Plantation will be done 3. IIIrd and IVth Quarter: Maintenance of plantation will be done
				2) 5000 plants will be planted on Tajpur Road, Central Jail to KhasiKalan under NPV scheme.		
				3) 10,000 plants will be planted on PF Laddowal under NPV Scheme.		
				4) 2000 Plants will be planted on RF		

				Ludhiana Compartment No. 7 & 8 under NPV Scheme.		
				5) 2000 plants will be planted along BudhaNala from Central Jail to KhasiKalan under MGNREGA		
7	CRD 7 - Blacktopping of metalled road including pavement of road shoulders	Municipal Corporation	MC Ludhiana is maintaining about 2680 Kms of Blacktop roads and 1010 Kms of concrete roads (Main and internal Roads). MC has provided interlocking tiles in 130 Kms length along road shoulder.	Additional 40 Kms of internal roads are to be constructed as blacktop in the coming year.	March 2020	1 ST 20KM upto 30.06.2019 2 nd 20KM upto March 2020, Ongoing process work is done as per the estimates & finances available from time to time.
		GLADA	Continuous process blacktopping being done on roads in GLADA Estates	Internal Metalled roads (15-21 Kms) are being converted into concrete roads and berms are to be paved by interlocking tiles. Blacktopping of External roads is to be done shortly.	30.09.2019	1. DPR- Completed 2. Tender- Completed 3. Allotment- 01 month 4 Completion -03 months
		NHAI	In the project, there are few patches with unpaved shoulders.	As per the scope of the project, drain to drain blacktopping would be provided.	April 2020	April, 2020

8	CRD 8- Road design improvement	Municipal Corporation	40 Kms of roads has been constructed as concrete roads after proper road designing.	<p>Malhar Road (1.1 Kms),</p> <p>Rotary Club Road (600 meters) &</p> <p>Ghumar Mandi road (1.0 Km) are being redesigned under Smart City Mission.</p>	<p>Malhar Road upto Dec 2019</p> <p>Rotary Club Road upto Dec 2020</p> <p>Ghumar Mandi Road upto March 2021</p>	<p>DPR- Completed Tender- Completed Allotment-completed Completion -Dec 2019.</p> <p>DPR- Completed Tender- 2 months Work Allotment-1 month Completion -Dec 2020.</p> <p>DPR- 6 months Tender- 2 months Work Allotment-1 month Completion -March 2021</p>
		NHAI	At present, the stretch from Samrala Chowk to Municipal limits has many congestion points including at Cheema Chowk, Bus Stand location, Bharat Nagar Chowk, Aarti chowk etc.	<p>Flyover at Cheema Chowk</p> <p>Bus Stand location within the space available</p> <p>Construction of elevated road from Bharat Nagar Chowk to Municipal limits to decongest the city traffic.</p>	<p>April -2019</p> <p>Sep - 2019</p> <p>April -2020</p>	<p>DPR, Tendering ,Work Allotment - Completed</p> <p>DPR, Tendering ,Work Allotment - Completed</p> <p>DPR, Tendering ,Work Allotment - Completed</p>

Annexure E – Action Plan for Control on Burning of Garbage and Biomass

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	CBGB 1 – Control on open burning of bio-mass in City	Municipal Corporation	MC has prepared 40 nos. kacha pits in different parks for collection of horticulture waste to avoid of the burning of bio-mass in city.	21 nos. of Pucca compost pits with project cost of about Rs. 37 Lacs are to be constructed in parks and green belts of Ludhiana city for proper collection of horticulture waste and its disposal.	6 nos. of pucca pits upto Dec 2019 & 15 nos. of Pucca pits upto April 2020	<p>6 nos. of pucca pits : DPR- Completed Tender-6 months Work Allotment-1 month Completion -Dec 2019.</p> <p>8 nos. of Pucca pits : DPR- Completed Tender- 8 months Work Allotment-1 month Completion -April 2020. Major sub activities</p> <ol style="list-style-type: none"> 1. Identification of sites prone to open burning of biomass- 03 months 2. To create awareness among the general public- Once in month
2	CBGB 2 – Control on burning of municipal solid wastes	Municipal Corporation	A static Compactor has already been installed near dugri road where garbage is lifted quickly after compaction which reduces the probability of setting fire to solid waste. Regular challaning is	21 nos. of compactors are to be installed in Ludhiana city under Smart City Mission	March 2020	<ol style="list-style-type: none"> 1. 10 Nos. Compactor upto Dec 2019. 2. 11 Nos. Compactor upto june 2020

			also done to stop burning of solid waste.	for which DPR has already been prepared.		
3	CBGB 3 – Control on burning of agriculture waste and crop residue	Department Of Agriculture	<p>-Around 85% of the total Crop Area is subjected to crop residue burning.</p> <p>-Total 180 awareness camps have been organized dedicated to In-Situ Management of Crop Residue till 31.01.2019 and more of the camps will be held in coming months also.</p> <p>-Total no. of 2623 machines for Crop Residue Management comprising subsidy amount of Rs. 23.68 crores have been supplied to farmers, group of farmers and co-societies</p>	0% burning of crop residue.	31.03.2020.	<ol style="list-style-type: none"> 1. Identification of sites 2. To create awareness among farmers regarding health effects of residue burning 3. Deptt. of Agriculture to provide subsidy for equipment/ machinery as per Govt. policy 4. PSPCL shall ensure electricity for in-situ management <p>Progress review in District Level Air Quality Monitoring Committee meeting</p>
		PPCB/District Administration.	<p>-PRSC, Ludhiana employed by PPCB to supply information regarding incidents of fire to the teams, district administration to enforce the orders of no burning of crop residue by NGT.</p> <p>-Regular monitoring under supervision of DC</p>	<p>• Constitution of teams.</p> <p>• Enforcement</p>	During wheat/rice harvesting season	<p>Teams will be constituted one month prior to start of each harvesting season.</p> <p>Enforcement- During the season</p>

4	CBGB 4- Proper collection of horticulture waste (bio-mass) and its disposal following composting-cum-gardening approach	Municipal Corporation	M.C Ludhiana has prepared 70 No of honeycomb structures for collection of horticulture waste which will be used as manure for green belts.	21 nos. of Pucca compost pits are to be constructed in parks and green belts of Ludhiana city for proper collection of horticulture waste and its disposal.	March 2020	1. 10 nos. pits upto 30.06.2019 2. 11 nos. pits upto March 2020
5	CBGB 5- Public Awareness campaign against open burning of bio-mass, crop residue, garbage, leaves, etc	Municipal Corporation	Public is being made aware by various IEC activities like radio jingles, hoardings, PVR and flexes etc. to avoid open burning of biomass, crop residue, garbage, leaves etc. to reduce air pollution.	Public will be made aware constantly by various IEC activities like radio jingles, hoardings, PVR and flexes etc. to avoid open burning of biomass, crop residue, garbage, leaves etc.	March 2020	It is a continuous process- Once in one month

Annexure F – Action Plan for Control on Industrial Emissions

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1.	CIE 1 – Conversion to side hood suction in induction furnaces	PPCB	74 nos. of units (64 within M.C. and 10 outside M.C. within 05 Kms). Nil units have adopted side hood suction facility.	100 %	31.07.2019	<ul style="list-style-type: none"> Monthly review meetings. Steps:- <ol style="list-style-type: none"> 1) Taking design 2) Implementation
		PSCST	Out of 74 induction furnaces operating in Ludhiana, 35 have already initiated the process to upgrade their APCD in consultation with PSCST. PPCB, in July 2018 has directed all the induction furnace units using magnet for charging to get their APCDs upgraded.	39 units yet to convert	Regular Activity	PSCST would provide consultancy to industry as and when approached by it.
2.	CIE 2 – Conversion to cleaner fuels from pet coke/coal.	PPCB/Jai Madhok Energy Pvt Ltd.	66 no. of total no. of industry is using pet coke as fuel.	All industries to shift from pet coke to cleaner fuel.	6 months after approval from NHA	The company is awaiting approval from NHA for laying of pipeline to supply PNG. First phase of laying shall be completed within Six Months after obtaining approval, upto Jeevan Nagar Chowk.

3.	CIE 3 – Development of cleaner technologies to control fugitive emissions	PSCST	PSCST has developed cleaner technologies for brick kilns, induction furnaces, cupola furnaces, rice shellers and re-rolling mills. These technologies needs to be implemented/ replicated in these sectors in a time bound manner.	The targets for implementation of these technologies are required to be finalized by PPCB in-consultation with respective industrial associations. (Adequacy of APCD of these sectors)	Regular Activity	PSCST can provide consultancy for cleaner technology to industry as and when approached by it.
4.	CIE 4 – Conversion of natural draft brick kilns to induced draft	PPCB	One unit out of 08 (within 05 kms of M.C. limits) have adopted induced draft technology.	7 units yet to be converted	31.07.2019	Action has been initiated.
5	CIE 4 – Action against non-complying industrial units	PPCB	Action is being initiated immediately against the violating industries.	100% compliance of Environmental laws	Regular Activity	Regular inspections by PPCB
5.	CIE 6 – Shifting of industries from non-designated areas to industrial areas	PSIEC/ Department of Industries and Commerce/MC	Already add in newspaper regarding shifting of non-designated industries had been given but no industries come forward for	-All the plots in 15 acre pocket have to be occupied by non designated	E-auction will be started in the first week of	As per the provisions of by-laws of notified Master Plan

			allotment.	industries. -Out of 22 industrial plots, allotment process of 21 non designated industries may be completed in March 2019	Feb 2019.	
6.	CIE 7 –. Training for effective operation of Air Pollution Control Devices	PSCST.	Most of the industries have installed APCDs in the form of cyclones/ bag filters/ scrubbers. The industries are required to provide dedicated operators to operate and maintain these APCDs and the training of these operators are required on basis for their effective operation to achieve the prescribed emission norms.	The Council can provide training to operators for sectors such as brick kilns, cupola furnaces, induction furnaces, rice shellers and rolling mills.	Regular Activity	15PSCST can conduct training programs for brick kilns, cupola furnaces, induction furnaces, rice shellers and rolling mills on quarterly basis. However, the participation from industries needs to be mobilized by PPCB.

Annexure G – Action Plan for Control on Mining

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	COM 1 – Efforts for good mining practises	Department of Mining	Trollies carrying the sand are properly covered.	Proper implementation of mining rules whenever the mining site is active.	Regular	Monthly inspection of sites will be carried out whenever any mining site shall be active.
2.	COM2- Green Belt for activity zone and the buffer zone for each mining area	Department of Mining	Currently no mining site is active.	Green belt will be provided for each mining site whenever site is active	Regular	Monthly inspection of sites will be carried out whenever any mining site shall be active

Annexure H – Action Plan for Control on Construction and Demolition Activities

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	CCDA 1 – Enforcement of Construction & Demolition Rules.	Municipal Corporation	MC Ludhiana has notified 6 nos of secondary points for collection of C & D waste under MC limits vide house reso NO. 37 dated 04.09.2018. It has also been approved to fine the defaulters under NGT guidelines.	MC Ludhiana is going to install a C&D plant under Smart City Mission for which DPR has already been prepared. Installation of CCTV cameras at major construction sites	March 2021	Setting up of processing/ recycling plant for C&D Rules, 2016.
		GLADA	GLADA Estate	Implementation of C & D Rules.	Regular Activity	Monthly inspection
2	CCDA 2 – Ensure carriage of construction material in closed/covered vessels.	Municipal Corporation	MC Ludhiana has already directed to all the contractors working in MC Ludhiana to carry the building materials and malba enclosed/covered vessels.	MC Ludhiana will continue to direct the contractors working in MC Ludhiana to carry the building materials and malba enclosed/covered vessels.	Continuous process	Regular inspections
		GLADA	GLADA Estate	Implementation of C & D Rules.	Regular Activity	Monthly inspection

Annexure I – Action Plan for Control on Other Sources

Sno.	Activity	Responsible Agencies	Base Line	Target to be achieved	Target Date	Milestones (Monthly / Quarterly)
1	COS 1 – Dissemination of Air Quality Index	PPCB	One no. CAAQMS installed	Three more CAAQMS to be installed	One year	<ol style="list-style-type: none"> 1. Expected Allotment of Station by CPCB on 50:50 sharing basis- 31.03.2019. 2. Finalization of specifications by CPCB 31.05.2019. 3. Tendering- 31.07.2019 4. Identification of site and its approval from CPCB (Simultaneously with tendering- 31.07.2019). 5. Procurement& installation of CAAQMS- 31.01.2020 Calibration, Commissioning & data procurement – 31.03.2020.
2	COS 2 – Establish an Air Quality Management Division at SPCB HQ	PPCB	No such division exists	One required	One year	<ol style="list-style-type: none"> a. Develop methodology-Three months b. Providing infrastructure-Six months c. Implementation-Three months
3	COS 3 – Setup helpline in each city/town as well as SPCB HQ Policy	PPCB	No such helpline exists	Providing helpline	One year	<ol style="list-style-type: none"> 1. Develop methodology-Three months 2. Providing infrastructure-Six months 3. Implementation-Three months
4.	COS 4- Provisions of electricity based crematorium	Municipal Corporation	One Electricity based crematorium at	No immediate proposal for	NA	NA

			DaresiShamshanGhat.	establishment of another electricity based crematorium		
5	COS 5 - Coverage of LPG/PNG for domestic and commercial cooking	MC/Food and Supply Department/	-No such system exists -The company is awaiting approval from NHA for laying of pipeline to supply PNG. First phase shall be completed in Six Months from the date of installation of pipe line.	100% use of LPG / PNG	One year	<ol style="list-style-type: none"> 1. Identification-Two months 2. Awareness-Two months 3. Providing infrastructure-Six months 4. Implementation-Two months
6	COS 6 - Monitoring of DG sets and action against violations	Municipal Corporation & Punjab Pollution Control Board	Manual monitoring exists	No non-complying DG set to be operated	One year	<ol style="list-style-type: none"> 1. Identification – Four months 2. Implementation- Two months
