

**Action Plan  
for  
Abatement of Pollution  
in  
Critically Polluted Area of  
Ludhiana City**



**PUNJAB POLLUTION CONTROL BOARD,**

Vatavaran Bhawan, Nabha Road, Patiala

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## **Foreword**

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The industrial cluster of Ludhiana has 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 has resulted in imposition of a temporary restriction of 8 months for establishment of the new industrial units, which are covered in Schedule-I appended to the EIA notification dated 14/9/2006. Punjab Pollution Control Board has taken this as a challenge and also as an opportunity, in order to achieve significant improvement in environmental quality and pave the road for sustainable development in the area.

A comprehensive remedial environmental action plan has been prepared in consultation with all the stakeholders, including Industrial Associations. The Public Private Partnership (PPP) model is proposed to be effectively used for the success of the environmental action plan. The multi-disciplinary action plan is based on Prevention, Promotion and Mitigation (PPM) principles emphasizing on a time bound implementation of effective measures. The key role of monitoring the action plan itself is proposed to be bestowed on a high level steering committee, which will ensure collaborative efforts among various implementing agencies and industries.

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## Executive Summary

This report presents the details of proposed action plan for the abatement of pollution in the industrial clusters of Ludhiana. The action plan has been evolved based on the studies of present environmental conditions, key hotspots, industrial activities, condition of pollution control measures for treatment and disposal of solid waste, effluents and air emissions. Special emphasis has been given to identify the polluting technologies and propose techno-economically feasible improvements in time bound manner.

The multi-disciplinary action plan is based on Prevention, Promotion and Mitigation (PPM) principles and emphasizes on a time bound implementation of the following measures:

1. Installation and Commissioning of 2 CETPs for dyeing clusters.
2. Shifting of industries from the non-designated areas.
3. Improvement in the sewerage system, wastewater treatment plants, water supply, road infrastructure, green cover within the industrial areas alongwith development of buffer separating the residential areas from the industrial areas.
4. Development of engineered municipal solid waste disposal site
5. Remediation plan for the dump sites
6. Installation/ up-gradation of effluent treatment plants and air pollution control devices installed by the industries
7. Ensuring proper management and handling of hazardous waste.
8. Improvement in public transport system and phasing out of old polluting commercial transport vehicles
9. Construction of bye-pass along Sidhwan Canal
10. Promotion of bio-methanization and compost facilities for the agricultural residues and awareness regarding ill effects of stubble burning
11. Evolving of cleaner technologies and installation of pilot plants for improved effluent/ emissions treatment technologies.
12. Awareness creation

The action plan identifies and emphasizes for effective check on the pollution load due to industrial activities especially dyeing, electroplating and induction furnaces. In spite of the pollution prevention and control at the individual industries, there is an urgent need to provide the common facilities for treatment of industrial effluent from dyeing units along with the separate collection and conveyance system.

The action plan delineates the roles and responsibilities of various agencies for its effective implementation including, Departments of Industries & Commerce, Department of Local Bodies, Punjab Pollution Control Board, Department of Transport, Department of Police, Department of Forests, PWD (B & R), District Administration, Ludhiana, Department of Agriculture, Punjab State Council for Science & Technology and Central Ground Water Authority. It is envisaged that a high level project steering committee, will ensure collaborative efforts among various implementing agencies and industries.

The effective implementation of the proposed action plan is expected to improve the quality of environment and help in sustainable development in the area.

# Action Plan for abatement of Pollution in Critically Polluted Area of Ludhiana City

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# **CHAPTER-1**

## **PRESENT ENVIRONMENTAL STATUS OF LUDHIANA CITY**

### **1.0 INTRODUCTION**

After analyzing the Environmental Status of Industrial Cluster of the country, Central Pollution Control Board in consultation with the Ministry of Environment & Forests as identified 88 critically polluted industrial clusters, of which Ludhiana is one of such critically polluted cluster in the State of Punjab, besides Mandi Gobindgarh. The Ministry of Environment & Forests vide office memorandum J-11013/5/2010-IA.II(I) dated 13/1/2010 has imposed a temporary restriction of 8 months for establishment of the industrial units in the said critically polluted industrial clusters, which are covered in Schedule-I appended to the EIA notification dated 14/9/2006. It has been felt to assess the environmental degradation of the identified industrial clusters and to formulate a remedial action plan for abatement of pollution and restoration of the environmental quality of these clusters. The present report has been prepared keeping in view the above motive in mind.

### **1.1 GEOGRAPHICAL FEATURES**

#### **1.1.1 Location**

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.

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. It is the largest city in Punjab, both in terms of area and population. The City is spread over an area of 159.37 sq km and accommodates approx. 14 lacs population as per 2001 census. The projected present population of Ludhiana city is about 17.5 Lacs. Being the hub of Indian small scale Industry especially hosiery & Cycle parts, it is popularly known as "Manchester of India." The Ludhiana is also an important education centre with famous Punjab Agricultural University, two Medical Colleges and an Engineering College.

### **1.1.2 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.

### **1.1.3 Climate**

The climate of the district is characterized by dryness except a brief spell of monsoon season in a very hot summer and a bracing winter. The winter season is from middle of November to the early part of March. The succeeding period up-to the end of June is the hot season. July, August and half of September constitute the south west of monsoon, the period of mid September to about the middle of November may be termed as post monsoon or transitional period. June is generally the hottest month. Hot and scorching dust laden winds blow during summer season. December & January are the coldest months. The mean daily temperature varies in the range of 5.8 °C to 41.2 °C.

### **1.1.4 Rainfall**

The rainfall in the district increases from south west towards the north east. About 70% of the rainfall is received during the period July to September. The rainfall during the December to March accounts for 16% of the rainfall. The remaining 14% rainfall is received in the other months of the year. The average annual rainfall is 681mm.



### **1.1.5 Ground Water Scenario**

As per Central Ground Water Authority data, the Ludhiana District is spread over a total area of 3767 Sq. Km. having total precipitation of 2.565 BCM. The District has been divided into 11 blocks. The ground water development stage is 161%. Most of the blocks of Ludhiana District such as Ludhiana, Samrala, Mangat, Jagraon, Sidhwan Bet, Pakhowal, Sudhar, Khanna and Machhiwara are observed to be over exploited blocks as far as ground water is concerned.

## **1.2 MAJOR WATER BODIES AROUND LUDHIANA CITY**

### **1.2.1 River Sutlej:**

Sutlej River after flowing through Himachal Pradesh territory, it debouches from the Shivalik hills near Roopnagar and enters Ludhiana District somewhere at 32 Km East of the boundary of Samrala Tehsil and it flows due west along the top of the district, for about 96 Km and turns, as it leaves Jagraon Tehsil slightly to north towards its junction with Beas at Harike during its journey along the district. It maintains east west direction. The Sutlej has experienced a westward drift during recent times. The old towns/ villages of Behlolpur, Machhiwara, Kumkalan etc. were built on its banks. After the construction of Bhakhra Dam, the flooding menace of the River Sutlej in the district has considerably reduced.

### **1.2.2 Budha Nallah:**

It runs parallel to Sutlej, on its south for fairly large section of its course in the district and ultimately joins Sutlej at Gorsian Kadar Baksh in the north western corner of the district. Ludhiana and Machhiwara are situated to the south of the Budha Nallah. The water of the stream becomes polluted after it enters Ludhiana City. With the industrialization/ urbanization of the area, Budha Nallah has become the sullage/ sewage as well as industrial effluent carrier for the Ludhiana city leading to River Sutlej. The Punjab Pollution Control Board is regularly monitoring the quality of water flowing in the Budha Nallah as well as in River Sutlej upstream and downstream of the confluence point of Budha

Nallah. As per the analysis results carried out by PPCB, the annual average concentration of BOD, DO and Total coliform varies in the range of 1.1-3.7 mg/l, 6.0-6.3 mg/l and 1050-7100 MPN/ 100 ml, respectively, at upstream of confluence point of Budha Nallah with River Sutlej. Whereas, the value of these parameters varies in the range of 13.9-40.3 mg/l, 0.6-5.3 mg/l and 55000-117500 MPN/ 100 ml at the downstream. The concentration of BOD and T-coli in the Budha Nallah before entering to River Sutlej has been found to be 110 mg/l and 1,00,000 MPN/100 ml respectively as per the study conducted by the Board in the month of June 2010.

It is clear from the above that the sewage alongwith industrial effluent being carried by Budha Nallah is impacting the water quality in river Sutlej to a large extent as decrease in DO level, increase in the BOD as well as coliform levels has been observed and the water quality of river Sutlej at downstream of confluence point of Budha Nallah is of Designated Best Use (DBU) as D-E quality. The Budha Nallah is carrying about 550 MLD of effluent to river Sutlej, out of which 200 MLD is trade effluent mainly from dyeing units and the rest is domestic effluent.

### **1.2.3 Flora & Fauna**

A variety of mammals like the Smooth Indian Otter, Hog Deer, Wild Boar, Wildcat, Squirrel, Fruit bat, Common Mongoose can be seen in the forest area of the district.

All kind of migratory and exotic birds can be seen here especially during the winters. The frequent ones are Great Crested Grebe, White Necked Stork, Adjutant Stork, Glossy Ibis, Pintail, Gadwall, Eastern Purple Heron, Brahminy, Mallard, Wigeon, Spotbill Duck, Coot, Tailor Bird, Peafowl, Ruddy Sheduck.

Reptiles and Amphibians like Turtle, Snakes, Frogs, Tortoise and Toads alongwith fishes like Abeo, Catla, Puntius, Cirrhina, Channa, Mystus, Notopterus, Cyperinus, Ambasis ranga are available here.

Plants among the flora are terrestrial & aquatic plants, such as Dalbergia, Prosopis, Albizzia, Ficus, Azolla, Hydrilla, Nelumbo, Typha, Phragmites, Zizyphus Mauritiana, Syzgium cumini, Ipomoea aquatica, Cyprus and Grasses are also found in the region. Besides, certain rare animals and birds like Indian Skimmer, Yellow-eyed Pigeon, Rufous-vented Prinia, Scaup Duck, Falcated Teal, Testudine turtle, etc. are found in the region. A systematic study is required to be conducted by some agencies like Punjab Agriculture University, Ludhiana/ Forest Department, so as to keep track on the status of flora and fauna in the area and to prepare inventory for the same.

#### **1.2.4 Eco-geological Features**

Ludhiana city is located in the catchment area of river Sutlej which flows at a distance of 11 Kms. from the city limits. There is only one Nallah known as Budha Nallah, which passes through the habitation area of Ludhiana and it mainly carries sewage/ sullage of the town besides carrying industrial effluent. However, there is no any protected forest area within the MC limits and adjoining to the MC limits.

### **1.3 SENSITIVE RECEPTORS**

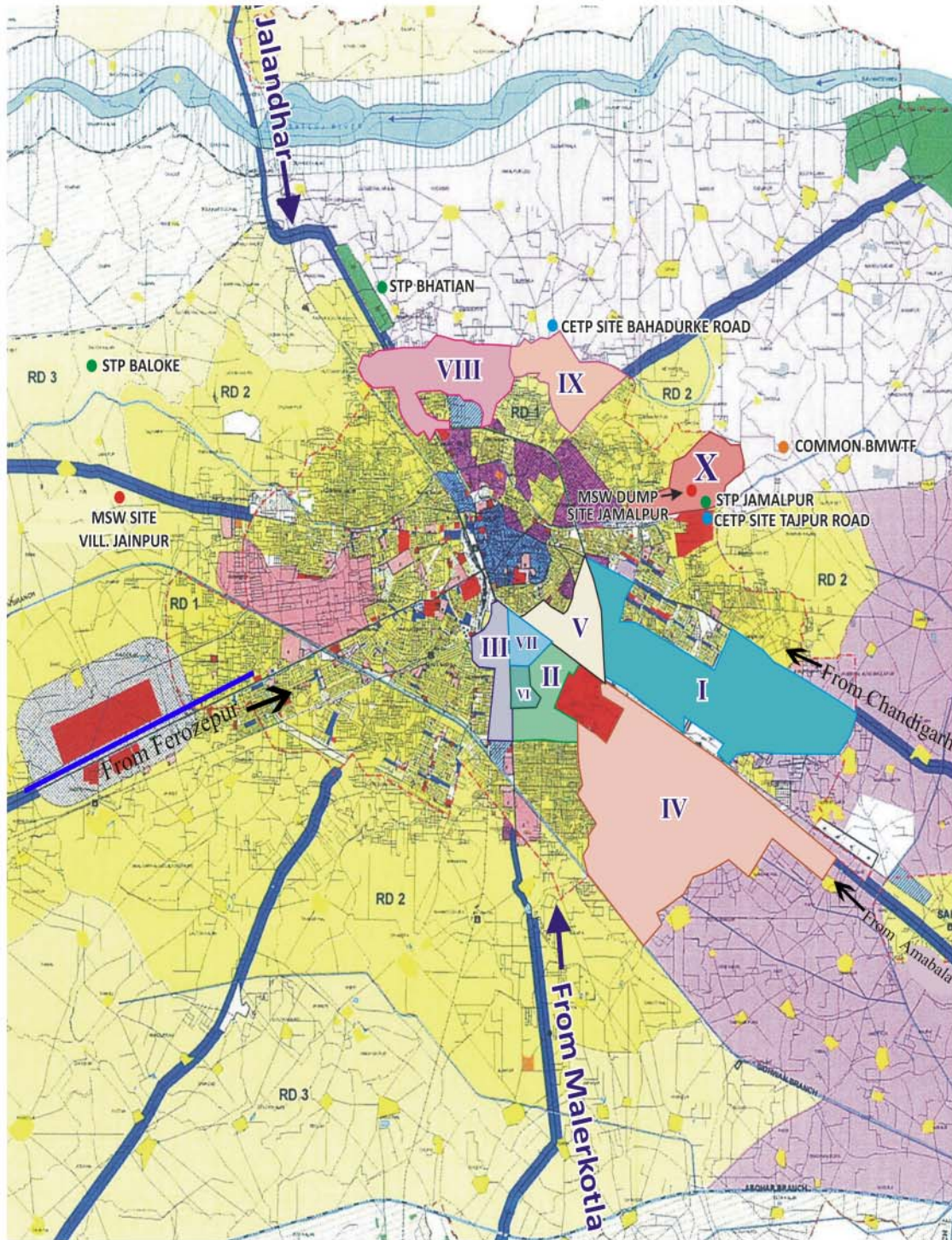
As per report of Central Pollution Control Board, the frame work of the CEPI is based on three factors i.e. pollutant, pathway and receptor. The high density of population in and around Ludhiana city has been identified, as one of the major sensitive receptors. The population of the Ludhiana city was about 14 Lacs as per 2001 Census, which has further increased significantly during the last 10 years. The people residing in the city are not only being influenced by the industrial as well as the water pollution but also, they are contributing to the generation of the domestic sewage being carried through Budha Nallah to river Sutlej. There is no eco-park/ protected monuments/ wild life sanctuary within the MC limits. Tiger Safari Zoo in Ludhiana is situated on G. T. Road (Ludhiana-Jalandhar Highway) at a distance of 6 kms from the main city. The area of this zoo is about 25 acres, which is located outside MC limits.

## 1.4 DEMARCATION OF THE INDUSTRIAL CLUSTERS

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:

<b>CLUSTER No.</b>	<b>NAME OF INDUSTRIAL CLUSTER</b>
I	Focal point along with NH-1 Total Eight Phase
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

# Map showing the clusters of critically polluted area of Ludhiana



## 1.5 IDENTIFICATION OF VARIOUS POLLUTION SOURCES

### 1.5.1 Water Pollution

*As per the report of Central Pollution Control Board, the cumulative environmental pollution index has been observed to be 66 for water pollution. The higher level of the said index has been attributed to the inadequate treatment facilities provided by the industry including irregular operation of the treatment plants. One of the major factors contributing to the high index level is non-availability of common treatment facilities for industrial effluent and inadequate common treatment facility for domestic effluent as well as discharge of untreated wastewater by the non-point sources. The higher density of population per square kilometer in Ludhiana city, which has been considered as sensitive receptor alongwith impact on the eco-system of river Sutlej, are also major factors for high index value.*

### INDUSTRIAL POLLUTION

Presently, 200 MLD of wastewater from the industries is generating within Ludhiana city, out of which 150 MLD effluent is generated by small scale dyeing units (130 MLD from 5 clusters of dyeing units and 20 MLD from scattered units), whereas, 50 MLD is generated from the large and medium dyeing units. There are 1060 water polluting industries located in the jurisdiction of Ludhiana city. The category wise detail of the industries is as under:

S.N.	Category	No. of Industries
1.	Dyeing	268*
2.	Hosiery / Washing / Printing	66
3.	Electroplating	482*
4.	Galvanizing units	9
5.	Wire Drawing / Pickling	111
6.	Engineering Goods	12
7.	Milk Plant	3

8.	Pulp & Paper	4
9.	Beverages/ Soft Drinks	2
10.	Brewery	1
11.	Used Oil Refining units	6
12.	Rubber Industries / Tyre & Tube	22
13.	Pesticide Formulation Industries	1
14.	Miscellaneous	73
<b>TOTAL</b>		<b>1060</b>

\* The number of units within municipal limits and in its immediate vicinity connected to a industrial cluster.

## **CATEGORY WISE STATUS OF POLLUTION CONTROL**

### **Dyeing Industries**

There are 268 dyeing industries in Ludhiana, of which 10 industries are in large scale and 258 are in medium and small scale sector. Out of 258 medium and small scale dyeing industries, 200 dyeing units are located in 5 clusters namely Tajpur Road (73 industries, discharge-40 MLD), Industrial Area-A (37 industries, discharge-20 MLD), Focal Point (53 industries, discharge-40 MLD), Rahon Road (19 industries, discharge-15 MLD) and Bahadurke Road (18 industries, discharge-15 MLD). The remaining 58 small and medium dyeing industries are scattered in various parts of the Ludhiana city. The textile dyeing industries are generating 150 MLD of wastewater from their process which is having organic as well as chemical pollutants. The level of B.O.D. concentration varies in the range of 500-700 mg/l.

*All the 268 dyeing units have installed effluent treatment plant to treat their wastewater, out of which 36 no. of units are required to carry out major upgradation of their existing effluent treatment plants so as to achieve the standards laid down by the Board and the remaining 10 units are required only minor upgradation in their existing treatment facilities.*

### **Hosiery / Washing / Printing**

There are 66 Hosiery / Washing / Printing units in Ludhiana, out of which 25 industries have installed effluent treatment plants. Out of the above units, few new units have been identified during the recent door to door survey of Ludhiana area. As per survey, it has been observed that there are 23 units, which are yet to install the effluent treatment plants as they are engaged in printing/ washing processes on job basis. The effluent discharged from the industry is organic in nature and the BOD concentration varies from 200-400 mg/l. Action against these units is being taken by the Board as per the provisions of the Water (Prevention & Control of Pollution) Act, 1974. Out of 25 units, 6 units are required to carryout major upgradation of their existing effluent treatment plants.

### **Electroplating Industries**

There are 482 small scale and 6 large / medium scale electroplating industries in Ludhiana. The small electroplating industries are generating trade effluent to the tune of 0.15 MLD, whereas, the large and medium industries are generating 3.85 MLD trade effluent. These industries generate effluent which contains heavy metals such as zinc, nickel, chrome, copper, iron etc. in different concentrations.

### **Galvanizing Units**

There are 9 Galvanizing units in Ludhiana, out of which 3 industries have installed their individual effluent treatment plants, whereas, the remaining 6 industries do not generate any trade effluent and hence installation of effluent treatment plant is not required. The effluent generated from the industries contains zinc and iron in various concentrations.

### **Wire Drawing / Pickling**

There are 111 Wire Drawing / Pickling units in Ludhiana, out of which 78 industries have installed their individual effluent treatment plants / joined the common treatment facility for the recovery of  $\text{FeSO}_4$  and the remaining 33



industries are not required to install effluent treatment plants. There are 2 industries out of 78 industries, which are required to carryout minor upgradation in their existing effluent treatment plants. The effluent generated from the industries is acidic in nature and also contains zinc and iron in various concentrations.

### **Engineering Goods**

There are 12 industries manufacturing Engineering Goods in Ludhiana, out of which 3 industries have installed their individual effluent treatment plant and the remaining 9 industries are not required to install any effluent treatment plant as there is no water polluting process.

### **Milk Plants**

There are 3 Milk Plants in Ludhiana and all these units have installed their individual effluent treatment plants, which are adequate to achieve the prescribed standards. The major source of effluent is from floor washing, pans and evaporators. The effluent is highly biodegradable in nature and BOD ranges from 1000-1500 mg/l.

### **Pulp and Paper**

There are 4 Pulp and Paper manufacturing industries in Ludhiana and all of them have installed their individual ETPs, which are adequate to achieve the prescribed standards. All the industries are waste paper based industries and the effluent is biodegradable in nature having BOD varying from 400-600 mg/l.

### **Beverages / Soft Drinks**

There are two Soft drink manufacturing industries in Ludhiana. Both the industries have installed ETP, to achieve the prescribed standards laid down by

the Board. The main source of effluent is from floor as well as vessel washing alongwith reject of R.O system.

### **Brewery Units**

There is only one large scale brewery in Ludhiana, which has installed its own ETP. It is a highly water polluting industry generating effluent having organic parameters. The BOD ranges from 800-1200 mg/l.

### **Used Oil Refining Units**

There are 6 waste oil refining units in Ludhiana, which are not generating any trade effluent. As such, these units are not required to install any effluent treatment plant.

### **Rubber Industries/ Tyre and Tubes**

There are 22 such units out of which 3 units have installed their individual effluent treatment plants and the refining 19 units are not required to install any effluent treatment plants as these industries are not generating any trade effluent.

### **Pesticides Formulation Industries**

There is one such unit engaged in pesticide manufacturing, however, it is not required to install effluent treatment plant as no trade effluent is generated by it.

### **Miscellaneous Units**

There are 73 miscellaneous units falling under the category of Chemical Manufacturing, Scouring, Powder Coating, Phosphating, Heat Treatment, Auto Blackening, Service Stations etc., which are water polluting in nature. All the

units have installed the necessary effluent treatment plants for treatment of their effluents.

## DOMESTIC POLLUTION

It has been estimated that about 350 MLD of sewage/ sullage is being generated within the limits of Municipal Corporation, Ludhiana, which is being discharged into Budha Nallah. The conveyance system for the domestic as well as the industrial effluent is common sewerage system provided by Municipal Corporation. The Punjab Water Supply & Sewerage Board has installed 3 no. STPs of capacity 111 MLD at Vill. Bhattian, 152 MLD at Vill. Balloke and 48 MLD at Jamalpur, to treat the sewage of Ludhiana under Sutlej Action Plan. Presently, the total treatment capacity provided for the domestic effluent is 311 MLD viz-a-viz generation of 350 MLD.

STP installed at Bhattian is under utilized as already 80 MLD of wastewater is reaching the STP due to silting of certain sewerage lines as well as non-connectivity of certain areas of the sewerage system to the said STP. D.G. sets have already been provided at all pumping stations of STPs to avoid overflow of untreated effluent during power failure. The performance evaluation of all these 3 STPs has been carried out and the analysis results are tabulated as under:

S. N.	Location of the STP	Date of sampling	Concentration of the pollutants (mg/l) except pH, T-Coli and F-Coli at the outlet									
			pH	BOD	COD	TDS	TSS	SO <sub>4</sub>	S	NH <sub>3</sub>	T-Coli	F-Coli
1.	Jamalpur	29/1/2010	7.2	68	240	1089	52	80	1.5	6.5	4.2 x 10 <sup>5</sup>	4.0 x 10 <sup>5</sup>
2.	Bhattian	19/1/2010	7.1	70	232	711	40	42	1.4	7.4	3.0 x 10 <sup>5</sup>	2.4 x 10 <sup>5</sup>
3.	Balloke	19/1/2010	7.1	40	128	533	35	35	1.6	7.2	4.0 x 10 <sup>5</sup>	3.4 x 10 <sup>5</sup>

## OTHER SOURCES

Besides above, the other sources of water pollution are two dairy complexes located at Tajpur Road & Humbran Road, hotels/ restaurants, service stations and slaughter houses etc. There are also individual dairy units along the Budha

Nallah on Tajpur Road, which are discharging their effluents to the drain without any treatment. Some of the illegal colonies in the different areas are also discharging their effluent into Budha Nallah through unauthorized outlets as they are not connected with the regular sewerage system. The slums located along the Budha Nallah are also discharging their wastewater directly/ indirectly into Budha Nallah.

### **1.5.2 AIR POLLUTION**

*The main stationary sources of air pollution are the industrial units, which are emitting particulate matter, hydrocarbon, sulphur dioxide, oxides of nitrogen, VOCs and acid mist. As per inventory prepared by the Board, there are 994 no. of air polluting industries in Ludhiana city, which are using fossil/ bio-mass as fuel, thus, emitting the aforesaid pollutants, besides, emitting process/ fugitive emissions. Besides above, non-agricultural activities are going on within the MC limits of Ludhiana city but the city is surrounded by agricultural fields, as such, the burning of rice and wheat straw by the farmers is affecting the ambient air quality of the town. Furthermore, due to erratic supply of power, most of the establishment, residential houses and industries have installed D.G set of various capacities to cater to their power needs, which are emitting uncontrolled emissions into the atmosphere within the city limits. Also, anaerobic digestion of biomass and garbage within the city limits, is emitting air pollutants like methane etc. Due to all these sources, the quality of ambient air quality of the city is deteriorating. As per report of Central Pollution Control Board, the Cumulative Environmental Pollution Index (CEPI) in respect of air has been calculated as 68 for Ludhiana Industrial Cluster, on the basis of which Ludhiana has been declared as critically polluted area. The major contribution to the said index is due to inadequate/ irregular operation of air pollution control systems provided by the industrial units. The air polluting industries located in the jurisdiction of Ludhiana city are as under:*

S.N.	Category	No. of Industries
1.	Dyeing	268*
2.	Hosiery / Washing / Printing	66
3.	Galvanizing units	9
4.	Engineering Goods	12
5.	Milk Plant	3
6.	Pulp & Paper	4
7.	Soft Drink	2
8.	Brewery	1
9.	Used Oil Refining units	6
10.	Induction Furnace / Arc Furnace	65
11.	Cupola Furnace	100
12.	Rolling Mills	23
13.	Forging units	28
14.	Lead / Battery Manufacturing units	10
15.	Rubber Industries / Tyre & Tube	22
16.	Pesticide Formulation Industries	1
17.	Miscellaneous	64
<b>Total</b>		<b>684</b>

\* The number of units within municipal limits and in its immediate vicinity connected to a industrial cluster.

## CATEGORY WISE STATUS OF POLLUTION CONTROL

### Boiler Furnaces in Dyeing Industries

There are 268 dyeing industries out of which 217 are operating within the city limit of Ludhiana. Out of these, 197 no. industries have installed air pollution control devices and remaining 20 units does not require any air pollution control device as there is no source of air pollution like boiler etc. *Only 15 industries are required to carryout major upgradation of their existing air pollution control devices and the 3 industries are required to carryout minor upgradation of their existing air pollution control devices. The major problem being faced from the*

*boiler furnaces is use of un-authorized fuels like plastic material, tyres and municipal solid waste refuse by industries. Due to burning of such un-authorized fuels, the various pollutants are released into the atmosphere which cannot be controlled with the help of existing air pollution control devices. A close vigil is being kept on all these units to ensure that all such industries should use only authorized fuel. The boilers furnaces are generating flue gas emissions, which mainly consist of particulate matter, CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub> gases etc.*

### **Hosiery/ Washing/ Printing**

There are 66 Hosiery/ Washing/ Printing units, out of which 23 units have installed air pollution control devices and remaining 43 units are not required to install air pollution control devices as these units are not emitting any air pollutants.

### **Hot Dip Galvanizing Units**

There are 9 hot dip galvanizing units, out of which 6 units are not required to install air pollution control devices and the remaining 3 units have installed air pollution control devices.

### **Engineering Goods**

There are 12 industries manufacturing Engineering Goods in Ludhiana out of which 10 units are not required to install air pollution control devices and the remaining 2 units have installed air pollution control devices.

### **Milk Plants**

There are 3 Milk Plants in Ludhiana and all these units have installed their individual air pollution control devices, which are adequate to achieve the prescribed standards.

## **Pulp and Paper**

There are 4 Pulp and Paper manufacturing industries in Ludhiana and all of them have installed air pollution control devices, which are adequate to achieve the prescribed standards.

## **Beverages/ Soft Drink**

There are 2 soft drink manufacturing industries in Ludhiana, which have installed air pollution control device, to achieve the prescribed standards laid down by the Board.

## **Brewery Units**

There is only one Brewery in Ludhiana, which has installed adequate air pollution control device to achieve the standards laid down by the Board.

## **Used Oil Refining Units**

There are 6 used oil refining units in Ludhiana, out of which 4 units have installed air pollution control devices and the remaining 2 units are not emitting any air pollutants, as such, these industries do not require any air pollution control devices.

## **Induction/ Arc furnaces**

Iron scrap is melted in electrically heated in induction / arc furnaces, which results into lot of emissions containing oxides of metals etc. There are 65 such units and all of them have installed air pollution control devices. The present emission collection system installed by the industry is not adequate to collect the entire emissions due to which a significant emissions escape into atmosphere as fugitive emissions. The metal contents especially iron present in the solid waste generated in the form of slag from these units, is recovered through physical processes such grinding, sieving etc. and reused back into the processes. The remaining solid waste, which is non-hazardous in nature, is disposed off onto low lying area as a filling material.

## **Cupola Furnaces**

There are 100 Cupola furnaces, out of which 98 industries have installed air pollution control devices and 2 industries are yet to install the proper and adequate air pollution control devices. Out of 98 industries, 2 industries are required to carry out major upgradation and 4 industries are required to carry out minor upgradation.

## **Rolling Mills**

There are 23 rolling mills within the action plan area, out of which 16 industries have installed air pollution control devices and remaining 7 industries are not required to install air pollution control devices.

## **Forging Units**

There are 28 Forging units in Ludhiana, out of which 4 industries have installed air pollution control devices and remaining 24 industries are not required to install air pollution control devices. Out of 4 industries, 3 industries are required to carryout major upgradation of the air pollution control devices.

## **Lead / Battery Manufacturing Units**

There are 10 Lead / Battery manufacturing industries and all such units have installed adequate air pollution control devices to contain the concentration of pollutants within the standards laid down by the Board.

## **Rubber Industries / Tyre & Tube**

There are 22 Rubber Industries / Tyre & Tube manufacturing units out of which 20 industries have installed air pollution control devices and remaining 2 industries are not required to install air pollution control devices. Out of 20 industries, 3 industries are required to carryout minor upgradation. Such type of industries are generating mainly fugitive emissions, which needs to be tackled on priority to improve the environment around such industries.



## **Pesticide Formulation Industries**

There is only 1 pesticide formulation industry in Ludhiana, which is not required to install any air pollution control device.

## **Miscellaneous Units**

There are 64 air polluting industries under the miscellaneous category, which are required to install air pollution control devices. The various industrial categories falling under this head are Scouring, Spinning Mill, Chemical Manufacturing / Formulation, Heat Treatment, Powder Coating, Shot Blasting, Painting etc. All such industries have already installed the individual air pollution control devices.

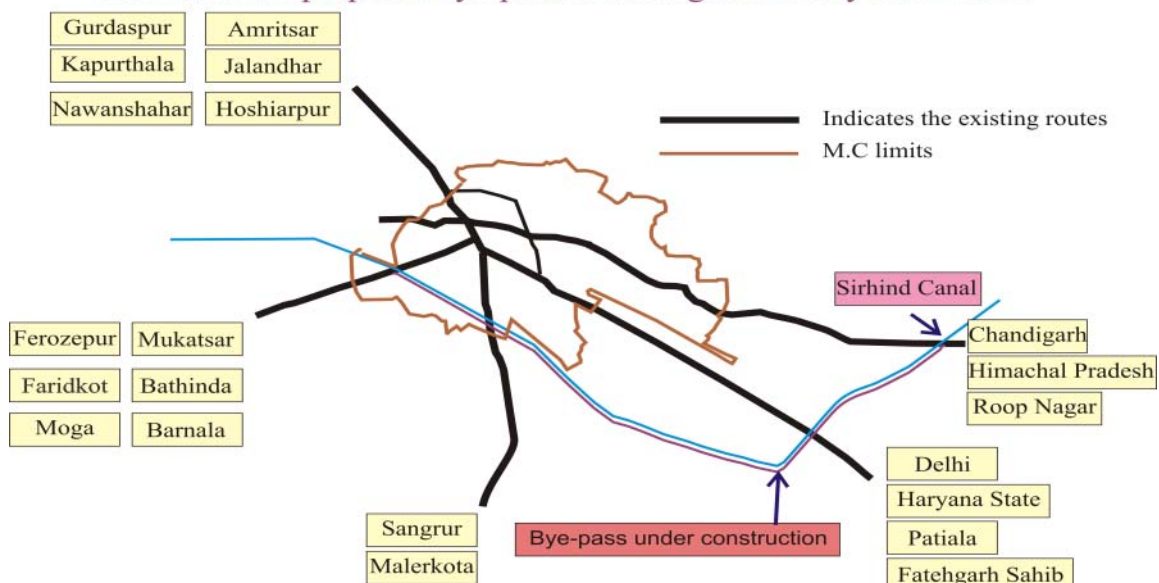
### **1.5.3 OTHER SOURCES OF AIR POLLUTION**

#### **Mobile sources**

With the development of industries, growth of population and rise in living standards, the demand of two wheelers and four wheelers has increased manifold. There are more than 10 Lacs vehicles of different nature which are registered in the district. Out of which 1,38,013 are the cars, jeeps etc. There are 29913 trucks/ lorries registered in the district. There are about 13,522 registered three wheelers and 7,65,224 registered two wheelers in Ludhiana city due to which the Ludhiana city has the highest vehicular density in Punjab. There are reports that after the phasing out of three wheelers from the metro cities, some of the phased out vehicles have started operating in Ludhiana illegally. These types of unregistered three wheelers have been estimated to be around 20,000. *These three wheelers are major source of air pollution within the city limits of Ludhiana as these are generally using adulterated fuel.* A study has been carried out by the Punjab Pollution Control Board to see the impact of diesel driven vehicular traffic on the environment. It was observed that 23% of the Govt. buses, 15.6% of the private buses, 47% of the cars/ auto rickshaws

etc. have failed to meet with the standards. The concentration of the respirable suspended particulate matter at Sherpur Chowk as well as Bharat Nagar Chowk were observed to be 252-282  $\mu\text{g}/\text{m}^3$  and 343-571  $\mu\text{g}/\text{m}^3$  respectively against the prescribed limits of 100  $\mu\text{g}/\text{m}^3$ . There are five major roads entering from different directions into Ludhiana city Ambala-Khanna G.T. Road, Chandigarh-Ludhiana Road, Jalandhar-Ludhiana Road, Malerkotla-Ludhiana Road and Ferozepur-Ludhiana Road etc. Although, a bye pass road constructed earlier starting from Sherpur Chowk to Jalandhar Chowk to ease out the traffic congestion in the city. However, with the rapid growth of industries and urban areas around Ludhiana, the Jalandhar Bye-Pass Road has become life line of the Ludhiana city with number of traffic bottlenecks. The floating population of the vehicles entering Ludhiana city from other towns is thus impact the environment to a great extent as the vehicles coming from Ferozepur, Faridkot, Moga, Jagraon, Khanna, Chandigarh, Jalandhar areas and destined to other towns, have to pass through the whole of the town. As per a study conducted by Punjab Pollution Control Board in June 2010, the total number of vehicles entering into the city on a single day observed to be 72,491, out of which 2,604 buses, 4,499 trucks, 23,137 cars, 14,703 auto rickshaws and 9367 others four wheelers vehicles. There is an urgent need to provide a bye-pass facility in a time bound manner to avoid such vehicular traffic through the heart of the city.

**Map Showing existing traffic flow pattern from different Towns/Cities through Ludhiana and proposed bye-pass to decongest the City from traffic**



## Stationary Point Sources

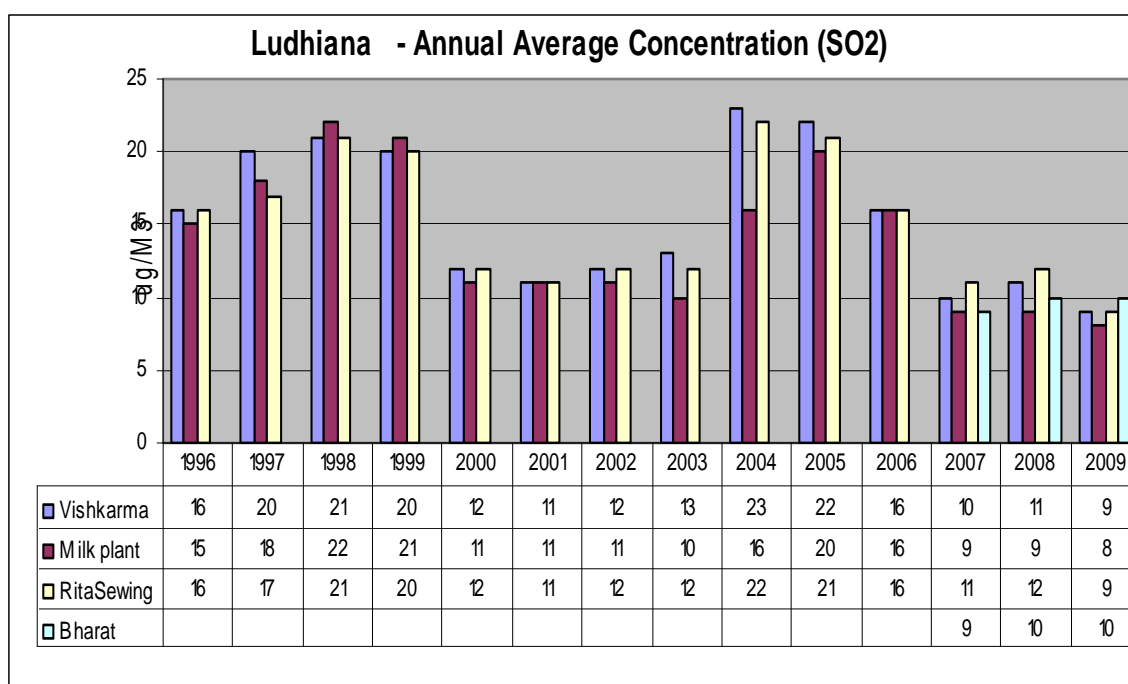
Due to erratic supply of power, most of the establishment, residential houses and industries have installed D.G set of various capacities to cater to their power needs, which are emitting uncontrolled emissions into the atmosphere within the city limits.

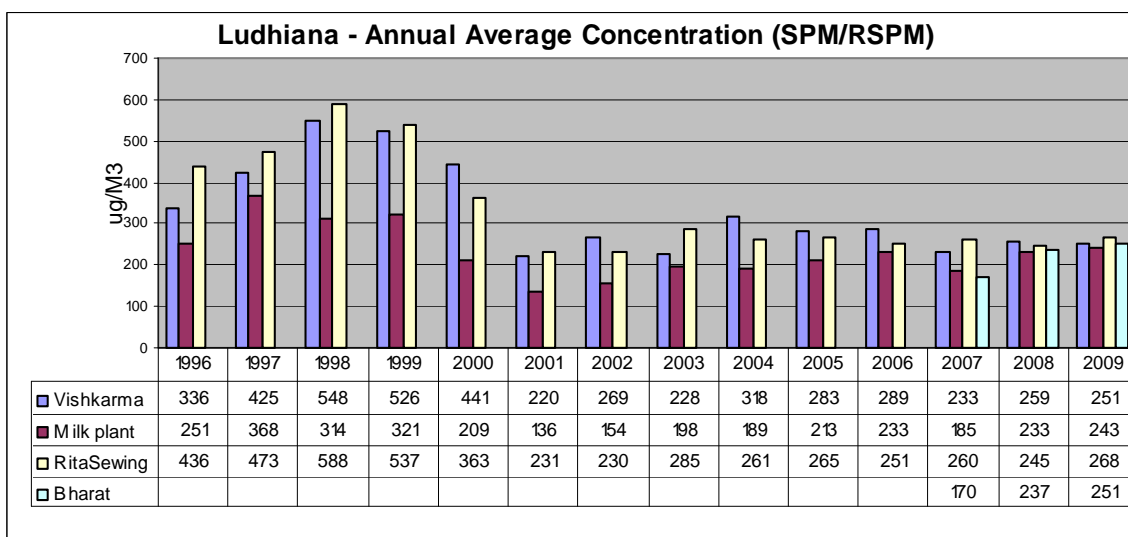
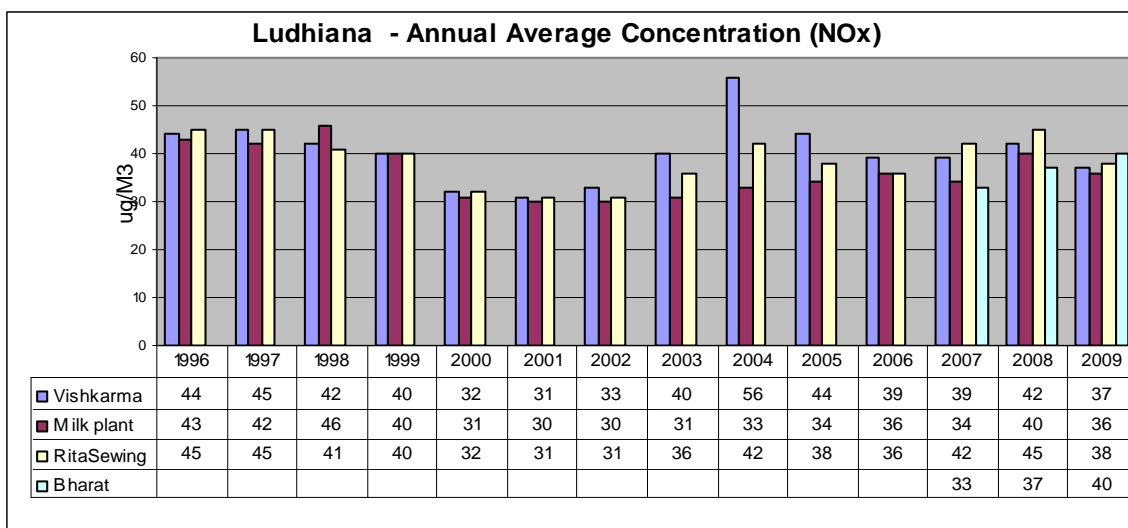
## Non Point Sources

Ludhiana city is surrounded by agricultural fields. As such, the burning of rice and wheat straw by the farmers during the harvesting season, is also affecting the ambient air quality of the town. Also, anaerobic digestion of biomass and garbage within the city limits is emitting air pollutants like methane etc. Due to all these sources, the quality of ambient air quality of the city is deteriorating.

### 1.5.4 AMBIENT AIR QUALITY MONITORING DATA

The Board is monitoring ambient air quality of Ludhiana city at 4 no. of stations namely Vishkarma Chowk, Milk Plant, Rita Sewing Machine & Bharat Nagar Chowk under the National Ambient Air Quality Scheme, out of which, the said data are being monitored at 3 stations since 1996 and at one remaining station, the same is being monitored since 2007, which is presented as below:





The trend of SO<sub>2</sub>, NO<sub>x</sub> and SPM in the ambient air shows that the concentration of these parameter is decreasing as compare to previous years, this may be due to persuasion made and regular monitoring of air polluting units carried out by the Punjab Pollution Control Board.

### 1.5.5 POOR MAINTENANCE OF ROADS, UNPAVED AND EXPOSED SURFACES

With the continuous flow of traffic on the roads, damaging of roads occurs and leads to creation of patches in the roads. These patches not only increase wear and tear of the vehicles but also become the source of dust emissions on the road and subsequently increase in the level of particular matter on the roads. This creates low visibility, causes accidents and breathing problems. Similar environmental problems are generated due to unpaved and exposed surfaces.

Due to bad condition of the roads, the speed of the vehicles also slows down leading to enhanced emissions from the engines

### 1.5.6 GROUND WATER CONTAMINATION SCENARIO

As per report of CPCB, the Cumulative Environment Pollution Index for land (soil and ground water) has been observed to be 64.75 for Ludhiana city. The high index value suggests that the ground water and soil of Ludhiana are susceptible to contamination mainly due to non-availability of common treatment facilities.

The Punjab Pollution Control Board is monitoring ground water at six locations in Ludhiana city under National Water Monitoring Program (NWMP). The data is being sent to Central Pollution Control Board through Environmental Data Bank (EDB), which is being examined by them regularly. The analysis results of ground water samples collected by the Board in the month of April 2008, November, 2008, April 2009 and November, 2009 are as under:

#### April 2008

#	Station (Ludhiana)	Sta. code	pH	TDS mg/l	Cl mg/l	SO4 mg/l	Total Hardness mg/l	Ca Hardness mg/l	Mg Hardness mg/l	Alkalinity mg/l	F mg/l	Na mg/l
1.	Hero Cycles, Adj.Petrol Pump	1898	7.2	780	40	18	280	190	90	140	1.0	88
2.	Bhagwan Singh Dashmesh Nagar	1899	7.1	810	48	20	310	240	70	160	0.8	90
3.	Habowal Dairy Complex	1900	7.2	470	32	16	240	160	80	140	1.4	40
4.	Dushera Ground, Industrial Estate	1901	7.6	490	36	20	180	110	70	130	1.8	45
5.	Shukla Tea Stall	1902	7.2	1240	54	24	420	340	80	110	1.4	88
6.	PAU research fields	1903	7.2	470	36	22	180	110	70	90	1.2	70

The concentration of all other parameters such as Fe, PO<sub>4</sub>, Ni, Cr, Zn, Pb, Cd, COD, BOD is found not detectable. Besides, no count of T-Coli and F-Coli was found at the said sampling stations.

## November 2008

#	Station (Ludhiana)	Sta. code	pH	TDS mg/l	Cl mg/l	SO4 mg/l	Total Hardness mg/l	Ca Hardness mg/l	Mg Hardness mg/l	Alkalinity mg/l	F mg/l	Na mg/l
1.	Hero Cycles, Adj. Petrol Pump	1898	7.3	988	50	18	260	170	90	160	1.8	86
2.	Bhagwan Singh Dashmesh Nagar	1899	7.1	939	48	16	280	220	60	180	2	88
3.	Habowal Dairy Complex	1900	7.2	373	40	18	210	180	40	130	1.4	45
4.	Dushera Ground, Industrial Estate	1901	7.2	308	30	20	190	150	40	140	1.2	49
5.	Shukla Tea Stall	1902	7.3	355	32	14	160	130	30	110	1	86
6.	PAU research fields	1903	7.2	348	34	12	150	120	30	90	1	76
The concentration of all other parameters such as Fe, PO4, Ni, Cr, Zn, Pb, Cd, COD, BOD is found not detectable. Besides, no count of T-Coli and F-Coli was found at the said sampling stations.												

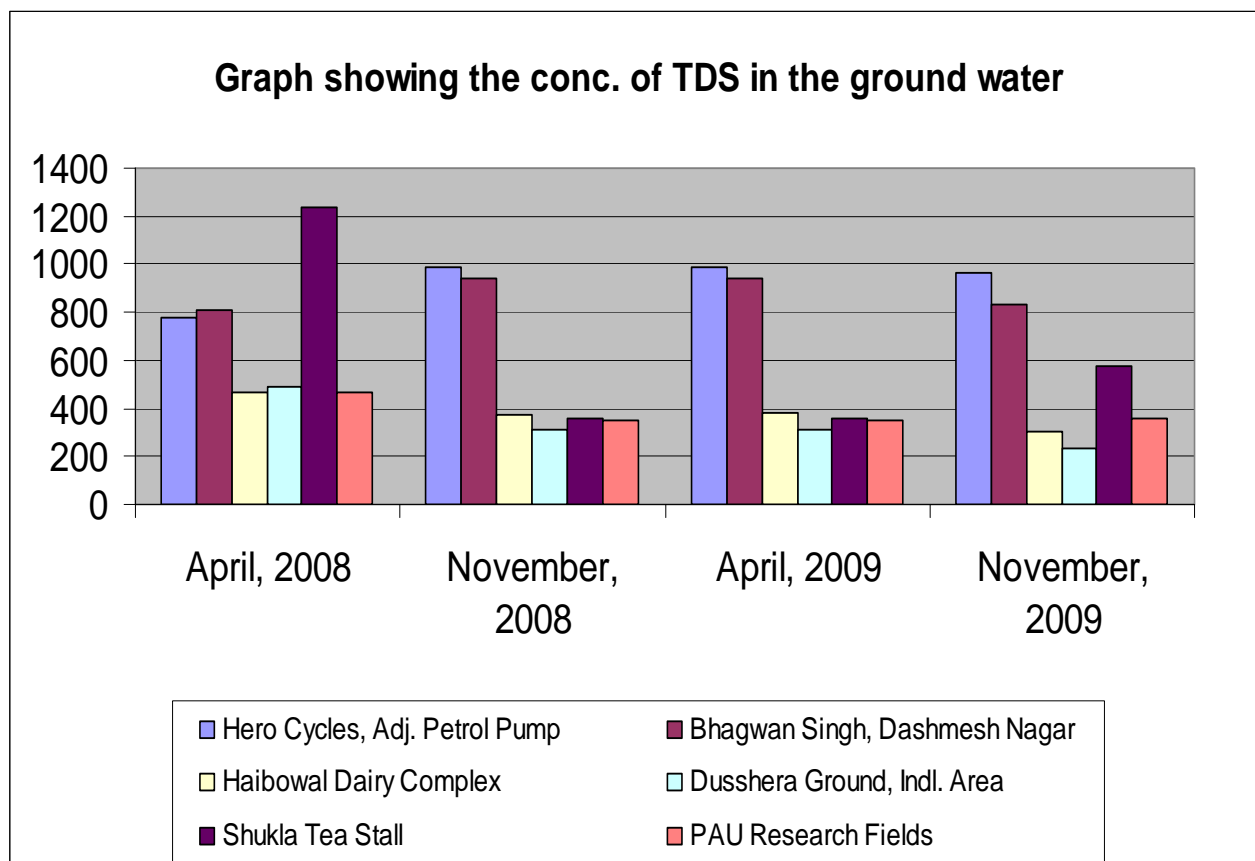
## April 2009

#	Station (Ludhiana)	Sta. code	pH	TDS mg/l	Cl mg/l	SO4 mg/l	Total Hardness mg/l	Ca Hardness mg/l	Mg Hardness mg/l	Alkalinity mg/l	F mg/l	Na mg/l
1.	Hero Cycles, Adj. Petrol Pump	1898	7.1	990	52	18	260	180	80	140	1.1	76
2.	Bhagwan Singh Dashmesh Nagar	1899	7.2	940	46	16	304	210	44	150	0.6	84
3.	Habowal Dairy Complex	1900	7.2	380	42	20	252	135	117	135	1.2	36
4.	Dushera Ground, Industrial Estate	1901	7.3	310	32	22	188	105	83	138	1.6	42
5.	Shukla Tea Stall	1902	7.3	360	28	12	410	325	85	112	1.2	47
6.	PAU research fields	1903	7.4	350	16	16	182	102	80	98	1.2	37
The concentration of all other parameters such as Fe, PO4, Ni, Cr, Zn, Pb, Cd, COD, BOD is found not detectable. Besides, no count of T-Coli and F-Coli was found at the said sampling stations.												

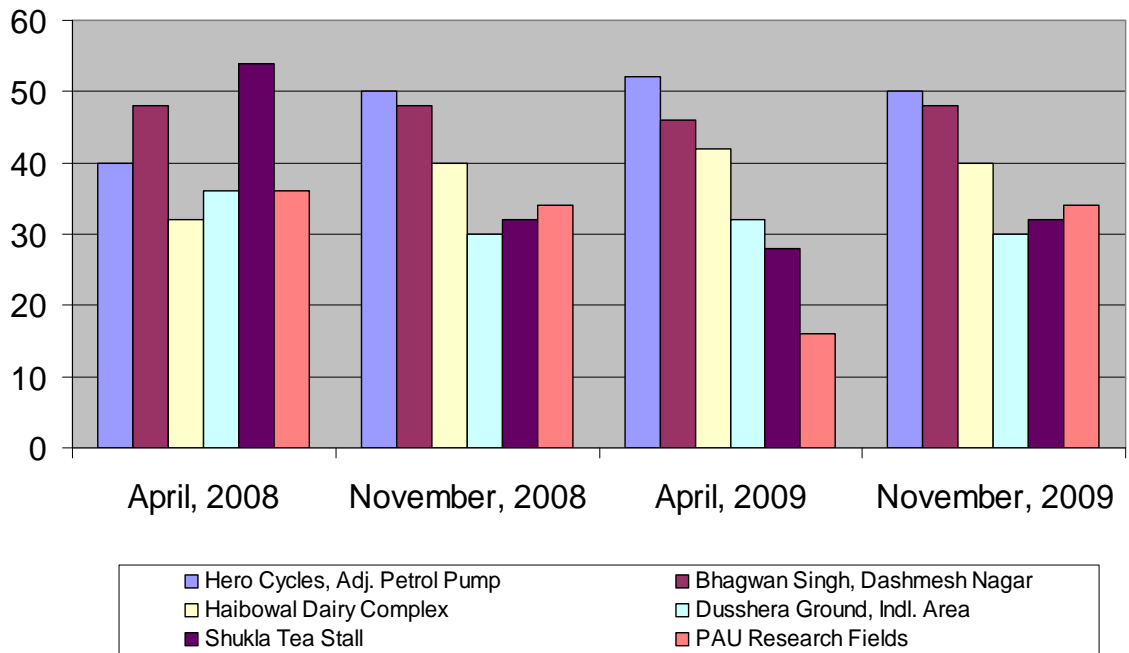
## November 2009

#	Station (Ludhiana)	Sta. code	pH	TDS mg/l	Cl mg/l	SO4 mg/l	Total Hardness mg/l	Ca Hardness mg/l	Mg Hardness mg/l	Alkalinity mg/l	F mg/l	Na mg/l
1.	Hero Cycles, Adj. Petrol Pump	1898	7.1	964	50	18	240	160	80	180	1	86
2.	Bhagwan Singh Dashmesh Nagar	1899	7.3	830	48	16	260	170	90	170	1	88
3.	Habowal Dairy Complex	1900	7.2	300	40	14	200	120	80	140	1.2	38
4.	Dushera Ground, Industrial Estate	1901	7.4	234	30	12	140	90	50	110	1.4	40
5.	Shukla Tea Stall	1902	6.9	578	32	10	130	88	42	110	1.2	72
6.	PAU research fields	1903	7.0	354	34	14	120	90	30	120	1.4	64

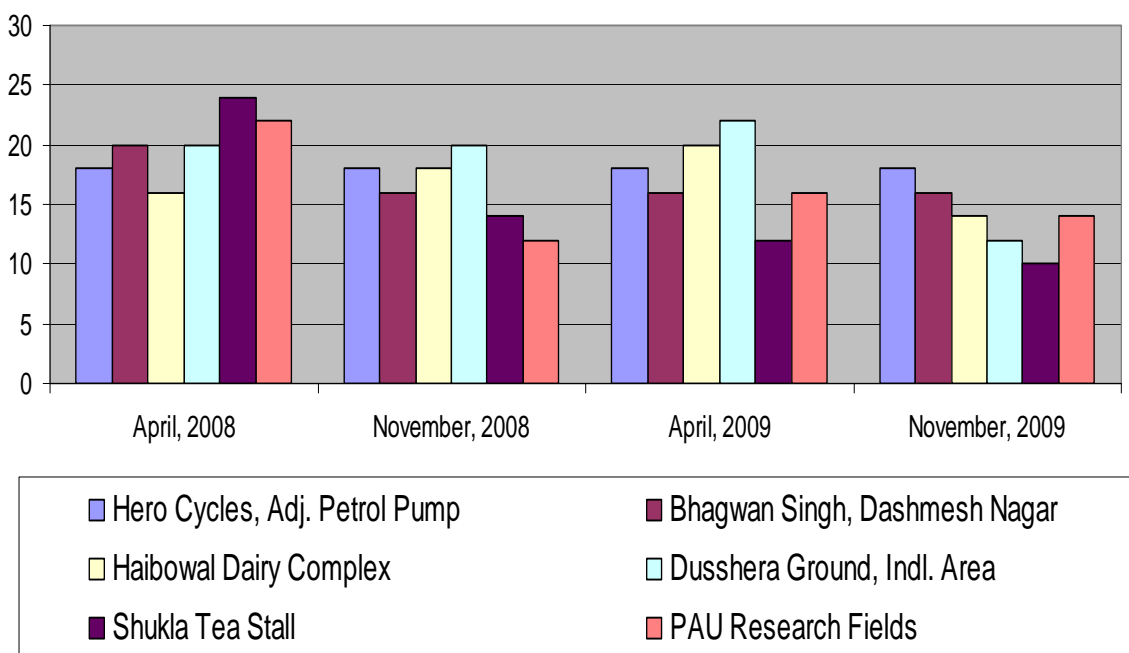
The concentration of all other parameters such as Fe, PO<sub>4</sub>, Ni, Cr, Zn, Pb, Cd, COD, BOD is found not detectable. Besides, no count of T-Coli and F-Coli was found at the said sampling stations.



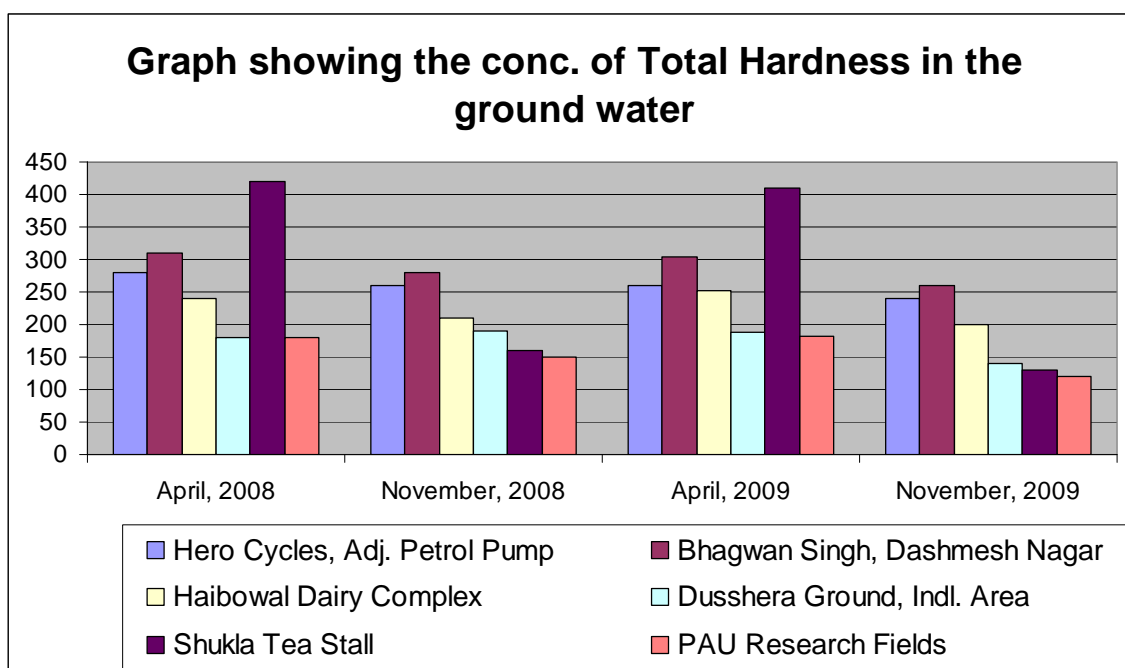
**Graph showing the conc. of Chloride in the ground water**



**Graph showing the conc. of sulphate in the ground water**







The trend of the analysis results shows that the concentration of the TDS, Chloride, Total Hardness and Sulphate are more or less in the same range. The variation observed may be seasonal and due to the characteristics of ground water strata surrounding the aquifer. The concentration of all other parameters such as Fe, PO<sub>4</sub>, Ni, Cr, Zn, Pb, Cd, COD and BOD is found not detectable. Besides, no count of T-Coli and F-Coli was found at the said sampling stations. The data suggests that no major contamination of the ground water has been observed in and around Ludhiana city as per the above analysis reports.

It is further added here that the municipal solid waste of Ludhiana city is disposed off at two sites located at Tajpur Road, Vill. Jamalpur and Humbran Road, Vill. Jainpur. To ascertain as to whether any hazardous waste had been dumped at these two sites, the Punjab Pollution Control Board has got conducted the Environment Site Assessment (ESA) from M/s Tetra Tech (India) Ltd., New Delhi. As per report submitted by the said consultancy firm, the soil and ground water at both the landfill sites have been impacted as higher values of BOD, COD, TOC, TDS, hardness, alkalinity and iron have been reported. Primarily, there is organic contamination in ground water, which could be

directly attributed to the presence of waste landfill. As far as the land contaminated of the area around the land fill site is concerned, only metallic parameters in the form of iron has been observed at both the dump sites. From the above, it is clear that the underground water contamination is localized one in the vicinity of municipal solid waste dump sites and it cannot be generalized on the basis of this data to whole of Ludhiana city.

### **1.5.7 NOISE POLLUTION**

Most of the industrial units located in the non-designated areas of Ludhiana city are surrounded by residential areas and these units are causing significant noise pollution in the said areas. Recently, the Master Plan of Ludhiana has been finalized by the State Govt. as per zoning regulation of the said Master Plan for the year 2007-2021, all these units are required to shift their industrial plants to the designated areas.

There are about 35,000 three wheelers running within Ludhiana city out of which 13,522 are registered one. These three-wheelers generally install illegal pressure horns causing which substantial noise pollution in and around the city. Besides above, bad conditions of these vehicles, being old model and deteriorating road conditions also deteriorate the noise pollution scenario in the city.

Due to erratic supply of power, most of the establishment, residential houses and industries have installed D.G set of various capacities to cater to their power needs, which are causing noise pollution during their operation.

Some of the religious places and marriage palaces located within the city limits are causing abnormal noise pollution especially during wee hours and evening as well late nights.

### **1.5.8 HAZARDOUS WASTE**

There are 1332 hazardous waste generating industries. The main industries are dyeing, electroplating, induction furnaces etc. Presently, these industries are generating total hazardous waste of 5498 MT, out of which 223 MT, 275 MT is

recyclable and incinerable respectively. The remaining hazardous waste i.e. 5000 MT is disposable to common Treatment, Storage and Disposal Facility.

All these industries are storing their hazardous waste temporarily in their premises. A common Treatment, Storage & Disposal Facility has been developed by M/s Nimbuan Greenfield (Punjab) Ltd., at Vill. Nimbuan, Tehsil Dera Bassi, Distt. Mohali for environmentally sound disposal of the hazardous waste, which came in operation in the month of October 2007 and its life span is about 15-years. Presently, this facility is taking the storageable waste for further disposal. The quantity of such waste is estimated to be 15,365 MT as on June 2010, which has been shifted to the said facility.

The disposal of incinerable waste is not a problem in Ludhiana as there are only 3 oil refining units which are producing incinerable hazardous waste to the tune of 292 TPA. These units have installed captive incinerators for the incineration of this hazardous waste. Presently, 14965 MTA of incinerable waste is generated from different industries in the State of Punjab. There are 13 captive incinerators installed by major incinerable waste generating industries. The incinerable waste generated from different industries is being stored in an environmentally sound manner within the premises of the industries. The Board have also given authorization to M/s Bharat Oil Company, Gaziabad for incineration of hazardous waste in view of the non-availability of incinerator facility in TSDF.

### **1.5.9 E-WASTE**

The e-waste is generally generated from dismantling activities of various electrical / electronics appliances / gadgets such as audiovisual components, televisions, VCRs, stereo equipment, mobile phones and computer components but till date no inventory of such waste has been prepared so far. However, for the proper disposal of such type of waste, the Ministry of Environment & Forest has included this waste in the Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2008.

### **1.5.10 MUNICIPAL SOLID WASTE**

About 850 MTD of Municipal Solid Waste is generated in the jurisdiction of Municipal Corporation, Ludhiana. Presently, no segregation of this waste is being carried out. As such, this waste is dumped in an unscientific manner on two sites located at Humbran Road, Vill. Jainpur and at Tajpur Road, Vill. Jamalpur. Therefore, the unscientific disposal of municipal solid waste is causing soil and underground water contamination besides causing air pollution in the area due to flying of the same into the atmosphere and discharge of gases due to anaerobic digestion.

### **1.5.11 BIO-MEDICAL WASTE**

The Board has identified 245 health care establishments having 5518 bed capacity in Ludhiana city, which are generating about 2.2 TPD of bio-medical waste of different categories as specified in Schedule-1 appended to the Bio-medical Waste (Management & Handling) Rules 1998. The segregation of the bio-medical waste is being done by all these health care establishments at source. Furthermore, the liquid waste being generated by all these health care establishments is being disinfected as per the procedure prescribed in the said rules. The bio-medical waste generated is not allowed to mix with the municipal solid waste and it is handled by a common Bio-medial Waste Treatment Facility, which has been developed by M/s Semb Ramky Environ Pvt. Ltd., at Tajpur Road, Ludhiana, having capacity to handle 4.0 TPD of bio-medical waste of different categories. This facility has installed incineration, shredder and autoclave facilities alongwith on-site storage facility for the bio-medical waste. The health care establishments located at Ludhiana have made agreements with the said facility for collection, transportation, treatment and disposal of their bio-medical waste. The Punjab Pollution Control Board is regularly monitoring the emissions generated from the incinerator of the said facility. As per the emission analysis report, the concentration of SPM, HCL, NO<sub>x</sub> has been observed to be 120 mg/Nm<sup>3</sup>, 1.8 mg/Nm<sup>3</sup> and 22.4 mg/Nm<sup>3</sup> respectively.

## CHAPTER-2

### IDENTIFICATION OF ROLE OF THE DIFFERENT DEPARTMENTS IN ABATEMENT OF POLLUTION

Due to complex problem of pollution, different arms of the State Govt. required to take corrective measure in the area of their operation to improve the environment of the Ludhiana city and to achieve reduction in the Comprehensive Environment Pollution Index. The various departments/ authorities and work to be done by them, are identified as under:

S. No.	Name of the Department	Main Areas
1.	Deptt. of Industries and Commerce/ Punjab Small Industries & Export Corporation/ Punjab State Industrial Development Corporation.	<ul style="list-style-type: none"><li>➤ Commissioning of 3 CETPs in a time bound and prompt manner.</li><li>➤ Scout for improved technologies.</li><li>➤ Awareness creation to increase green cover in industrial areas.</li><li>➤ Shifting of industries, which are located in the non-designed areas, to the designated areas within the time frame given in the zoning regulations of Master Plan, Ludhiana.</li><li>➤ Provision of environment infrastructure in the various industrial estates and Focal Points in Ludhiana city including wastewater treatment facilities, improved water supply, road infrastructure, parking facilities and green cover within the industrial areas alongwith development of buffer zone along the residential areas.</li></ul>
2.	Department of Local Bodies	<ul style="list-style-type: none"><li>➤ Upgradation of existing sewage treatment plants.</li><li>➤ Laying of sewer lines in remaining areas and connecting with the sewage treatment facilities.</li></ul>

		<ul style="list-style-type: none"> <li>➤ Development of engineered municipal solid waste dump site and compliance of provisions of the Municipal Solid Waste (Management &amp; Handling) Rules, 2000.</li> <li>➤ Control of water pollution from dairy complexes located at Tajpur Road and Humbran Road and shifting of individual dairies located in the city limits to a suitable site outside MC limits and provide with adequate infrastructure including effluent treatment plant and disposal of treated effluent.</li> <li>➤ To prepare and implement time target Remediation Plan for the dump sites located at Vill. Jamalpur and Vill. Jainpur, where the contamination soil and ground water has been found as per Environmental Site Assessment carryout by the M/s Tetra Tech (India) Ltd., New Delhi.</li> <li>➤ Improvement of road infrastructure for better and smooth traffic movement.</li> <li>➤ Improvement of public transport system.</li> <li>➤ Upgrading traffic lights for smooth traffic movement.</li> <li>➤ Steps for compulsory installation of rainwater harvesting structure by the different establishment within the city and encouragement to construction of green buildings.</li> <li>➤ Improvement of sanitation conditions in slum areas.</li> <li>➤ Steps for improvement of percolation if</li> </ul>
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		<p>rainwater from sides of roads/ pavements and through green cover.</p> <ul style="list-style-type: none"> <li>➤ Increasing green cover in city and provisions of green belt/ buffer zones separately industrial areas from residential zones.</li> <li>➤ Mandatory requirement to provide canopies with the exiting D.G sets alongwith stacks as per norms fixed by the Punjab Pollution Control Board and not to allow any shop, office / commercial establishment to install D.G. sets without canopy and shall take policy decision regarding regulation of DG sets in residential houses.</li> </ul>
3.	Punjab Pollution Control Board	<ul style="list-style-type: none"> <li>➤ Control of Water, Air and Solid Waste Pollution.</li> <li>➤ Regular monitoring/ ensuring the regular operation of effluent treatment plant and air pollution control devices installed by industries/ establishments.</li> <li>➤ Upgradation of existing effluent treatment plant and air pollution control device so as achieve the prescribed standards, wherever required.</li> <li>➤ Monitoring of the installation of the sewage treatment plant as well as Common Effluent Treatment Plant in a time bound manner.</li> <li>➤ Monitoring of ambient air quality, ground water and surface water quality.</li> <li>➤ Ensuring proper management and handling of hazardous waste/ bio-medical waste.</li> <li>➤ Preparation of inventory of E-Waste.</li> </ul>

4.	Department of Transport	<ul style="list-style-type: none"> <li>➤ Plan for phasing out old polluting commercial transport vehicles especially autos / Vikrams.</li> <li>➤ Improved Public Transport System.</li> <li>➤ Impounding and challan of vehicles especially Vikrams autos running without permission/ registration.</li> <li>➤ Plan for effective traffic management including provisions of traffic lights, notification of one way traffic, parking of vehicles at the designated place challaning of polluting vehicles etc.</li> <li>➤ Plan for shifting to cleaner fuels viz. CNG etc.</li> <li>➤ Increased monitoring of vehicles running without P.U.C certificate and implementation of applicable emission norms.</li> <li>➤ Banning of pressure horns.</li> </ul>
5.	Police Department	<ul style="list-style-type: none"> <li>➤ Increased monitoring of vehicles running without pollution under control certificate.</li> <li>➤ Formation and implementation of proper traffic management plan for smooth flow of traffic.</li> <li>➤ Impound and challan of vehicles especially Vikrams autos running without permission/ registration.</li> <li>➤ Implementation of Noise Pollution (Regulation &amp; Control) Rules, 2000 for control of noise from D.G. sets and other non-point sources.</li> </ul>
6.	Department of Forests	<ul style="list-style-type: none"> <li>➤ Preparation of afforestation plan for increasing forest/ green cover in areas under their jurisdiction.</li> <li>➤ Rendering training / seminars / awareness camps for increasing green cover in city.</li> <li>➤ Providing of green belt around the industrial</li> </ul>



		<p>areas and the pollution sources.</p> <ul style="list-style-type: none"> <li>➤ Providing more plants / saplings free of cost in Ludhiana.</li> <li>➤ A systematic study to keep the track of status of flora and fauna and to prepare inventory for the same.</li> <li>➤ Formulating and implementing more projects of afforestation under MNREGA in Rural areas adjoining Ludhiana</li> </ul>
7.	PWD (B & R)	<ul style="list-style-type: none"> <li>➤ Providing bye pass alongside canal</li> <li>➤ Improving road conditions for smooth movement of traffic.</li> <li>➤ Increasing green cover on roadside under their jurisdiction.</li> </ul>
8.	District Administration	<ul style="list-style-type: none"> <li>➤ To act as facilitator for installation of common effluent treatment plant for dyeing industries.</li> <li>➤ To impose complete ban on the stubble burning within the 10 Km from the periphery of Ludhiana city.</li> <li>➤ Regulation on use of loud speaker and sound system by the religious places and marriage palaces.</li> <li>➤ Action on marriage palaces another establishments flouting noise pollution control norms.</li> </ul>
9.	Department of Agriculture	<ul style="list-style-type: none"> <li>➤ Promotion of bio-methanization and compost facilities for the agricultural residue and awareness regarding ill effects of stubble burning</li> </ul>
10.	Punjab State Council for Science and Technology	<ul style="list-style-type: none"> <li>➤ Evolving of cleaner technologies and installation of pilot plants for improved effluent/ emissions treatment technologies.</li> </ul>

11.	Central Ground Water Authority	➤ To stop the over exploitation of ground water.
12.	Department of Health & Family Welfare	➤ To carryout health study during the implementation of action plan.

## CHAPTER-3

### ACTION PLAN FOR CONTROL OF POLLUTION AND TIME LINE

#### 3.1 APPROACH AND AGENDA FOR ACTION PLAN

To accomplish the task, emphasis shall be laid on integrated approach involving preventive, promotion and mitigative measures. Thus, the keyword for the pollution abatement will be Prevention, Promotion and Mitigation (PPM). Instead of dealing with the pollution problems on case to case basis an integrated approach involving preventive, promotional as well as mitigation (PPM) measures will be propagated. Pollution abatement responsibilities of concerned development department/ organizations such as Punjab Pollution Control Board, Department of Local Bodies, Municipal Corporation, Ludhiana, Punjab Small Industries & Export Corporation, Deptt. of Forest, Deptt. of Transport, District Administration, Traffic Police, Punjab State Council for Science and Technology, PWD (B & R) and Central Ground Water Authority, need to be articulated in their development programmes. Besides, above the other stack holders like city residents, Non-Government Organizations and Promoters of the Common Bio-Medical facility/ Hazardous Waste Facility and various Industrial Organizations shall also be involved to improve upon the environment by implementing the Action Plan. Augmentation of professional manpower with supporting Scientific & Clerical Staff alongwith infrastructure is the need of the hour. The Action Plan approach will be as under:

##### **Prevention**

- Restriction on polluting technologies
- Restriction on siting of polluting industries

##### **Promotion**

- Clean technologies/ improved house keeping
- Compatible industries
- Training & awareness programmes.

##### **Mitigation**

- Control at source (in plant/ add on system)
- Reduction of waste, recovery and recycling.
- Restoration/ reclamation.

### **3.2 AGENDA**

The agenda for the action plan shall centre around major problem specific and sector specific programme having significant bearing on the environmental status and living conditions. Keeping in view these considerations, the priorities should focus on the followings:

#### **Problem Specific Programme (P.S.P.)**

1. Action plan for control for industry pollution
2. Hazardous Waste Management.
3. Municipal Waste (Waste water & solid waste)
4. Noise pollution

#### **Area Specific Programme (A.S.P.)**

1. Identified problem areas.
2. Sensitive zones.

#### **Sector Specific Programme (S.S.P.)**

1. Highly polluting industries.
2. Agriculture, sewage forming, agricultural run off, burning of agro waste.
3. Vehicular traffic.

#### **Public Involvement**

Participatory programmes for public support and involvement in cleaning of neighborhood areas especially in case of Municipal waste shall be promoted.

### **3.3 ACTION PLAN FOR DIFFERENT DEPARTMENTS**

The degradation in quality of environment of Ludhiana has been brought out by the various activities and in order to upgrade the quality of environment and for the betterment of eco-system, the various departments need to play their role in the development activities at the micro as well as macro level to bring about a definite change.

### **3.3.1 Department of Industries & Commerce/ Punjab Small Industries & Export Corporation/ Punjab State Industrial Development Corporation**

In Ludhiana, there are two major types of industries i.e. dyeing & electroplating. Common Effluent Treatment Plant for electroplating industries has been made operational. It is being run under PPP mode by SPV of industries formed by the Department of Industries & Commerce. The CETP has been installed by M/s JBR Technologies Pvt. Ltd., Phase-VIII, Focal Point, Ludhiana. All the small scale electroplating industries have been persuaded to join CETP. The CETP is working on the zero liquid discharge technology and no effluent is discharged into Budha Nallah. The treated effluent from the electroplating CETP is reused by dyeing industries adjoining to the CETP.

So far the dyeing industries are concerned, though presently almost all these industries have provided individual effluent treatment plants to treat their effluents, however, these effluent treatment plants are yet to be upgraded to treat the effluents so as to achieve the prescribed standards for discharge into Budha Nallah.

#### **DEVELOPMENT OF NEW INFRASTRUCTURE IN GOVERNMENT / PPP MODE**

The dyeing industries have been divided into 5 no. clusters located at Rahon Road, Bahadurke Road, Tajpur Road, Industrial Area-A and Focal Point. 200 small and medium scale dyeing industries are located in these 5 clusters and it is proposed to construct two no. CETPs at Village Bahadurke and Tajpur Road for the treatment of effluent generated by these industries. The details of the CETP are as under:

- i) One CETP has been proposed to be installed at Tajpur Road, where 32 acres of land is available, for treatment of effluent from clusters of dyeing industries at Tajpur Road (73 industries, discharge 40 MLD), Focal Point (53 industries, discharge 40 MLD) and Industrial Area-A (37 industries, discharge 20 MLD). 163 dyeing units with total effluent discharge 100 MLD will join this CETP. Sewer lines of adequate capacity will be laid from

cluster of dyeing industries at Tajpur Road, Focal Point and Industrial Area-A to the proposed CETP of capacity 100 MLD at Tajpur Road. To set up this CETP, 32 acres of land is being transferred to the Mother SPV-Punjab Dyers Association on lease basis by the Department of Home Affairs and Justice. It will not be out of place to mention here that the land for setting up of the CETP is being provided by the Punjab Government after the approval of the Cabinet. It shows that the Punjab Government is committed to the implementation of CETP project. The Expressions of Interest (EOI) for selection of the consultant to prepare the DPR of the said project has been published in print media by the Department of Industries & Commerce. CETP for Tajpur Cluster is likely to be commissioned by 31/12/2011.

- ii) Second CETP has been proposed for treatment of effluent from cluster of dyeing industries at Bahadurke Road (18 industries, discharge 15 MLD). Sewer lines of adequate capacity will be laid from Bahadurke road cluster to proposed CETP at Vill. Bahadurke. In this regard a detailed project report for setting up of a CETP & power co-generation at Bahadurke Road has been submitted to Central Pollution Control Board, New Delhi / NEERI, Nagpur for comments / suggestions. The project cost has been estimated to be Rs. 122 crores for setting up of CETP-15 MLD with power co-generation at Bahadurke Road, Ludhiana. There is a proposal to recycle the treated wastewater by the member dyeing units in their process and the surplus power co-generated will also be consumed by the member units of the CETP. After the comments / suggestions received from the expert bodies, the final proposal of the CETP will be sent under IIUS scheme to Ministry of Industries, Government of India by 31/7/2010. The CETP scheme for Bahadurke Cluster will be implemented by 31/12/2011.
- iii) Third CETP of capacity 15 MLD for the treatment of effluent from cluster of dyeing industries at Rahon Road (19 industries, discharge 15 MLD) has been proposed to be set up near STP, Bhattian for which the land is being identified. The land identification for CETP will be accomplished by

31/8/2010 and it is proposed to implement the CETP scheme by 31/3/2012.

- iv) Presently, combined sewerage system has been laid down in the Ludhiana city for carrying the industrial as well as domestic effluent, however, there is a proposal to lay down separate conveyance system for the effluent generated from dyeing clusters leading to CETPs.
- v) The sludge to be generated from the CETPs will be handled, collected and disposed off in an environmentally sound manner.

### **Technology Intervention**

Awareness is being created among the industry for the adaptation of cleaner technology ranging from low cost modification to change of product through experts of National Cleaner Production Centre. Under the waste minimization techniques, the dyeing industries have adopted soft flow dyeing process, which has reduced the water consumption. After pilot studies, the cupola furnaces have been provided with wet cap technology for control of emissions from their process.

### **Adoption of Zero Liquid Discharge Technology (ZLD) in electroplating sector**

Ludhiana city is hub of the small scale tiny electroplating industries due to the existence of cycle & sewing machine parts in various industrial clusters. The Board has identified 482 such small scale industries which are discharging few hundred litres of trade effluent individually on a daily basis. Such industries were earlier discharging their effluents into the sewerage system of Ludhiana. A common effluent treatment plant installed by Punjab Small Industries and Export Corporation has been made operational through a Special Purpose Vehicle (SPV) formed by the Department of Industries in collaboration with the Electroplating Industrial Association on a PPP mode. This facility is being operated by M/s JBR Technologies Pvt. Ltd. in Phase-VIII, Focal Point, Ludhiana. All the effluent generated by the electroplating industries is being collected and treated in the

CETP. The CETP is based on the zero liquid discharge technology as the treated effluent is being re-used into the processes of neighboring dyeing industries.

*Going one step ahead for achievement of ZLD technology, the PPCB is persuading all the large and medium electroplating industries to adopt the ZLD technology by 30/9/2010.*

### **Awareness for Increase of Green Cover in Industrial Area**

The Punjab Small Industries & Export Corporation Ltd. undertakes drive to plant trees on the road side of the Focal Point and the green parks being maintained in the Focal Point and industrial areas. Further, a scheme in the shape of proposed legislation is already under preparation for the maintenance of industrial area by the Industrial Association themselves.

### **Shifting of Industries**

The department shall make proper arrangement and take adequate steps for shifting of industries, which are located in the non-designed areas, to the designated areas within the time frame given in the zoning regulations of Master Plan, Ludhiana.

### **Provisions of Environmental Infrastructure in the various designated areas**

The Industries Department is undertaking measures to provide environment infrastructure in the various industrial estates and Focal Points in Ludhiana city including wastewater treatment facilities, improved water supply, road infrastructure, parking facilities and green cover within the industrial areas alongwith development of buffer zone along the residential areas on a continuous basis.

## **3.3.2 DEPARTMENT OF LOCAL BODIES**

### **Infrastructure Renewal**

#### **Upgradation of existing STPs**

The Punjab Water Supply & Sewerage Board has already installed 3 no. STPs of capacity 152 MLD at Balloke, 111 MLD at Bhattian and 48 MLD at Jamalpur for



the treatment of domestic sewage generated in the city under Sutlej Action Plan. Most of the outlets discharging directly into the Budha Nallah have been closed so that the entire sewage of Ludhiana can be treated in the STPs. Now, there is a proposal to upgrade the capacity of STPs by 105 MLD at Balloke and 50 MLD at Bhattian. The construction work for these STPs has already been started by Punjab Water Supply & Sewerage Board and the total capacity of the STPs will become 466 MLD. The project is likely to be completed by September 2011. The total available capacity of 466 MLD shall be sufficient to take care of domestic wastewater generation expected in 2025. The said project is being implemented with a cost of Rs. 268 crores (including the cost of sewerage system) under the JNNURM scheme.

Also, with the separation of the conveyance system for industrial and domestic effluent as proposed earlier alongwith CETP schemes, the treatment efficiency of the present STPs will also increase significantly. There will be a requirement for carrying out leak detection of the sewerage system and components of the STPs since earlier industrial and domestic effluent were being treated combined.

### **Laying of Sewer Lines in Remaining Areas**

Presently, some of the residential colonies of Ludhiana have not been connected with the sewerage facilities and these colonies discharge their wastewater into soakage pits / open drains leading to Budha Nallah, which is source of contamination due to presence of fecal coliform and stagnation of the domestic waste also leads to contamination of the groundwater locally. Thus, there is need to extend the sewerage facilities to these areas and further the sewer lines should be connected to the STP installed by the Municipal Corporation, Ludhiana. Sewer lines in the remaining areas of Ludhiana are being laid under JNNURM, Govt. of India scheme and the project is likely to be completed by 30/6/2012.

## **Control of Pollution from Dairy Complexes and Scattered Dairy Units**

The Municipal Corporation, Ludhiana shall take adequate steps for installation of proper and adequate treatment facility to treat the wastewater of dairy complexes located at Tajpur Road and Humbran Road. The Municipal Corporation, Ludhiana shall also take necessary steps for shifting of scattered dairies to some suitable sites outside the MC limits by providing adequate infrastructure including effluent treatment plant and proper disposal arrangements. The Municipal Corporation will be persuaded to install effluent treatment plant and proper arrangement for the treated wastewater for the two dairy complexes by 31/12/2010. Identification of site for shifting of the scattered dairies alongwith preparation of DPR will be undertaken by 31/12/2010. RFP will be floated by 31/3/2011. The new dairy complex will be developed alongwith environment infrastructure by 30/9/2011 and shifting of the dairies to new complex will be accomplished by 31/12/2011.

## **Development of Engineered Landfill**

The Municipal Corporation will take adequate steps for development of engineered landfill site so as to comply with the provisions of the Municipal Solid Waste (Management & Handling) Rules, 2000. The Punjab Govt. has divided the State into 8 clusters for the managements of municipal solid waste. The project involves door to door collection of garbage its segregation, transportation, treatment and recycling. Ludhiana is one of the major clusters. RFP for Ludhiana cluster shall be finalized by July 2010. Door to door collection of the municipal solid waste alongwith commissioning of the facility will be undertaken by 31/3/2011.

## **Preparation of Remedial plan for the Dump Sites**

The Municipal Corporation, Ludhiana is required to prepare and implement the remedial action plan for the dump sites located at Vill. Jamalpur and Vill. Jainpur, where the contamination soil and ground water has been found as per

the Environmental Site Assessment carryout by the M/s Tetra Tech (India) Ltd., New Delhi. The remediation plan shall include leachate collection and treatment system and methane collection/ flaring arrangement. The preparation and finalization of plan will be accomplished by 30/9/2010 and the same will implemented within one year i.e. by 30/9/2011. Regular monitoring of ground water in the vicinity of dump site will be done by the Municipal Corporation on quarterly basis.

### **Improvement in Road Infrastructure and Traffic lights**

The road infrastructure within the city limits needs to be improved upon including re-carpeting, filling of the patches of roads. The over-bridges shall also be constructed, wherever possible, for smooth and speedy flow of traffic. Traffic lights need to be provided at certain cross-sections to ease traffic bottlenecks. This activity will not only result in low consumption of fuel but also less wear and tear of the vehicles resulting in the lower emission levels. It is an on going process which is carried out by the various agencies like municipal corporation as well as PWD (B & R) on a continuous basis. Another exercise will be carried out by the Municipal Corporation to identify the bottlenecks by 30/9/2010 and to install the traffic lights by 31/12/2010.

### **Rainwater Harvesting in the City**

Rainwater Harvesting is harvesting the rain water during Monsoon and storing it either in man made tanks or natural aquifers and use it for secondary purpose as per the requirements. Large amount of rainwater goes wasted in the drains every year which otherwise is a good source of harvesting through Rainwater Harvesting Projects. The total rainfall in a year is 600-700 mm in Ludhiana. The Punjab Govt. has recently made it mandatory for the owners of 200 Sq. yards or more plots to provide rainwater harvesting structures at the time of construction of the house. The building plans are approved by the Local Authority only with the proposal for rainwater harvesting. The implementation shall be monitored vigorously. As a result, in coming times, rain water harvesting shall contribute to improve the groundwater quality in Ludhiana.

### **Improvement of sanitation conditions in slum areas**

There is a need to provide proper sanitation facilities in the slum areas so as to ensure no discharge of untreated sewage/ sullage directly/ indirectly into Budha Nallah from these areas. The Municipal Corporation, Ludhiana shall either provide sewerage system in the entire such area or provide mobile toilets in order to improve the sanitary conditions. For the development of slum areas, the Corporation has made a scheme of 40 Crores during the current financial year i.e. 2010-11. The Municipal Corporation, Ludhiana is also implementing a scheme for providing 4800 dwelling units at a cost of Rs. 66 Crores under Basic Services for Urban Poor (BSUP) scheme of Govt. of India. Out of this, 1600 dwelling units will be completed by 30/9/2010 and rest will be completed by April 2011.

### **Provisions of green cover in the City and in industrial area**

The Municipal Corporation, Ludhiana will undertake a special drive to identify the areas and shall make plantation thereby increasing the green belt in and around the industrial areas, residential areas and road sides etc. The Municipal Corporation alongwith GLADA will be planting 30000 trees saplings and shrubs during 2010-11 along roads, parks, green belts, rehabilitation colonies, city centre etc. over an area of 3,18,685 Sq. yards as per the area identified by the Forest Department. The first phase of the plantation drive will be completed by 31/8/2010 and the other phase will follow 28/2/2011.

## **3.3.3 PUNJAB POLLUTION CONTROL BOARD**

### **INDUSTRIAL POLLUTION**

Presently, the industries of Ludhiana are discharging their effluents into public sewers leading to one of the three STPs installed by Punjab Water Supply & Sewerage Board. However, these STPs have been designed for the treatment of domestic sewage and therefore, the mixing of industrial effluents with the domestic sewage in the sewerage system results in hampering of smooth operations of STPs. Therefore, the Punjab Pollution Control Board is pursuing

the industries and coordinating with the Department of Industries & Commerce to ensure that the effluent of dyeing industries, which is toxic in nature, should be segregated from the domestic sewage and treated separately. In this regard the following action plan has been proposed:

### **Installation of Common Effluent Treatment Plants**

There is a proposal to install three CETPs of capacity 100 MLD, 15 MLD and 15 MLD at Tajpur Road, Bahadurke Road and Village Bhattian, respectively. The land for 100 MLD CETP at Tajpur Road has been identified, whereas, the identification process of land for second CETP at Village Bahadurke is at final stage. There are about 200 dyeing industries existing in these 5 clusters, which will join three CETPs. These CETPs will treat the effluent to the BOD level to 10 mg/l. The large scale dyeing industries (17 nos.) will also upgrade their individual effluent treatment plants so that the quality of effluent discharged from such industries is at par with the treated effluent discharged from the CETPs. These CETPs will be equipped with State of the Art Laboratories with skilled manpower to monitor the performance on day to day basis. The total cost of three CETPs excluding the values of land is about Rs. 347 crores. The Punjab Pollution Control Board will pursue the Department of Industries as well as Industrial Associations to install and commission the CETPs in a time bound manner.

### **Monitoring of sewage treatment plants and common effluent treatment plant**

The Punjab Pollution Control Board will carry out regular monitoring of sewage treatment plants and common effluent treatment plants so as to ensure the achievement of prescribed standards. The Punjab Pollution Control Board is already taking effluent samples at the outlet of the installed STPs and CETP for small scale electroplating industries so as to ensure the regular operation and achievement of standards.

## **INFRASTRUCTURE RENEWAL IN GOVERNMENT / PRIVATE / PPP MODE**

Although most of the industries located in Ludhiana city have already installed the necessary individual effluent treatment plants as well as air pollution control devices to control the pollution generated from their processes. However, as per report prepared by NEERI, Nagpur, some of the cotton / blended yarn dyeing units have installed only physico chemical treatment to treat their wastewater. Such units are required to upgrade their existing facilities so as to achieve the prescribed standards. Furthermore, the Board has carried out door to door inspection of all industrial units and it has been noticed that some of the recently identified units are yet to install the effluent treatment facility despite the fact that the Board has taken suitable action against these industries under the law. There is also a bottleneck regarding the disposal of the incinerable hazardous waste which is lying stored with the industries due to non-availability of incineration facilities with the TSDF operator. In order to tackle the above problems, the following action plan is proposed:

- i) The industries, which have not installed effluent treatment plants and air pollution control devices, will be persuaded to install the same by 31/12/2010. Major upgradation in the effluent treatment plants and air pollution control devices will be got carried out by 31/12/2010. Minor upgradation in the effluent treatment plants and air pollution control devices will be got carried out by 30/9/2010.
- ii) M/s Nimbuan Greenfield (Punjab) Ltd. who is running the common Treatment, Storage and Disposal Facility for hazardous waste at Nimbuan, Tehsil Dera Bassi will be persuaded to shifting the incinerable waste by 30/9/2010 to its other facilities having incinerator. Further, the common Treatment, Storage and Disposal Facility will be asked to install incinerator facilities by 31/3/2011 on its own on BOOT basis. It is worthwhile to mention here that all the incinerable hazardous waste produced by the industries is being stored in an environmentally sound manner.

- iii) The TSDF operator will be pursued to install GPS tracking system for transportation of hazardous waste by 31/3/2011.
- iv) The Board will also be encouraging the use of the incinerable hazardous waste for co-processing of the same in the cement plants. There is no cement kiln in Punjab. However, the Punjab Pollution Control Board is exploring the possibility to promote co-processing of hazardous waste in the cement kilns installed in the neighboring states. M/s Ambuja Cements Ltd. Rajasthan has been given authorization for co-processing of paint sludge in their cement kiln.
- v) The large scale dyeing industries will be directed by Punjab Pollution Control Board to upgrade their effluent treatment plants and adopt such technology, which may bring pollutants to the level at par with the level of treatment to be achieved by the proposed CETPs.

## **Technological Intervention**

### **Improvement of Emission Collection System in Induction Furnaces**

There are 84 Induction furnace units in Ludhiana. These industries are mainly emitting process emissions containing oxides of metals, which are generally collected by installation of a collection hood of conical shape. This hood is further connected to APCD with the help of ducting, to contain the concentration of particulate matter within the norms fixed by the Board. The air pollution control systems generally consist of wet scrubber or bag filters house etc. The present collection system installed by the industry is not adequate to collect the entire emissions due to which apart of emissions escape into the atmosphere resulting into air pollution in the area. Therefore, there is a need to upgrade to evolve proper collection system for the said purpose. Indian Institute of Technology, Roorkee has been engaged by the Punjab Pollution Control Board for redesigning / modifying the existing collection mechanism and air pollution control systems. The cost of this project is Rs. 7.87 lacs and is likely to be completed by 31/8/2010. The Board will also undertake installation of demonstration plants (redesigned / modified air pollution control systems) in two

induction furnace units at Mandi Gobindgarh. The estimated cost of these demo units is Rs.55.00 lacs. The project is likely to be completed 31.3.2011. After the successful implementation of the above said projects, the existing induction furnaces will be asked to duplicate the same in a time bound manner.

### **Installation of Online Monitoring System**

The Board is also persuing to install GPS-GIS based on-line monitors for the large scale highly polluting industries. A pilot project for installation of online monitors for the measurement of pH, DO and ammonia parameters of the treated wastewater has been proposed for M/s National Fertilizer Ltd., Naya Nangal as the area being a sensitive eco-zone. The proposed date of commissioning of the pilot project is 30/9/2010. After the successful commissioning of the online monitors at the said industry, the online monitoring system shall be made mandatory for the large scale highly polluting industries in Ludhiana city in a time bound manner.

### **Regular Monitoring**

- i) All the large scale electroplating units in Ludhiana will be persuaded to achieve zero liquid discharge by 30/9/2010.
- ii) No small scale electroplating unit will be allowed to discharge industrial effluent into sewer and it will be ensured that no electroplating effluent shall be diverted and the entire effluent shall reach the Common Effluent Treatment facility, which has been made operational under PPP mode for treatment of electroplating effluent.
- iii) All the dyeing / printing and washing units will be monitored so as to achieve the standards prescribed for discharges into inland surface water bodies.
- iv) No pickling unit will be allowed to dispose off spent acid into sewer and will be persuaded to join authorised recycler for recovery of  $\text{FeSO}_4$  from spent acid of pickling section. Besides, the spent acid being generated by the battery manufacturing units will also not be allowed to discharge into



sewerage system and all such units will be pursued to make agreement with the registered recyclers, to ensure proper disposal of the same by 31/3/2011.

- v) The air polluting industries will be monitored by the Punjab Pollution Control Board regularly, so as to ensure that only authorized fuel is used and compliance of the emissions standards achieved.
- vi) All the water and air polluting industries will be pursued to interlock their pollution control devices with the main manufacturing process, wherever feasible, so as to ensure regular and continuous operation of the same.
- vii) No unit will be allowed to dispose off any hazardous waste in any uncontrolled / environmentally unsound manner. All the industries will be persuaded to shift their storageable hazardous waste to common Treatment, Storage and Disposal Facility by 31/12/2010.
- viii) The Board will monitor all the health care establishments so as to ensure that the entire bio-medical waste shall be properly collected, segregated and treated at the common bio medical waste facility.
- ix) Preparation of inventory of E-Waste will be carryout as per the guidelines as and when received.
- x) In order to control emissions/ noise from D.G. sets installed by the industry, industry will be pursued to install silent type D.G. sets with canopy by 30/6/2011.

### **Upgradation of Air & Water Monitoring Network**

The Punjab Pollution Control Board will continue to carry out regular monitoring of ambient air quality, surface water and ground water. The Punjab Pollution Control Board also intends to install 8 no. piezo-metric wells at various locations in Ludhiana city for monitoring of ground water quality. At present, the Board does not have sufficient manpower and adequate laboratory facilities at Ludhiana, which may be matching to the criteria fixed by the CPCB/ MoEF regarding monitoring of industries, analysis of water, air and ground water parameters. The capacity enhancement of the various infrastructure facility at

Ludhiana is need of the hour. Therefore, the Board proposes to enhance the infrastructure facility as per the following:

S.N.	Head	Description	Cost (Rs. in lacs)
1.	<b>Equipments</b>	Upgradation of Zonal Laboratory, Ludhiana	70
		Dedicated Mobile Lab	22
		4 vehicles for increased surveillance	25
		10 ambient air monitoring kits (HVS) for monitoring of all the parameters as prescribed in new ambient air quality standards vide notification dated 16/11/2009	50
		Fugitive emission detectors	20
		4 no. vehicular emission testing kits (diesel as well as petrol)	12
		8 no. DB meter	16
		Installation of 8 peizo-metric wells at Ludhiana city	10
		<b>Total</b>	
2.	Operation and maintenance cost of equipments and vehicles for five years	@ 20% per year of the capital cost.	Rs. 43 Lacs per year
3.	Manpower requirement on contract basis for five years	• 4 Jr. Scientific Officer	15
		• 6 Scientific Assistant	15
		• 8 Field Attendant	12
		• 5 Drivers	09
<b>Total</b>			<b>Rs. 51 Lacs (for each year)</b>
4.		Total fund requirement during the implementation of Action Plan for five years	=> 225 + 43 x 5 + 51 x 5 <b>= 695 Lacs</b>

With the availability of above infrastructure, the Board will be in position to increase the frequency of the monitoring and maintenance of data. The above requirement of funds is for the first year of the implementation of the Ludhiana Action Plan. At the kick off of the Action Plan, funds to the tune of the Rs. 3.09 Crores will be required. Subsequently, Rs. 0.94 Crores will be required every year for the next four years. The staff required for the plan will be employed on contract basis for five years. The request is made for making funds available from Ministry of Environment & Forests/ Central Pollution Control Board/ Financial Institutions for upgradation of the monitoring infrastructure.

### **3.3.4 DEPARTMENT OF TRANSPORT**

#### **Improvement in Public Transport System and phasing out of old polluting transport vehicles**

There is tremendous increase in the traffic on the roads of the Ludhiana due to industrial growth. This kind of activity has not only increased the use of more petrol/diesel but also has become the source of generation of emissions into the environment and consequently there is degradation in the quality of the environment. Thus, there is a need to improve the public transport system. The Deptt. of Transport in collaboration with Municipal Corporation, Ludhiana has proposed to start city bus service by 31/12/2010. The cost of project will be 27.0 Crores and will consist of 40 low floor buses in the first phase. The second phase of the project will be implemented by 30/6/2011 with total project outlay of 66.0 Crores. With the implementation of the City Bus Service scheme, the dependence of the residents on the auto rickshaws and their individual vehicles will reduce. Moreover, the auto rickshaws will be automatically phased out being not economically feasible.

The motor vehicle inspector has been instructed not to pass any vehicle, which has completed its fixed life in years if the same is not found to be roadworthy. A detailed phase out plan is being prepared to replace the existing diesel driven auto rickshaws by either CNG or LPG driven auto rickshaws. The vehicles

especially the three wheelers using adulterated fuel will be impounded and check on adulteration will be carried out on fuel stations regularly.

### **Effective traffic management**

In order to improve upon, the traffic management in Ludhiana city, the Deptt. of Transport will prepare a plan for traffic management. The plan will include provisions of traffic lights, notification of one way traffic, designation of area for parking of vehicles, drive for challan of polluting vehicle etc. by 30/9/2010 and the same will implemented by 31/12/2010. The traffic management plan will be implemented and upgraded on a continuous basis.

### **Use of cleaner fuels / CNG**

At present, there are only two outlets of LPG, which are functional in Ludhiana. These outlets are insufficient to cater to the need of consumers. The Local Transport Department, Ludhiana has issued 400 permits to LPG driven auto rickshaws. Efforts are being made to open more CNG or LPG outlets at Ludhiana so as to facilitate the switching of commercial vehicles to the CNG or LPG fuels. Gas Authority of India Ltd. (GAIL) is laying a CNG pipeline from Dadri to Nangal, which will pass nearby Ludhiana which will enable easy transportation and distribution through company outlets in Ludhiana. This gas pipeline project is likely to be completed during the next 2 years. It will facilitate the availability of CNG outlets in and around Ludhiana in the near future.

### **Regular monitoring of the vehicles**

The Department of Transport undertakes regular monitoring of vehicles and only vehicles with Pollution under Control Certificate are allowed to operate on the roads. The vehicles, without Pollution under Control Certificate, are challaned on a regular basis.

### **Banning on Pressure Horns**

Vehicles with pressure horns are being challaned by the Police as well as Transport Department on a regular basis.

### **3.3.5 DEPARTMENT OF POLICE**

#### **Increased monitoring of vehicles running without PUC certificate**

There are lot of vehicles in Ludhiana city running without PUC certificates. The Department of Police undertakes drives for challan of vehicles running without PUC certificates on a continuous basis.

#### **Improved traffic management and upgrading traffic lights**

There is a need for identification of cross sections/ points where the traffic lights need to be introduced with time controllers for better control of traffic. By introducing the time controllers, the fuel consumption of the vehicles may also be minimized. The Police Department will undertake such a study for Ludhiana for implementation of proper traffic management plan by 30/9/2010.

#### **Implementation of Noise Pollution (Regulation & Control) Rules, 2000**

The department shall ensure the proper implementation of Noise Pollution (Regulation & Control) Rules, 2000 for control of pollution from D.G. set and other non point sources.

### **3.3.6 DEPARTMENT OF FORESTS**

#### **Increasing of Forest / Green Cover**

In order to improve the green cover, in and around the Ludhiana, the Deptt. of Forest has formulated greening Ludhiana Action Plan for 2010-11, which include identification of plantation site, selection and choice of species, ornamental and aesthetic requirements etc. The Industrial Focal Point, Dhandari Kalan has been taken priority area for plantation of trees on roadside, parks and other common places. 50,000 saplings will be provided free of cost by Deptt. of Forests through its nurseries to Educational Institution and NGOs for plantation on public/ private lands. Total area to be covered by the Forests Department will be 199.94 hectares in Ludhiana District. The estimated project cost is 6.70 Crores.

### **Training / Workshops / Seminars / Awareness Camps for increasing green cover**

In order to increase the green cover in Ludhiana area, there is a requirement of giving trainings to the public / school children and other Government Organizations. Workshops / Seminars / Awareness camps may be conducted atleast two or three times in a year, so that the public may be educated and motivated to increase green cover in the city. The component of awareness has been added in the greening Ludhiana Action Plan.

### **Providing plants / sampling free of costs**

The department will provide plants / sampling free of cost to the general public and the NGOs to encourage them for increase in the green belts within city limits under the Greening Ludhiana Action Plan 2010-11.

### **Systematic study of Flora & Fauna and to prepare inventory for the same**

The department is being asked to carryout systematic study of Flora & Fauna and to prepare inventory for the same.

### **3.3.7 PWD (B & R)**

#### **Construction of Bye-pass alongside Sidhwan Canal**

The vehicular traffic has been identified to be one of the major sources of air pollution contributing to the deterioration of environment of Ludhiana city. The vehicles coming from towns on different sides of Ludhiana and destined to other cities pass through the city limits emitting pollutants and impacting the environment. There is an urgent need to develop some kind of ring road all around Ludhiana urban limits so as to ease out this traffic pressure on the Ludhiana city itself.

The Deptt. of PWD (B & R) has already initiated process for four lanning of road along Sidhwan Canal from Doraha to Ludhiana-Ferozepur Road known as

Southern Bye Pass Ludhiana having approximate length of 26.9 Km. The total project cost is 416 Crores and is likely to be completed by 28/2/2012. About 10-15% construction work has already been completed. This will go a long way in easing out the traffic in the heart of the city.

### **Improvement in the road condition and provision of green belt along the road**

For smooth flow of traffic and to avoid any crowd and reduction in the consumption of fuel and consequently decrease in the pollution level, it is utmost essential that the roads be widened to the extent possible and duly carpeted. The damaged roads must be repaired and re-carpeted. The plantation is carryout along the road side as per the availability of land. The PWD (B & R) department is undertaking such activities under its jurisdiction on a regular basis.

#### **3.3.8 DISTRICT ADMINISTRATION, LUDHIANA**

The District Administration, Ludhiana will continue to monitor the implementation the various development schemes of the Government in a time bound manner so as to improve upon the environment of Ludhiana city.

- i) To act as facilitator for installation of common effluent treatment plant for dyeing industries.
- ii) To impose complete ban on the stubble burning within the 10 Km from the periphery of Ludhiana city on every cultivating season.
- iii) Continuous monitoring regarding the use of loud speaker and sound system by the religious places and marriage palaces.

#### **3.3.9 DEPARTMENT OF AGRICULTURE**

The Department of Agriculture shall propagate sustainable technology for the bio-methanization of the agricultural waste including the compost facilities so as to avoid un-controlled burning of agricultural residue and emitting of gases like methane. The department is already undertaking demonstration of rotavators, zero till drill and happy seeders in order to provide technologies for tilling of land without restoring to the burning of crop residue. The farmers are provided

happy seeder at 20% subsidy under the Macro Management of Agriculture scheme (MMA)/ National Food Security Mission. Also, Punjab Energy Development Agency has signed MoU with different companies for setting up of bio-mass based power projects of capacity 300 MW in Punjab. It is estimated that about 1 million Tonne of paddy straw will be consumed after the establishment of these projects, which are at the advance stage of implementation. Three bio-mass based generation projects of 28.5 MW capacity have already been commissioned in the State. The department will also undertake a campaign in the rural areas of Ludhiana city through print as well as electronic media to make the farmers aware regarding the ill effects of stubble burning. The Punjab Pollution Control Board has also prepared documentaries on the ill effects of stubble burning which is being shown to rural population through different establishments / organizations.

### **3.3.10 PUNJAB STATE COUNCIL FOR SCIENCE & TECHNOLOGY**

The Punjab State Council for Science & Technology will take necessary steps for evolving cleaner technologies for abatement of pollution at the source by installing pilot plants so as to encourage entrepreneurs.

### **3.3.11 CENTRAL GROUND WATER AUTHORITY**

The authority shall take adequate steps to overcome the over exploitation of ground water.

### **3.3.12 DEPARTMENT OF HEALTH & FAMILY WELFARE**

The Department shall plan to carryout Health Study in and around Ludhiana during the implementation of the Action Plan in order to understand the impact of abatement of pollution on the health of the residents of Ludhiana. In the study, biannual health camps will be organized in different locations of Ludhiana, wherein, the data regarding the ailments prevailing among the population related to pollution problems will be collected. Two camps each shall be organized in different localities like industrial area, slum areas and city areas separately. The first such camps will be organized in the month of August 2010 and thereafter in January 2011 followed by camps at six months interval. The



Punjab Pollution Control Board is also exploring the idea of giving the detailed health impact study to some reputed agency in Ludhiana for which the Board has identified Christian Medical College, Ludhiana and ESIC Model Hospital, Ludhiana. The health study will be got conducted by 30.9.2011.

### 3.4 TIME LINE FOR IMPLEMENTATION OF ACTION PLAN

S. No.	Name of the Department	Main Areas	Target date
1.	Deptt. of Industries and Commerce/ Punjab Small Industries & Export Corporation	Installation and Commissioning of 3 CETPs for dyeing clusters. (Refer 3.3.1, Page 39)	<ul style="list-style-type: none"> <li>➤ Selection of Technical Consultant for preparation of DPR by 31/7/2010.</li> <li>➤ Land identification for installation of CETP at Tajpur Road by 31/8/2010.</li> <li>➤ Preparation of DRP by 30/9/2010.</li> <li>➤ Finalization of main Contractor by 31/10/2010.</li> <li>➤ Construction and commission of CETP at Tajpur Road by 31/12/2011.</li> <li>➤ Construction and commission of CETP at Bahadurke Road by 31/12/2011.</li> <li>➤ Construction and commission of CETP at Bhattian by 31/3/2012.</li> </ul>

		Scout for improved technologies. (Refer 3.3.1, Page 41)	Continuous
		Awareness creation to increase green cover in industrial areas. (Refer 3.3.1, Page 42)	Continuous
		Shifting of industries, which are located in the non-designed areas, to the designated areas. (Refer 3.3.1, Page 42)	As per zoning regulation of Master Plan, Ludhiana
		Provision of environment infrastructure in the various industrial estates and Focal Points in Ludhiana city including wastewater treatment facilities, improved water supply, road infrastructure, parking facilities and green cover within the industrial areas alongwith development of buffer zone along the residential areas. (Refer 3.3.1, Page 42)	➤ Continuous
2.	Department of Local Bodies	Upgradation of existing sewage treatment plants. (Refer 3.3.2, Page 42)	30/9/2011
		Laying of sewer lines in remaining areas and connecting with the sewage treatment facilities.	30/6/2012

		(Refer 3.3.2, Page 43)	
		<p>Control of water pollution from dairy complexes located at Tajpur Road and Humbran Road and shifting of individual dairies located in the city limits to a suitable site outside MC limits and provide with adequate infrastructure including effluent treatment plant and disposal of treated effluent.</p> <p>(Refer 3.3.2, Page 44)</p>	<ul style="list-style-type: none"> <li>➤ Installation of effluent treatment plant and providing proper arrangement for the treated wastewater for the two dairy complexes by 31/12/2010.</li> <li>➤ Identification of site for shifting of scattered dairies by 31/12/2010.</li> <li>➤ Preparation of DPR for new dairy complex by 31/12/2010.</li> <li>➤ Floating of RFP for new dairy complex by 31/3/2011.</li> <li>➤ Development of dairy complex alongwith environmental infrastructure by 30/9/2011.</li> <li>➤ Shifting of scattered dairies by 31/12/2011.</li> </ul>
		Development of Engineered Municipal Solid Waste dump site and compliance of	➤ RFP finalization for municipal solid waste handling and

	<p>provisions of the Municipal Solid Waste (Management &amp; Handling) Rules, 2000. (Refer 3.3.2, Page 44)</p>	<p>management by 31/7/2010.</p> <ul style="list-style-type: none"> <li>➤ Door to door collection and commission of facility by 31/3/2011.</li> </ul>
	<p>To prepare and implement time target Remediation Plan for the dump sites located at Vill. Jamalpur and Vill. Jainpur, where the contamination soil and ground water has been found as per Environmental Site Assessment carryout by the M/s Tetra Tech (India) Ltd., New Delhi. (Refer 3.3.2, Page 44)</p>	<ul style="list-style-type: none"> <li>➤ Preparation and finalization of remediation plan by 30/09/2010.</li> <li>➤ Implementation of remediation plan by 30/09/2011.</li> <li>➤ Regular monitoring of ground water in the vicinity of dump sites.</li> </ul>
	<p>Improvement of road infrastructure for better and smooth traffic movement. (Refer 3.3.2, Page 45)</p>	<p>Continuous</p>
	<p>Upgrading traffic lights for smooth traffic movement. (Refer 3.3.2, Page 45)</p>	<ul style="list-style-type: none"> <li>➤ Identification of congested traffic cross-sections by 30/09/2010.</li> <li>➤ Upgradation and implementation of plan by 31/12/2010.</li> </ul>
	<p>Steps for compulsory installation of rainwater harvesting structure by the</p>	<p>Continuous</p>

		different establishment within the city. (Refer 3.3.2, Page 45)	
		Improvement of sanitation conditions in slum areas (Refer 3.3.2, Page 46)	Continuous
		Increasing green cover in city and provisions of green belt/ buffer zones separately industrial areas from residential zones. (Refer 3.3.2, Page 46)	<ul style="list-style-type: none"> <li>➤ First phase of plantation by 31/8/2010.</li> <li>➤ Second phase of plantation by 28/2/2011.</li> <li>➤ Plantation shall be done regularly.</li> </ul>
3.	Punjab Pollution Control Board	Installation of CETP for Dyeing Units (Refer 3.3.3, Page 47)	Regular persuasion
		Implementation of Standards for treated wastewater at the outlet of CETP. (Refer 3.3.3, Page 47)	Continuous monitoring
		Monitoring of the capacity enhancement of the existing sewage treatment plant. (Refer 3.3.3, Page 47)	Regular persuasion
		Installation / upgradation of effluent treatment plants and air pollution control devices installed by the industries so as achieve the prescribed standards, wherever required.	<ul style="list-style-type: none"> <li>➤ The industries, which have not installed effluent treatment plants and air pollution control devices, will be</li> </ul>

		(Refer 3.3.3, Page 48)	<p>persuaded to install the same by 31/12/2010.</p> <ul style="list-style-type: none"> <li>➤ Major upgradation in the effluent treatment plants and air pollution control devices will be got carried out by 31/12/2010.</li> <li>➤ Minor upgradation in the effluent treatment plants and air pollution control devices will be got carried out by 30/9/2010.</li> </ul>
		<p>Ensuring proper management and handling of hazardous waste. (Refer 3.3.3, Page 48)</p>	<ul style="list-style-type: none"> <li>➤ All the industries will be persuaded to shift their storageable hazardous waste to common TSDF by 31/12/2010.</li> <li>➤ M/s Nimbuan Greenfield (Punjab) Ltd. will be persuaded to shift the incinerable waste by 30/9/2010 to other facilities and further be</li> </ul>

			asked to install incinerator at the facility by 31/3/2011 on BOOT basis.
		Achievement of zero liquid discharge technology by large & medium scale electroplating industries. (Refer 3.3.3, Page 49)	30/9/2010
		Upgradation of emission collection system of Induction furnaces. (Refer 3.3.3, Page 49)	<ul style="list-style-type: none"> <li>➤ Preparation of technical report by IIT, Roorkee by 30/9/2010.</li> <li>➤ Installation of Pilot Plant by 31/12/2010.</li> <li>➤ Duplication of technology by 30/6/2011.</li> </ul>
		Monitoring/ ensuring the regular operation of effluent treatment plants and air pollution control devices installed by industries/ establishments. (Refer 3.3.3, Page 50)	Continuous
		Preparation of inventory of E-Waste. (Refer 3.3.3, Page 50)	31/3/2011

		Monitoring of ambient air quality, ground water and surface water quality. (Refer 3.3.3, Page 50)	Continuous monitoring of ambient air, monthly monitoring of ground and surface water will be carried out.
		Upgradation of Air and Water Monitoring network. (Refer 3.3.3, Page 51)	31/3/2011
4.	Department of Transport	Plan for effective traffic management including provisions of traffic lights, notification of one way traffic, parking of vehicles at the designated place challan of polluting vehicles etc. (Refer 3.3.4, Page 53)	➤ Traffic Management plan to be prepared by 30/9/2010 and implementation of plan shall be continuous.
		Improvement in public transport system and phasing out of old polluting commercial transport vehicles especially auto/ vikrams. (Refer 3.3.4, Page 53)	<ul style="list-style-type: none"> <li>➤ First phase of city Bus service to start by 31/12/2010.</li> <li>➤ Second phase to be implemented by 30/6/2011.</li> <li>➤ Phasing out of polluting / old commercial transport vehicles shall be continuous.</li> </ul>
		Plan for shifting to cleaner fuels viz. CNG etc. (Refer 3.3.4, Page 54)	➤ To prepare plan for shifting to cleaner fuels like LPG & CNG by 31/12/2010.
		Monitoring of Vehicles. (Refer 3.3.4, Page 54)	Continuous



		Banning of pressure horns. (Refer 3.3.4, Page 54)	Continuous implementation
		Checking on usage of adulterated fuel and impounding of such vehicles. (Refer 3.3.4, Page 54)	Continuous
5.	Police Department	Increased monitoring of vehicles running without pollution under control certificate. (Refer 3.3.5, Page 55)	Continuous
		Formation and implementation of proper traffic management plan for smooth flow of traffic. (Refer 3.3.5, Page 55)	30/9/2010
		Implementation of the Noise Pollution (Regulation & Control) Rules, 2000 for control of noise from D.G. sets and other non-point sources. (Refer 3.3.5, Page 55)	Continuous
6.	Department of Forests	Preparation of afforestation plan for increasing forest/green cover in areas under their jurisdiction. (Refer 3.3.6, Page 55)	<ul style="list-style-type: none"> <li>➤ Identification of vacant land and preparation of plan by 31/07/2010.</li> <li>➤ First major drive for plantation by 31/8/2010.</li> <li>➤ Second major drive for plantation by</li> </ul>

			28/2/2011.
		Rendering training/ seminars/ awareness camps for increasing green cover in city. (Refer 3.3.6, Page 56)	Continuous
		Providing more plants/ saplings free of cost in Ludhiana. (Refer 3.3.6, Page 56)	Continuous
		A systematic study to keep the track of status of flora and fauna and to prepare inventory for the same. (Refer 3.3.6, Page 56)	31/3/2011
7.	PWD (B & R)	<ul style="list-style-type: none"> <li>➤ Construction of bye-pass along Canal (Refer 3.3.7, Page 56)</li> <li>➤ Improvement in road conditions and provisions of green belt along the road. (Refer 3.3.7, Page 57)</li> </ul>	<ul style="list-style-type: none"> <li>➤ 28/2/2012</li> <li>➤ Continuous</li> </ul>
8.	District Administration	To act as facilitator for installation of common effluent treatment plant for dyeing industries. (Refer 3.3.8, Page 57)	Continuous and regular.
		To impose complete ban on the stubble burning within the 10 Km from the periphery of Ludhiana city.	Every cultivating season

		(Refer 3.3.8, Page 57)	
		Regulation on use of loud speaker and sound system by the religious places and marriage palaces within permissible limits of Noise Pollution (Regulation & Control) Rules, 2000. (Refer 3.3.8, Page 57)	Continuous monitoring
9.	Department of Agriculture	Promotion of bio-methanization and compost facilities for the agricultural residue and awareness regarding ill effects of stubble burning. (Refer 3.3.9, Page 57)	Continuous
10.	Punjab State Council for Science and Technology	Evolving of cleaner technologies and installation of pilot plants for improved effluent/ emissions treatment technologies. (Refer 3.3.10, Page 58)	Continuous
11.	Central Ground Water Authority	To stop the over exploitation of ground water. (Refer 3.3.11, Page 58)	➤ To make the masses aware regarding exploitation of ground water by using print as well as electronic media by 30/9/2010.

12.	Department of Health & Family Welfare	Organization of Health Camps (Refer 3.3.12, Page 58)	➤ First phase will be started in August 2010. Thereafter in January 2011 followed by every six months.
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With the implementation of the above Action Plan, it is expected that the major environmental problems being faced by Ludhiana will be addressed by 31/12/2011 and it will go a long way in improving the environments of Ludhiana city making it healthy as well as green.

## CHAPTER-4

### FINANCIAL ASPECTS OF LUDHIANA ACTION PLAN

To implement the Ludhiana Action Plan for abatement of pollution, a lot of infrastructure as well as capacity enhancement activities at the organization level will be required to be undertaken. The various components of the Action Plans have already been discussed in the previous chapters. A comprehensive summary of the financial outlay of the Ludhiana Action Plan will be as under:

Sr. no.	Proposed Activities	Executing Agency	Finance required (In Crores)	Status of Project
1.	Upgradation of existing sewage treatment plants facilities and Laying of sewer line in the remaining area	Deptt. of Local Bodies/ Punjab Water Supply & Sewerage Board	268.00	Project under progress under JNNURM scheme of Government of India.
2.	Construction and commissioning of common effluent treatment plant of capacity 100 MLD for Tajpur Cluster	Deptt. of Industries & Commerce/ Punjab Dyers Association	200.00	EOI for engagement of consultant for DPR preparation has been floated by Department of Industries & Commerce. Financial assistance is being sought under IIUS scheme of Govt. of India.
3.	Construction and commissioning of common effluent treatment plant of capacity 15 MLD alongwith co-generation plant for Bahadurke Cluster	Deptt. of Industries & Commerce/ Bahadurke Industries Association	122.00	Project submitted to CPCB/ NEERI, Nagpur for comments. A project will be submitted to Ministry of Industries, GOI under IIUS by 31/7/2010.

4.	Construction and commissioning of common effluent treatment plant of capacity 15 MLD for Bhattian Cluster	Deptt. of Industries & Commerce/ Bahadurke Industries Association	25.00	Land identified process will be completed by 31/12/2010. Financial assistance is being sought under IIUS scheme of Govt. of India.
5.	Installation of incinerator at common Treatment, Storage and Disposal Facility at Nimbuan	M/s Nimbuan Greenfield (Punjab) Pvt. Ltd.,	23.00	DPR for the project is under preparation.
6.	Upgradation of Air & Water Monitoring Network	Punjab Pollution Control Board	6.95	DPR for the project is under preparation. <b>Request for funds under this Action Plan.</b>
7.	Providing new dairy complex with environmental infrastructure	Deptt. of Local Bodies/ Punjab Water Supply & Sewerage Board	50.00	DPR for the project has been prepared. RFP is to be floated by July, 2010.
8.	Development of engineered municipal solid waste dump site	Deptt. of Local Bodies/ Punjab Water Supply & Sewerage Board	4.00	DPR for the project is under preparation. Financial assistance is being sought under JNNURM scheme of Govt. of India.
9.	Remediation plan for the contaminated dump site	Deptt. of Local Bodies/ Punjab Water Supply & Sewerage Board	1.00	DPR for the project is under preparation. Financial assistance is being sought under JNNURM scheme of Govt. of India.

10.	Improvement of Road Infrastructure & traffic lights etc.	Municipal Corporation, Ludhiana	170.00	Municipal Corporation, Ludhiana project.
11.	Increase in the green cover in and around Ludhiana city	Municipal Corporation, Ludhiana and Deptt. of Forests	6.70	Department of Forests Project.
12.	Improvement in Public Transport System	Municipal Corporation, Ludhiana	66.00	Project under progress under JNNURM scheme of Government of India.
<b>Total</b>			<b>942.65</b>	

## CHAPTER-5

### EXPECTED IMPACT ON THE COMPREHENSIVE ENVIRONMENT POLLUTION INDEX

The present action plan for abatement of pollution in the critically polluted area of Ludhiana City has been prepared keeping in view the present environmental quality based on the Comprehensive Environment Pollution Index (CEPI). The CEPI score for Ludhiana City has been observed to be 81.66, which is cumulative score of the environment pollution index calculated for the Air (68.0), Water (66.0) and Land (64.75), separately.

While calculating the score for Comprehensive Environment Pollution Index for Air Environment Quality for Ludhiana, pollutants like Lead (Pb), Benzopyrene and Arsenic (As) have been taken as the critical pollutants. These critical pollutants belong to Group-C of pollutants, which are known carcinogens or chemicals with significant systematic or organ system toxicity. The Exceedence Factor in regard to Benzopyrene and Arsenic has been observed to be more than 1.5. However, no evidence of loss of flora/ fauna/ significant damage to ecological features has been observed. The whole of the population residing in Ludhiana City has been observed to be potentially affected and the level of exposure has been observed to be critical. The additional high risk element has been assigned due to lack of common action plan for control of the pollutants. The presence of these critical pollutants is basically related with the pollution caused mainly due to the vehicular traffic & to some extent from the industries.

The Comprehensive Environment Pollution Index calculation for Water Environment Quality has considered BOD, Mercury and Fluoride as the critical pollutants. BOD and Fluoride belongs to Group-B of the pollutants, which are organics that are probably carcinogens, whereas Mercury relates to Group-C pollutants. The above critical pollutants have been identified as per the data provided by SGS India Pvt. Ltd., which has collected two samples of the surface



water, one from the River Sutlej near Toll Plaza, Ludhiana and another from a pond near Focal Point, Phase-V, Ludhiana. The ambient pollutant concentration has been calculated to be critical as the Exceedence Factor is more than 1.5. Some evidence of symptoms of exposure on the eco-geological features has been reported. As stated above earlier, the whole of the population of Ludhiana has been taken as the sensitive receptor as the level of exposure has been found to be critical. Due to non-availability of the common facilities such as the CETP as well as inadequate treatment of the domestic effluent has been considered as the additional high risk factor. Thus, the high score of water Environment Pollution Index indicates the requirement of installation of adequate common effluent treatment facilities both for the industrial as well as the domestic effluent in order to improve the water environment quality.

The high score of Land CEPI is due to the presence of BOD, Mercury and Cadmium in the ground water of Ludhiana. The samples have been collected by SGS India Pvt. Ltd. at two locations i.e. borewell near Narindera Nagar, Ludhiana and the other one near Tata Motors, Dholewal Chowk, Ludhiana. Symptoms of exposure and adverse impact on eco-geological features, has also been reported.

On perusal of the above discussion, it has been observed that the air, water and land environment of the Ludhiana City has been impacted mainly due to the pollution caused by vehicular movement, industrial combustion and lack of common effluent treatment plant, engineered common municipal solid waste disposal site.

The Action Plan has been prepared keeping in view all the above factors impacting the environment. Action Plan includes installation of the common effluent treatment facilities for dyeing industries, electroplating industries as well as capacity enhancement of the sewage treatment plants for the domestic effluent, development of engineered common municipal solid waste treatment and disposal site, improvement/ upgradation in the pollution control devices

installed by the various industries and management of the vehicular traffic. With the implementation of the Action Plan, majority of the pollutants reported to be critical will reduce significantly resulting in the overall improvement of the environment in the area.

The Punjab Pollution Control Board expects that the Comprehensive Environmental Pollution Index score will come down to 46.09 with the implementation of the Action Plan. The detailed calculation regarding the expected Comprehensive Environmental Pollution Index at the end of different time lines are annexed as per Annexure A, B, C, D & E. The comparative chart of the expected CEPI Score after the implementation of action plan is annexed as per Annexure-F.

## **CHAPTER-6**

### **RECOMMENDATIONS**

The Action Plan for abatement of pollution in critically polluted area of Ludhiana city, will be implemented within the municipal limits of Ludhiana with a special emphasis to the pollution control in the industrial clusters. The various sources of pollution effecting the environment of Ludhiana have been identified in the Action Plan, which mainly includes water pollution, air pollution and ground water pollution. The areas of work for different departments with time frame have also been mapped out. The major requirements for the improvement of the environmental parameters are upgradation of the sewage treatment facilities, installation of common effluent treatment plants for dyeing units, installation of engineered municipal solid waste treatment and disposal site, diversion of the vehicular traffic from the congested areas of the city and the regular monitoring of the industrial discharges / emissions alongwith the ambient water and air quality.

Some funds are being requested through this Action Plan. It is requested that the funds may be provided immediately for the speedy and time bound implementation of the Action Plan.

In order to monitor the implementation of the Action Plan, a High Level Steering Committee of all the stakeholders i.e. the participating departments, representative of SPV / Industrial Association will be constituted under the chairmanship of the Chief Secretary, Govt. of Punjab. The Steering Committee shall meet on quarterly basis to monitor the progress of implementation of the Action Plans.

In the mean while, the Department of Industries & Commerce through its arms shall prepare an infrastructure scheme to facilitate the shifting of industries located in the non-designated areas of Ludhiana city alongwith proper environmental infrastructure before the stipulated time frame given in the zoning regulations of Master Plan Ludhiana and implement the same.

The Action Plan will be displayed on the website of the Punjab Pollution Control Board to facilitate the assessment of the implementation in the public domain.

Regarding the moratorium on the establishments of new/ expansion industries in the project area, the following recommendations are made:

- (i) Moratorium on establishment and expansion of industries falling under the following Red Categories of industries as defined vide Board's circular No.GPC/NIP/F-10/2010/4 dated 17.2.2010 will be imposed within the municipal limits of Ludhiana city till 31/12/2010. However, the Govt. of Punjab may review the decision on moratorium after 31/12/2010 based on progress in the implementation of Action Plan:

**(I) Part-A categories (17 category highly polluting industries)**

**(II) Part-B categories** as under:

- (a) Industrial process involving electroplating operations.
  - (b) Industrial process involving foundry operations.
  - (c) Yarn and Textile processing involving scouring, bleaching, dyeing, printing.
  - (d) Lead re-processing & manufacturing including lead smelting.
  - (e) Steel and steel products including coke plants involving use of any of the equipments such as blast furnaces, open hearth furnace, induction furnace or an arc furnace etc. or any of the operations or processes such as heat treatment, acid pickling, rolling or galvanizing etc.
  - (f) Ferrous and Non-Ferrous Metal Extraction, Refining, Melting, Smelting, Coating, Forging, Alloy making process etc.
- (ii) The remaining red category industries and orange category industries identified by the Board, will be allowed to establish or expand after detailed scrutiny with proposal for reuse/ recycle/ recovery of wastes, within the designated industrial areas.
  - (iii) All the green category of industries will be allowed to establish or expand within the designated industrial areas.

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## ANNEXURE-A

### Calculation details of Expected CEPI after the implementation of Action Plan of Ludhiana (Punjab)

#### I. Calculation of Air CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2010		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
Pollutants	Category		Pollutants	Category	
Pb	C		Pb	C	
Benzopyrene	C		Benzopyrene	C	
As	C		As	C	
<b>A1 = 6</b>			<b>A1 = 6</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 6 x 5 = 30</b>			<b>A = 6 x 5 = 30</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Exepcted Exceedence Factor
Pb	0.25	0.5	Pb	-	More than 1.5
Benzopyrene	7.145	7.145	Benzopyrene	-	
As	39.45	6.575	As	-	
*Source: SGS DATA by CPCB, Annexure I-Table 1			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 6 + 2.0 (Penalty) = 8.0</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>			<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>		
<b>B = 8</b>			<b>B = 8.0</b>		

<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17, 50, 000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		
<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>SNLF</b>	<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>Expected SNLF</b>
Pb	0/2 x 0.5	0	Pb	-	≥ 0.5
Benzopyrene	1/2 x 7.145	3.57	Benzopyrene	-	
As	2/2 x 6.57	6.57	As	-	
<b>C2 = 4</b>			<b>C2 = 4.0</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 20</b>			<b>C = 20</b>		
<b>D = 10 (common treatment facilities are not existing)</b>			<b>D = 10</b>		
<b>Air CEPI = 68.0</b>			<b>Expected Air CEPI = 68.0</b>		

## II. Calculation of Water CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>		<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2010</b>	
<b>(a) Pollutants</b>		<b>(a) Pollutants</b>	
<b>Pollutants</b>	<b>Category</b>	<b>Pollutants</b>	<b>Category</b>
BOD	B	BOD	B
Hg	C	T.Colli.	B
F	B	F	B
<b>A1 = 5.5</b>		<b>A1 = 2.0 + 1.0 = 3.0</b>	
R17	76	R17	76
R54	2685	R54	2685
<b>A2 = 5</b>		<b>A2 = 5</b>	
<b>A = 5.5 x 5 = 27.5</b>		<b>A = 3 x 5 = 15</b>	

(b) Pathway			(b) Pathway		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	17	1.4	BOD	-	1 – 1.5
Hg	0.128	128.5	T.Colli.	-	
F	0.2	0.33	F	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 2 = 5</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 8</b>		
(c) Receptor			(c) Receptor		
Population Exposed: 13, 95, 053			Population Exposed: 17,50,000		
<b>C1 = 5</b>			<b>C1 = 5</b>		
Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 3.4	0	BOD	-	0.25 – 0.5
Hg	2/2 x 128.5	3.57	T. Colli.	-	
F	0/2 x 0.33	6.57	F	-	
<b>C2 = 3.5 (Conservative Score ; actual score for C2=4)</b>			<b>C2=2.0 + 1.5 = 3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 17.5</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 10 (common effluent treatment plant for electroplating industries has already been made operational)</b>		
<b>Water CEPI = 66.0</b>			<b>Expected Water CEPI = 50.5</b>		

### III. Calculation of Land CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2010		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
<b>Pollutants</b>	<b>Category</b>		<b>Pollutants</b>	<b>Category</b>	
BOD	B		TDS	B	
Hg	C		Nitrate	B	
Cd	C		Chloride	B	
<b>A1 = 5.75</b>			<b>A1 = 2+1 =3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 5.5 x 5 = 28.5</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exceedence Factor</b>	<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Expected Exceedence Factor</b>
BOD	11	2.2	TDS	-	≥ 1.5
Hg	0.048	48	Nitrate	-	
Cd	0.01	2	Chloride	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 6+2 = 8</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 11</b>		
<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17,50,000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		



Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 2.2	2.2	TDS	-	≥ 0.5
Hg	2/2 x 48	48	Nitrate	-	
Cd	1/2 x 2	1.0	Chloride	-	
<b>C2 = 3 (Score is towards conservative side ; actual score for C2=5)</b>			<b>C2 = 2+2=4</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 15 (Score is towards conservative side ; maximum score =25)</b>			<b>C = 20</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 10</b>		
<b>Land CEPI = 64.75 (Conservative Score)</b>			<b>Expected Land CEPI = 56</b>		

### Comprehensive Environment Pollution Index (CEPI)

<b>As per earlier calculations by Central Pollution Control Board</b>	<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2010</b>
<b>81.66</b>	<b>77.05</b>

## ANNEXURE-B

### Calculation details of Expected CEPI after the implementation of Action Plan of Ludhiana (Punjab)

#### I. Calculation of Air CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2011		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
Pollutants	Category		Pollutants	Category	
Pb	C		Pb	C	
Benzopyrene	C		Benzopyrene	C	
As	C		As	C	
<b>A1 = 6</b>			<b>A1 = 2+1=3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 6 x 5 = 30</b>			<b>A = 6 x 5 = 30</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Exepcted Exceedence Factor
Pb	0.25	0.5	Pb	-	1.0 – 1.5
Benzopyrene	7.145	7.145	Benzopyrene	-	
As	39.45	6.575	As	-	
*Source: SGS DATA by CPCB, Annexure I-Table 1			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3.0+1.75 (Penalty) = 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>			<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>		
<b>B = 8</b>			<b>B = 4.75</b>		

<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17, 50, 000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		
<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>SNLF</b>	<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>Expected SNLF</b>
Pb	0/2 x 0.5	0	Pb	-	0.25 – 0.5
Benzopyrene	1/2 x 7.145	3.57	Benzopyrene	-	
As	2/2 x 6.57	6.57	As	-	
<b>C2 = 4</b>			<b>C2 = 2.0+1.5=3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 20</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are not existing)</b>			<b>D = 10</b>		
<b>Air CEPI = 68.0</b>			<b>Expected Air CEPI = 62.25</b>		

## II. Calculation of Water CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>		<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2011</b>	
<b>(a) Pollutants</b>		<b>(a) Pollutants</b>	
<b>Pollutants</b>	<b>Category</b>	<b>Pollutants</b>	<b>Category</b>
BOD	B	BOD	B
Hg	C	T.Colli.	B
F	B	F	B
<b>A1 = 5.5</b>		<b>A1 = 2.0 + 1.0 = 3.0</b>	
R17	76	R17	76
R54	2685	R54	2685
<b>A2 = 5</b>		<b>A2 = 5</b>	
<b>A = 5.5 x 5 = 27.5</b>		<b>A = 3 x 5 = 15</b>	

(b) Pathway			(b) Pathway		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	17	1.4	BOD	-	1 – 1.5
Hg	0.128	128.5	T.Colli.	-	
F	0.2	0.33	F	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.75 = 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.75</b>		
(c) Receptor			(c) Receptor		
Population Exposed: 13, 95, 053			Population Exposed: 17,50,000		
<b>C1 = 5</b>			<b>C1 = 5</b>		
Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 3.4	0	BOD	-	0.25 – 0.5
Hg	2/2 x 128.5	3.57	T. Colli.	-	
F	0/2 x 0.33	6.57	F	-	
<b>C2 = 3.5 (Conservative Score ; actual score for C2=4)</b>			<b>C2=2.0 + 1.5 = 3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 17.5</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 10 (common effluent treatment plant for electroplating industries has already been made operational)</b>		
<b>Water CEPI = 66.0</b>			<b>Expected Water CEPI = 50.25</b>		

### III. Calculation of Land CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2011		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
Pollutants	Category		Pollutants	Category	
BOD	B		TDS	B	
Hg	C		Nitrate	B	
Cd	C		Chloride	B	
<b>A1 = 5.75</b>			<b>A1 = 2+1 =3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 5.5 x 5 = 28.5</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	11	2.2	TDS	-	1.0 – 1.5
Hg	0.048	48	Nitrate	-	
Cd	0.01	2	Chloride	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.75 = 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.75</b>		
<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17,50,000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		

Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 2.2	2.2	TDS	-	0.25 – 0.5
Hg	2/2 x 48	48	Nitrate	-	
Cd	1/2 x 2	1.0	Chloride	-	
<b>C2 = 3 (Score is towards conservative side ; actual score for C2=5)</b>			<b>C2 = 2+1.5=3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 15 (Score is towards conservative side ; maximum score =25)</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 10</b>		
<b>Land CEPI = 64.75 (Conservative Score)</b>			<b>Expected Land CEPI = 50.25</b>		

### Comprehensive Environment Pollution Index (CEPI)

<b>As per earlier calculations by Central Pollution Control Board</b>	<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2011</b>
<b>81.66</b>	<b>71.78</b>

## ANNEXURE-C

### Calculation details of Expected CEPI after the implementation of Action Plan of Ludhiana (Punjab)

#### I. Calculation of Air CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>			<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2011</b>		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
<b>Pollutants</b>	<b>Category</b>		<b>Pollutants</b>	<b>Category</b>	
Pb	C		RSPM	B	
Benzopyrene	C		SO <sub>x</sub>	B	
As	C		NO <sub>x</sub>	A	
<b>A1 = 6</b>			<b>A1 = 2+1=3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 6 x 5 = 30</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exceedence Factor</b>	<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exepcted Exceedence Factor</b>
Pb	0.25	0.5	RSPM	-	1.0 – 1.5
Benzopyrene	7.145	7.145	SO <sub>x</sub>	-	
As	39.45	6.575	NO <sub>x</sub>	-	
*Source: SGS DATA by CPCB, Annexure I-Table 1			*The samples will be collected through the implementation of the Action Plan.		
<b>B1= 8</b>			<b>B1= 3.0+1.75 (Penalty)= 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>			<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>		
<b>B = 8</b>			<b>B = 4.75</b>		

<b>(c) Receptor</b>			<b>(c) Receptor</b>		
Population Exposed: 13, 95, 053			Population Exposed: 17, 50, 000		
C1 = 5			C1 = 5		
<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>SNLF</b>	<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>Expected SNLF</b>
Pb	0/2 x 0.5	0	RSPM	-	0.25 – 0.5
Benzopyrene	1/2 x 7.145	3.57	SO <sub>x</sub>	-	
As	2/2 x 6.57	6.57	NO <sub>x</sub>	-	
C2 = 4			C2 = 2.0+1.5=3.5		
C3 = 0 (Risk to sensitive receptors = No)			C3 = 0 (Risk to sensitive receptors = No)		
C = 20			C = 17.5		
D = 10 (common treatment facilities are not existing)			D = 5 [Polluting vehicles will be phased out and air pollution control devices of induction furnaces will upgrade]		
Air CEPI = 68.0			Expected Air CEPI = 42.25		

## II. Calculation of Water CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>		<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2011</b>	
<b>(a) Pollutants</b>		<b>(a) Pollutants</b>	
<b>Pollutants</b>	<b>Category</b>	<b>Pollutants</b>	<b>Category</b>
BOD	B	BOD	B
Hg	C	T.Colli.	B
F	B	F	B
<b>A1 = 5.5</b>		<b>A1 = 2.0 + 1.0 = 3.0</b>	
R17	76	R17	76
R54	2685	R54	2685
<b>A2 = 5</b>		<b>A2 = 5</b>	
<b>A = 5.5 x 5 = 27.5</b>		<b>A = 3 x 5 = 15</b>	



(b) Pathway			(b) Pathway		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	17	1.4	BOD	-	1 – 1.5
Hg	0.128	128.5	T.Colli.	-	
F	0.2	0.33	F	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.75 = 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.75</b>		
(c) Receptor			(c) Receptor		
Population Exposed: 13, 95, 053			Population Exposed: 17,50,000		
<b>C1 = 5</b>			<b>C1 = 5</b>		
Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 3.4	0	BOD	-	0.25 – 0.5
Hg	2/2 x 128.5	3.57	T. Colli.	-	
F	0/2 x 0.33	6.57	F	-	
<b>C2 = 3.5 (Conservative Score ; actual score for C2=4)</b>			<b>C2=2.0 + 1.5 = 3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 17.5</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 10 (common effluent treatment plant for electroplating industries has already been made operational)</b>		
<b>Water CEPI = 66.0</b>			<b>Expected Water CEPI = 50.25</b>		

### III. Calculation of Land CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2011		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
Pollutants	Category		Pollutants	Category	
BOD	B		TDS	B	
Hg	C		Nitrate	B	
Cd	C		Chloride	B	
<b>A1 = 5.75</b>			<b>A1 = 2+1 =3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 5.5 x 5 = 28.5</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	11	2.2	TDS	-	1.0 – 1.5
Hg	0.048	48	Nitrate	-	
Cd	0.01	2	Chloride	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.75 = 4.75</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.75</b>		
<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17,50,000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		

Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 2.2	2.2	TDS	-	0.25 – 0.5
Hg	2/2 x 48	48	Nitrate	-	
Cd	1/2 x 2	1.0	Chloride	-	
<b>C2 = 3 (Score is towards conservative side ; actual score for C2=5)</b>			<b>C2 = 2+1.5=3.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 15 (Score is towards conservative side ; maximum score =25)</b>			<b>C = 17.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 5 [MSW site will be operational &amp; remediation plan will be carried out]</b>		
<b>Land CEPI = 64.75 (Conservative Score)</b>			<b>Expected Land CEPI = 45.25</b>		

### Comprehensive Environment Pollution Index (CEPI)

<b>As per earlier calculations by Central Pollution Control Board</b>	<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2011</b>
<b>81.66</b>	<b>59.76</b>

## ANNEXURE-D

### Calculation details of Expected CEPI after the implementation of Action Plan of Ludhiana (Punjab)

#### I. Calculation of Air CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>			<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2012</b>		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
<b>Pollutants</b>	<b>Category</b>		<b>Pollutants</b>	<b>Category</b>	
Pb	C		RSPM	B	
Benzopyrene	C		SO <sub>x</sub>	B	
As	C		NO <sub>x</sub>	A	
<b>A1 = 6</b>			<b>A1 = 2+1=3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 6 x 5 = 30</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exceedence Factor</b>	<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exepcted Exceedence Factor</b>
Pb	0.25	0.5	RSPM	-	1.0 – 1.5
Benzopyrene	7.145	7.145	SO <sub>x</sub>	-	
As	39.45	6.575	NO <sub>x</sub>	-	
*Source: SGS DATA by CPCB, Annexure I-Table 1			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3.0+1.5 (Penalty)= 4.5</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>			<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>		
<b>B = 8</b>			<b>B = 4.5</b>		

<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17, 50, 000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		
<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>SNLF</b>	<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>Expected SNLF</b>
Pb	0/2 x 0.5	0	RSPM	-	0.25 – 0.5
Benzopyrene	1/2 x 7.145	3.57	SO <sub>x</sub>	-	
As	2/2 x 6.57	6.57	NO <sub>x</sub>	-	
<b>C2 = 4</b>			<b>C2 = 2.0+1.0=3.0</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 20</b>			<b>C = 15.0</b>		
<b>D = 10 (common treatment facilities are not existing)</b>			<b>D = 5 [Polluting vehicles will be phased out and air pollution control devices of induction furnaces will upgrade]</b>		
<b>Air CEPI = 68.0</b>			<b>Expected Air CEPI = 39.5</b>		

## II. Calculation of Water CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>		<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2012</b>	
<b>(a) Pollutants</b>		<b>(a) Pollutants</b>	
<b>Pollutants</b>	<b>Category</b>	<b>Pollutants</b>	<b>Category</b>
BOD	B	BOD	B
Hg	C	T.Colli.	B
F	B	F	B
<b>A1 = 5.5</b>		<b>A1 = 2.0 + 1.0 = 3.0</b>	
R17	76	R17	76
R54	2685	R54	2685
<b>A2 = 5</b>		<b>A2 = 5</b>	
<b>A = 5.5 x 5 = 27.5</b>		<b>A = 3 x 5 = 15</b>	

(b) Pathway			(b) Pathway		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	17	1.4	BOD	-	1 – 1.5
Hg	0.128	128.5	T.Colli.	-	
F	0.2	0.33	F	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.5 = 4.5</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.5</b>		
(c) Receptor			(c) Receptor		
Population Exposed: 13, 95, 053			Population Exposed: 17,50,000		
<b>C1 = 5</b>			<b>C1 = 5</b>		
Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 3.4	0	BOD	-	0.25 – 0.5
Hg	2/2 x 128.5	3.57	T. Colli.	-	
F	0/2 x 0.33	6.57	F	-	
<b>C2 = 3.5 (Conservative Score ; actual score for C2=4)</b>			<b>C2=2.0 + 1.0 = 3.0</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 17.5</b>			<b>C = 15.0</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 5 (common effluent treatment plant for dyeing units will be commissioned)</b>		
<b>Water CEPI = 66.0</b>			<b>Expected Water CEPI = 42.50</b>		

### III. Calculation of Land CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2012		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
<b>Pollutants</b>	<b>Category</b>		<b>Pollutants</b>	<b>Category</b>	
BOD	B		TDS	B	
Hg	C		Nitrate	B	
Cd	C		Chloride	B	
<b>A1 = 5.75</b>			<b>A1 = 2+1 =3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 5.5 x 5 = 28.5</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exceedence Factor</b>	<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Expected Exceedence Factor</b>
BOD	11	2.2	TDS	-	1.0 – 1.5
Hg	0.048	48	Nitrate	-	
Cd	0.01	2	Chloride	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 3 + 1.5 = 4.5</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 7.5</b>		
<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17,50,000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		

Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 2.2	2.2	TDS	-	0.25 – 0.5
Hg	2/2 x 48	48	Nitrate	-	
Cd	1/2 x 2	1.0	Chloride	-	
<b>C2 = 3 (Score is towards conservative side ; actual score for C2=5)</b>			<b>C2 = 2+1.0=3.0</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 15 (Score is towards conservative side ; maximum score =25)</b>			<b>C = 15.0</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 5 [MSW site will be operational &amp; remediation plan will be carried out]</b>		
<b>Land CEPI = 64.75 (Conservative Score)</b>			<b>Expected Land CEPI = 42.5</b>		

### Comprehensive Environment Pollution Index (CEPI)

<b>As per earlier calculations by Central Pollution Control Board</b>	<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 30/06/2012</b>
<b>81.66</b>	<b>52.15</b>



## ANNEXURE-E

### Calculation details of Expected CEPI after the implementation of Action Plan of Ludhiana (Punjab)

#### I. Calculation of Air CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2012		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
<b>Pollutants</b>	<b>Category</b>		<b>Pollutants</b>	<b>Category</b>	
Pb	C		RSPM	B	
Benzopyrene	C		SO <sub>x</sub>	B	
As	C		NO <sub>x</sub>	A	
<b>A1 = 6</b>			<b>A1 = 2+1=3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 6 x 5 = 30</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exceedence Factor</b>	<b>Pollutants</b>	<b>Average Conc.*</b>	<b>Exepcted Exceedence Factor</b>
Pb	0.25	0.5	RSPM	-	0.5 – 1.0
Benzopyrene	7.145	7.145	SO <sub>x</sub>	-	
As	39.45	6.575	NO <sub>x</sub>	-	
*Source: SGS DATA by CPCB, Annexure I-Table 1			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 2.0+1.0 (Penalty)= 3.0</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>			<b>B3 = 0 (No reliable evidence of exposure on Eco-geological features)</b>		
<b>B = 8</b>			<b>B = 3.0</b>		

<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17, 50, 000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		
<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>SNLF</b>	<b>Pollutants</b>	<b>Samples Exceeded/ total no. of samples x EF</b>	<b>Expected SNLF</b>
Pb	0/2 x 0.5	0	RSPM	-	< 0.25
Benzopyrene	1/2 x 7.145	3.57	SO <sub>x</sub>	-	
As	2/2 x 6.57	6.57	NO <sub>x</sub>	-	
<b>C2 = 4</b>			<b>C2 = 1.5 + 1.0 = 2.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 20</b>			<b>C = 12.5</b>		
<b>D = 10 (common treatment facilities are not existing)</b>			<b>D = 5 [Polluting vehicles will be phased out and air pollution control devices of induction furnaces will upgrade]</b>		
<b>Air CEPI = 68.0</b>			<b>Expected Air CEPI = 35.5</b>		

## II. Calculation of Water CEPI

<b>As per earlier calculations by Central Pollution Control Board</b>		<b>Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2012</b>	
<b>(a) Pollutants</b>		<b>(a) Pollutants</b>	
<b>Pollutants</b>	<b>Category</b>	<b>Pollutants</b>	<b>Category</b>
BOD	B	BOD	B
Hg	C	T.Colli.	B
F	B	F	B
<b>A1 = 5.5</b>		<b>A1 = 2.0 + 1.0 = 3.0</b>	
R17	76	R17	76
R54	2685	R54	2685
<b>A2 = 5</b>		<b>A2 = 5</b>	
<b>A = 5.5 x 5 = 27.5</b>		<b>A = 3 x 5 = 15</b>	

(b) Pathway			(b) Pathway		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	17	1.4	BOD	-	0.5 – 1.0
Hg	0.128	128.5	T.Colli.	-	
F	0.2	0.33	F	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 2.0 + 1.0 = 3.0</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 6.0</b>		
(c) Receptor			(c) Receptor		
Population Exposed: 13, 95, 053			Population Exposed: 17,50,000		
<b>C1 = 5</b>			<b>C1 = 5</b>		
Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 3.4	0	BOD	-	< 0.25
Hg	2/2 x 128.5	3.57	T. Colli.	-	
F	0/2 x 0.33	6.57	F	-	
<b>C2 = 3.5 (Conservative Score ; actual score for C2=4)</b>			<b>C2 = 1.5+1.0 = 2.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 17.5</b>			<b>C = 12.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 5 (common effluent treatment plant for dyeing units will be commissioned)</b>		
<b>Water CEPI = 66.0</b>			<b>Expected Water CEPI = 38.50</b>		

### III. Calculation of Land CEPI

As per earlier calculations by Central Pollution Control Board			Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2012		
<b>(a) Pollutants</b>			<b>(a) Pollutants</b>		
Pollutants	Category		Pollutants	Category	
BOD	B		TDS	B	
Hg	C		Nitrate	B	
Cd	C		Chloride	B	
<b>A1 = 5.75</b>			<b>A1 = 2+1 =3</b>		
R17	76		R17	76	
R54	2685		R54	2685	
<b>A2 = 5</b>			<b>A2 = 5</b>		
<b>A = 5.5 x 5 = 28.5</b>			<b>A = 3 x 5 = 15</b>		
<b>(b) Pathway</b>			<b>(b) Pathway</b>		
Pollutants	Average Conc.*	Exceedence Factor	Pollutants	Average Conc.*	Expected Exceedence Factor
BOD	11	2.2	TDS	-	0.5 – 1.0
Hg	0.048	48	Nitrate	-	
Cd	0.01	2	Chloride	-	
*Source: SGS DATA by CPCB, Annexure I-Table 2 **BOD/COD ratio is taken 1/2.5 <sup>th</sup>			*The samples will be collected through the implementation of the Action Plan.		
<b>B1 = 8</b>			<b>B1 = 2.0+1.0=3.0</b>		
<b>B2 = 0 (No reliable evidence of exposure on People)</b>			<b>B2 = 0 (No reliable evidence of exposure on People)</b>		
<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>			<b>B3 = 3 (Symptoms of exposure on Eco-geological features)</b>		
<b>B = 11</b>			<b>B = 6.0</b>		
<b>(c) Receptor</b>			<b>(c) Receptor</b>		
<b>Population Exposed: 13, 95, 053</b>			<b>Population Exposed: 17,50,000</b>		
<b>C1 = 5</b>			<b>C1 = 5</b>		

Pollutants	Samples Exceeded/ total no. of samples x EF	SNLF	Pollutants	Samples Exceeded/ total no. of samples x EF	Expected SNLF
BOD	2/2 x 2.2	2.2	TDS	-	< 0.25
Hg	2/2 x 48	48	Nitrate	-	
Cd	1/2 x 2	1.0	Chloride	-	
<b>C2 = 3 (Score is towards conservative side ; actual score for C2=5)</b>			<b>C2 = 1.5+1.0=2.5</b>		
<b>C3 = 0 (Risk to sensitive receptors = No)</b>			<b>C3 = 0 (Risk to sensitive receptors = No)</b>		
<b>C = 15 (Score is towards conservative side ; maximum score =25)</b>			<b>C = 12.5</b>		
<b>D = 10 (common treatment facilities are inadequate)</b>			<b>D = 5 [MSW site will be operational &amp; remediation plan will be carried out]</b>		
<b>Land CEPI = 64.75 (Conservative Score)</b>			<b>Expected Land CEPI = 38.5</b>		

### Comprehensive Environment Pollution Index (CEPI)

As per earlier calculations by Central Pollution Control Board	Calculations by Punjab Pollution Control Board for expected CEPI Score as on 31/12/2012
<b>81.66</b>	<b>46.09</b>

## ANNEXURE-F

### Expected Comprehensive Environment Pollution Index Score through the implementation of Action Plan of Ludhiana city

Parameters	CEPI Calculations on				
	31/12/2010	30/6/2011	31/12/2011	30/6/2012	31/12/2012
A	30	30	15	15	15
B	8	4.75	4.75	4.5	3
C	20	17.5	17.5	15	12.5
D	10	10	5	5	5
AIR CEPI	68	62.25	42.25	39.5	35.5
A	15	15	15	15	15
B	8	7.75	7.75	7.5	6
C	17.5	17.5	17.5	15	12.5
D	10	10	10	5	5
WATER CEPI	50.5	50.25	50.25	42.5	38.5
A	15	15	15	15	15
B	11	7.75	7.75	7.75	6
C	20	17.5	17.5	15	12.5
D	10	10	5	5	5
LAND CEPI	56	50.25	45.25	42.5	38.5
<b>OVERALL CEPI</b>	<b>77.05</b>	<b>71.78</b>	<b>59.76</b>	<b>52.15</b>	<b>46.09</b>