Report on

Action Plan for Air Quality Improvement of Haridwar City

Sponsored By:

Uttarakhand Environment Protection Pollution Control Board, Dehradun

Project Consultant:

Pollution Control Research Institute

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Ranipur, Haridwar – 249 403

2019

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CHAPTER 1

1.1 Introduction

Urbanization in India is more rapid around the major cities in India. Increase in industrial activities, population both endemic and floating and vehicular population etc. have led to a number of environmental problems, one of them being air pollution. Various contaminants continuously enter the atmosphere through natural and man-made processes and these contaminants interact with the environment to cause disease, toxicity, environmental decay and are labeled as pollutant. Air Pollutants means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

Environment: includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organisms and properties. Air pollution is basically the presence of air pollutants in the atmosphere.

The air has a relative constant composition of gases and is utilized by most of the living organisms in respiration to liberate chemical energy for their survival. This composition determines its quality and is being changed in the recent past due to emission of large amount of un-natural materials in the atmosphere by industries and automobiles. This changed quality became a great threat to survival of life, properties, materials and ecosystem as a whole.

In order to arrest the deterioration in air quality, Govt. of India has enacted Air (Prevention & Control of Pollution) Act in 1981. The responsibility has been further emphasized under Environment (Protection) Act, 1986. The National Ambient Air Quality Standards have been more strengthen in November 2009. It is necessary to assess the present and anticipated air pollution through continuous air quality survey/monitoring programs.

An inventory of air pollutants is a necessary first step towards control of air pollution. Air pollutants can be natural or may be the result of various anthropogenic activities like industrial emissions. Further the air pollutants can be primary or secondary depending upon their formation mechanism. Primary pollutants are directly emitted from the source and secondary pollutants are formed in the atmosphere.

Meteorological factors play a critical role in ambient concentrations of air pollutants. Even though the total discharge of air pollutants into the atmosphere may remain constant, the ambient concentrations of air pollutants may vary depending upon the meteorological conditions.

Air (Prevention and Control of Pollution) Act 1981 Government of India enacted the Air (Prevention and Control of Pollution) Act 1981 to arrest the deterioration in the air quality. The act prescribes various functions for the Central Pollution Control Board at the apex level and State Pollution Control Board at the state level. The main functions of the Central Pollution Control Board are as follows:

- To advice the Central Government on any matter concerning the improvement of the quality of the air and the prevention, control and abatement of air pollution.
- To plan and cause to be executed a nation-wide programme for the prevention, control and abatement of air pollution.
- To provide technical assistance and guidance to the State Pollution Control Board.
- To carry out and sponsor investigations and research related to air pollution prevention, control and abatement of air pollution.
- To collect, compile and publish technical and statistical data related to air pollution; and
- To lay down standards for the quality of air and emission quantities.

The main functions of the State Pollution Control Board are as follows:

- To plan a comprehensive programme for prevention, control or abatement of air pollution and to secure the execution thereof;
- To advise the State Government on any matter concerning prevention, control and abatement of air pollution.
- To collect and disseminate information related to air pollution.
- To collaborate with Central Pollution Control Board in programme related to prevention,

control and abatement of air pollution; and

• To inspect air pollution control areas, assess quality of air and to take steps for prevention, control and abatement of air pollution in such areas.

1.2 National Ambient Air Quality Standards (NAAQS): The ambient air quality objectives/standards are pre-requisite for developing management programme for effective management of ambient air quality and to reduce the damaging effects of air pollution. The objectives of air quality standards are: -

• To indicate the levels of air quality necessary with an adequate margin of safety to protect the public health, vegetation and property.

• To assist in establishing priorities for abatement and control of pollutant level;

• To provide uniform yardstick for assessing air quality at national level;

• To indicate the need and extent of monitoring programme; and

The revised National Ambient Air Quality Standards are depicted in Annexure-I. These standards are based on the land use and other factors of the area.

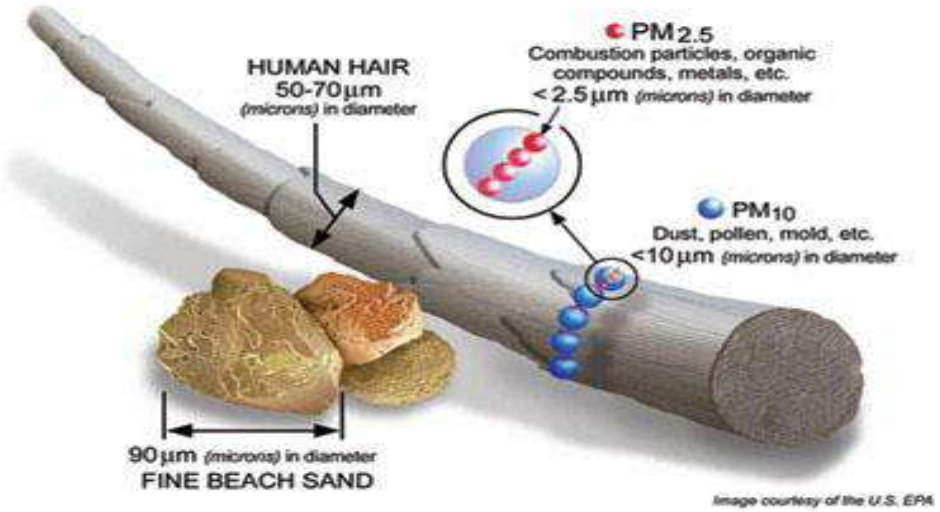
Air Quality Monitoring Ambient air quality monitoring is required to determine the existing quality of air, evaluation of the effectiveness of control programme and to identify areas in need of restoration and their prioritization. National Air Quality Monitoring Programme is described in this chapter alongwith details on pollutants measured and their frequency.

In urban areas – both in religious and tourist places, it is predominately vehicular pollution that contributes to air quality problem. The worst thing about vehicular pollution is that it cannot be avoided as the vehicular emissions are emitted at the near-ground level where we breathe. Haridwar attracts a large number of visitors, both pilgrims and tourists respectively. What matters is not the large number of visitors, but the type of visitors, their vehicles, emission from these vehicles, the quality of traffic management to achieve compatibility between vehicle movement & parkings undertaken by the visitors and the religious / tourists area objectives. Pollution from vehicles gets revealed through symptoms

like cough, headache, nausea, irritation of eyes, various bronchial problems and visibility. This is due to discharges like CO, unburned HC, NOx, & particulate matter (PM10 & PM2.5). PM_{10} is particulate matter 10 micrometers or less in diameter, $PM_{2.5}$ is particulate matter 2.5 micrometers or less in diameter. $PM_{2.5}$ is generally described as fine particles. By way of comparison, a human hair is about 100 micrometres, so roughly 40 fine particles could be placed on its width.

Particle pollution, also called particulate matter or PM, is a mixture of solids and liquid droplets floating in the air. Some particles are released directly from a specific source, while others form in complicated chemical reactions in the atmosphere.

Particles come in a wide range of sizes. Particles less than or equal to 10 micrometers in diameter are so small that they can get into the lungs, potentially causing serious health problems. Ten micrometers is less than the width of a single human hair.



Coarse dust particles (PM_{10}) are 2.5 to 10 micrometers in diameter. Sources include crushing or grinding operations and dust stirred up by vehicles on roads.

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

A compelling reason for controlling air pollutants such as suspended particulate matter (SPM) or respirable suspended particulate matters (RSPM) or sulphur dioxide (SO_2) is their damaging effect on human health. Of all air pollution constituents, the WHO has identified SPM as the most sinister in terms of its effect on health. The **Sulphur Dioxide (SOx)** is a Colourless Gas (Diesel-driven vehicles) which causes Bronchitis, frequent colds, emphysema, lung cancer. The **Nitrogen Oxide (Nox)** is a Yellowish gas (Diesel-driven) which causes Bronchitis, low lung function in children, high incidence of asthma. NOx combines with oxygen to form ozone, which causes progressive lung damage. The **Carbon Monoxide (CO)** is a **i**nvisible gas (Petrol-driven vehicles) which impairs oxygen-carrying capacity of blood. It affects central nervous system, causes high blood pressure, & heart disease. More than 3% concentration by volume in respirated air can lead to sudden death.

The Hydrocarbons (HC) is a sweet smelling, colourless or whitish gas (emitted by two- and three-wheelers) which causes Bronchitis, eye irritation, cataracts, cancer of skin & liver.

The Respirable suspended particulate matter (RSPM or PM10) is a bits of carbon, ash and oil emitted specially from diesel-driven vehicles.20% vehicles are diesel powered. The fine particulate matter (PM2.5), affects the worst, as range in size from 1.5 to 2.5 micrometers and are fine enough to be deeply respirable.

In tourist/religious places, the growing influx of visitors have increased the vehicles entry in the area tremendously. The floating population of vehicles plying in these places effects the air quality. All types of vehicles (irrespective of their age) - motor cycles, scooters, auto rickshaws, cars, trucks & lorries ply in the town and highways. The parking for the vehicles is

also not adequate in the areas and therefore these are parked along the roads. The tourist places and religious places are greatly affected due to non – conformity of the Vehicular Pollution norms, old technology vehicles, use of mixed fuel / adulterated fuel used by three wheelers.

Fuel quality is also very important as the transport sector is single largest user of oil and oil products, 57 % per cent of total consumption (112 Million MT/annum). Personal transport uses almost all of petrol. Road transport consumes more than 62 per cent of diesel.

ADB estimates have estimated that in India, consumption of fuels by vehicles in 2035 could be five times that of the 2005 level.

A compelling reason for controlling air pollutants such as suspended particulate matter (SPM) or respirable particulate matters (RPM) or carbon monoxide (CO) is their damaging effect on human health.

Presently, we do not have any assessment of vehicular pollution problems due to the influx of devotees / tourists coming to religious / tourist places. Also, no Management plan for vehicular pollution control and ambient air quality has been developed for these places. Therefore, UEPPCB, Dehradun has awarded a project on Action Plan for ambient Air Quality Improvement of Haridwar City to **Pollution Control Research Institute, BHEL Haridwar,** as Haridwar is an important tourist place because of pilgrimage due to holy Ganga River.

CHAPTER 2

2.0 SCOPE OF WORK FOR ACTION PLAN FOR AMBIENT AIR QUALITY IMPROVEMENT OF HARIDWAR CITY

2.1 Objectives of Study:

1. To measure baseline pollutants and air toxic levels at different locations of Haridwar city which includes residential, industrial, background (reference), commercial and sensitive areas.
2. To inventories various pollutants in Haridwar city.
3. Identification and inventorization of emission sources (industry, traffic, power plants, local power generation, small scale industries etc.), source appointment in Haridwar city.
4. Application of mathematical model to assess the dispersion of modeling of PM10 and NOx over some locations of the city from various sources at existing and future scenarios.
5. To assess some mitigating options for reductions of air pollutants in the Haridwar city.
6. Preparation of action plan for ambient Air Quality Management for Haridwar city.

2.2 Scope Of Work for the study:

1. Development of detailed emission inventory in the grid around the air quality monitoring stations for pollutants (such as SO_2, NO_x, CO, PM10 and PM2.5) will be established throughout the Haridwar city.
2. Development of software for emission database and information/data retrival system.
3. The study will include monitoring ambient air quality for 30 days continuously in each season (summer, post-monsoon and winter) at each seven identified locations.
4. Air monitoring stations were installed at locations such as near roadside, residential, industrial, outskirts (reference), commercial and sensitive areas or downwind of the city. There will be 7 air monitoring stations in Haridwar city for the purpose of this

study.

5. In each station 24 hrs. Average monitoring of ambient air quality for thirty days continuously in each season (summer, post-monsoon and winter) with total of 90 sampling days in year. Monitoring of the pollutants such as: SO_2, NO_x, CO, SPM, PM10 and PM2.5 shall be carried out. The monitoring and analysis of the above mentioned parameters will be done as per CPCB/MoEF methods.
6. In order to get a wider cross section of vehicles in-use/on-road, a systematic survey of vehicle population shall be undertaken in the city.
7. Automotive Research Association of India (ARAI) developed emission factors for each representative vehicle considering vehicle technology, age, traffic and conditions including influence of fuel quality with or without tail pipe treatment will be used.
8. The emission factors will be used to estimate the emission load.
9. The meteorological data obtained from weather monitoring stations will be used for air quality modeling. Permanent weather monitoring station will be installed at the representative location throughout the period of ambient air monitoring; the weather monitoring will be installed at one particular location.
10. Applicability of receptor modeling technique and their applicability in India context e.g. fingerprinting, chemical mass balance, multivariate analysis).
11. Source apportionment analysis will be carried out for the components of PM using receptor model.
12. Dispersion modeling and source apportionment of air pollutants.
13. Application of suitable dispersion models like- ISCST3, the critical air pollutants levels (NO_x, PM10 etc.) in ambient air would be predicted under different scenarios based on actual measurement.

CHAPTER 3

3.1 Methodology

The ambient air quality measurement has been done during summer and winter season of tourist influx of vehicles and religious places. The study has been carried out as per the method of Indian Standards (IS 5182) and CPCB guidelines. The topography, city map and weather data will consider to select the monitoring stations for ambient air quality assessment. The other areas like parking areas, entry points in tourist and religious places and main roads in the town will be considered.

The vehicular pollution load is calculated based on the emission factors of various types of vehicles, kilometer run in the tourist place, number of vehicles and average of vehicles.

3.1.1 Proposed Methodology, Objectives and Scope of Work:

1. Identification and inventorization of emission sources (industry, traffic, power plants, local power generation, small scale industries etc.) in Haridwar city;
2. To measure baseline air pollutants and air toxic levels at different parts of Haridwar, which includes "hot spots" on kerbside as well;
3. To project emission inventories using mathematical models taking into account of vehicle population/ improvements in vehicle technology, fuel quality changes and other activities having impact on ambient air quality thereof;
4. Application of receptor modeling to PM10 levels in ambient air to arrive at source apportionments.
5. Application of ISCST3 modeling to assess the dispersion of PM10 and NOx over some locations of the city from various sources at existing and future scenarios.
6. To assess some control options for reductions of air pollutants in the Haridwar city after studying the results from emission inventory, dispersion modeling, CMB modeling and factor analysis.

3.1.2 The overall methodology & scope for this study is summarized below:

1. Development of detailed emission inventory in the grid of 2×2 sq-km around the air quality monitoring stations for pollutants (such as: SO2, NOx, CO, SPM, PM10 and PM2.5) are being established throughout the city of Haridwar.
2. Development of software for emission database and information/data retrieval system.
3. The study has been carried out by monitoring ambient air quality for thirty days continuously in each season (summer, post-monsoon and winter) at each identified location.
4. Air monitoring stations were installed at locations such as kerbside, residential, industrial, outskirts (reference), commercial and sensitive areas or downwind of city. There are 7 air monitoring stations in Haridwar city for the purpose of this study.
5. In each station 24 hrs average data were considered by monitoring ambient air quality for thirty days continuously in each season (summer, post-monsoon and winter) with total of 90 sampling days in a year. Monitoring of the pollutants such as: SO2, NOx, CO, SPM, PM10 and PM2.5 are being carried out.
6. Analyses of the above monitored parameters were done by the recommended methods.
7. Kerbside by definition is site with sample inlets within 1 m of the edge of a busy road and sampling heights are at 3 m elevation. If for reasons, 1 m of the road edge is not possible, declare the site as roadside location, which has the definition of being a site with sample inlets between 1m of the kerbside of a busy road and the back of the pavement. Typical are within 5 m of the kerbside and the sampling height remains at 3 m elevation.
8. In order to get a wider cross section of vehicles in-use / on-road and the actual distance traveled by each sample vehicle, a systematic survey of vehicle population was undertaken in the city. Also, special emphasis was laid on the emission factors from vehicles of pre Euro / India 2000 as these form higher percentage in total vehicle population for assessing cost effective solutions.
9. Automotive Research Association of India (ARAI) developed emission factors for each representative vehicle considering vehicle technology, age, traffic and conditions including

influence of fuel quality with or without tail pipe treatment are being used.

10. For all other sources, USEPA emission factors (AP-42) and the factors finalized by the CBCB expert committee are being used to estimate the emissions.

11. The actual meteorological data obtained from weather monitoring stations are being used for air quality modeling. Two permanent weather monitoring stations were installed on two of the locations throughout the year and also at the time of the sampling station, the weather monitoring were installed at that particular station.

12. Review of receptor modeling techniques and their applicability in Indian context (e.g. fingerprinting, chemical mass balance, Multivariate analysis). Adoption of the technique suitable for study area.

13. Source apportionment analyses are being carried out for the components of PM using receptor model. For these purpose, relevant details pertaining to the city were gathered.

14. Further, by the way of application of suitable air dispersion models like ISCST3, the critical air pollutant levels (NOx, PM10 etc.) in ambient air were predicted under different scenarios on an attempt were made to validate the model based on actual measurements.

The following steps will be followed to fulfill the objectives of the project, which formed the scope of work for this project .

3.2 Preliminary Survey and Collection of Data

The preliminary survey has been carried for Haridwar as a tourist and religious place.

This is to be carried out from different literature, books on the subject. Reports on the studies already carried out was also referred. This provides input for preparation of guidelines. Preliminary survey of sites in holy city as Haridwar. The vehicle entry points at Haridwar was physically inspected and studied. The five vehicle entry points were identified at Haridwar and three at which are described in the forthcoming Chapters. The ambient air quality monitoring points at Haridwar were also finalized during the preliminary site visit.

This is essential as each place has some specific places of religious and tourists important where vehicular congestions occurs at various hot spots. The review and detailed study was carried out. The locations of parking, entry points and movement of vehicles inside the main spots are identified. The data has been collected in the peak and lean season at both places.

The road maps, data on type of vehicles entering in the religious place of Haridwar were collected.

The summer season in Haridwar (religious place) is from April to July when maximum number of tourists/pilgrims arrive and Post monsoon and winter is from October to March. The summer tourist season is from April to July, post monsoon season is from September to November and winter season from December to February. The summer, post-monsoon and winter season will be monitored. Evaluation of number of tourists & tourist vehicles coming in the proposed place during all the three seasons. This is done at all the entry points to the proposed tourist and religious place.

The mode of transportation (Vehicular Mix) used for commuting within the selected study place. The vehicle count has been done at all the major places.

The road infrastructure was also studied for selected / proposed place.

PM haze in a national park

Assessment of the ambient air quality during summer, Post Monsoon and winter period at the representative and prominent places will be carried out using the $PM_{2.5}$, Respirable Dust Samplers for SPM, RSPM, SO_2, NOx. The Carbon Monoxide (CO) will be monitored using ambient air analyzer. Equipment used are :

1. PM 2.5 Sampler
2. Respirable Dust Sampler
3. CO monitor

Methodology for Sampling and Analysis

Suspended Particulate Matter

The Suspended Particulate Matter (SPM) monitoring was carried out as per IS:5182, Part 4. As per requirements of the present study, ambient air monitoring was carried out for 07 Nos. sampling stations in Haridwar city. The ambient air quality monitoring was done continuously for a month in Summer, Post Monsoon and Winter. The gravimetric detection

method was used for the analysis of SPM. Respirable dust Sampler was used for sucking the ambient air through a glass fiber filter paper. Initially the blank filter paper was weighed after drying in an oven. The weight of the filter paper after sampling was again taken after drying it.

Respirable Suspended Particulate Matter

The Respirable Suspended Particulate Matter (RSPM) monitoring was carried out at the same seven (07) ambient air monitoring locations. The frequency of monitoring was twice a week per location and twenty four hourly samples per day per location was done. The gravimetric detection method was used for the analysis of SPM. Respirable Particulate Sampler was used for sucking the ambient air through a cyclone and glass fiber filter paper. The larger particles (> 10 microns) were collected in polythene through the cyclone. The finer particles (Respirable Particle) were collected on the filter paper surface. The gravimetric detection method was used for the analysis of filter paper.

Figure 3.2 Meteorological Monitoring Station Installed

Figure -3.2 Ambient Air Monitoring Station

Sulphur Dioxide (SO_2)

For the monitoring of SO_2, IS:5182, Part 2 was followed. The ambient air was sucked through a tapping in the exhaust side of the High Volume sampler. The frequency of monitoring was twice a week per location and twenty four hourly sampling per day per location.

SO_2 was absorbed in a solution of Sodium Tetrachloro Mercurate thus forming a stable Dichloro sulphito mercurate. The concentration of SO_2 was then estimated by the colour produced when p-rosaniline hydrochloride was added to the solution. The colour was estimated by using a Spectrophotometer, set at 560 nm wavelength for which a calibration curve was prepared.

Oxides of Nitrogen (NO_x)

For the monitoring of NOx, IS:5182 Part 6 and Emission Regulation Part 3 were followed. The ambient air was sucked through a tapping in the exhaust side of the High Volume sampler. The frequency of monitoring was twice a week per location and twenty four hourly sampling per day per location was done. For oxides of nitrogen, Sodium hydroxide was used as an absorbing solution. Sodium Arsenite was also added into the absorbing solution to increase the absorbing efficiency. The nitrite ion produced during sampling was determined colorimetrically by reaction of exposed absorbing reagent with Phosphoric Acid, Sulphanilamide & NEDA (Jacobs & Hochheiser method).

Carbon Monoxide

The carbon Oxide was measured using the instrument Environment S.A., based on NDIR principle. The concentration was measured in ppm.

Assessment of vehicular pollution problems during summer and winter periods has been done. Formulation of Vehicular Pollution Control and Ambient Air Quality Management Plan has been done specific to the proposed places & in line considering the objectives of the project.

3.3 Interaction with Civil Authorities & others and detailed data collection

At each of these places civil authorities like Municipal Boards, transport Departments, District Administration authorities, State transport authorities, Private taxi persons, Auto rickshaw persons, Public Health Departments, tourist and religious authorities have been consulted and ground situation was understood. Such authorities are contacted to understand the problems faced during such mass congestions, existing traffic management, road network and future plans. The probable city plans for vehicular management and control vehicular pollution from Town Planners have been collected to provide input for suggesting future areas for better parking and vehicular management.

Assessment of summer & winter tourist's period in a considered religious place (Haridwar) will be done.

Compilation of Information -

Information obtained have been compiled so as to provide details on present status. This data have been used for the Assessment of Vehicular Pollution and development of Vehicular Management Plan at tourist and religious place and the other requirement of the project as mentioned above.

3.4 Study at Haridwar as a religious place during Summer, Post-Monsoon and Winter season

The assessment of vehicular pollution was done by :

1. **Carrying out Vehicle Count at five places**
    a. Police Check Post, Bahadrabad, Jawalapur Road
    b. BHEL Haridwar –Barrier 2
    c. Laksar More
    d. Chandipul, Najibabad – Haridwar Road
    e. Dehradun – Haridwar Road Near Shantikunj

2. **Ambient Air Quality Monitoring at seven places**

The brief description of sites are given below:

I. VIP Ghat, Haridwar
II. Kanya Gurukul Mahavidyalaya, Kankhal
III. Saini Ashram, Jwalapur
IV. Police Thana, Bahadrabad
V. SKF Industries, SIDCUL

VI. Industrial Area, Haridwar

VII. PCRI, BHEL, Haridwar

3.4.1 Emission Factors for Calculating the Emission Load

The emission factors taken for two wheelers, three wheelers, four wheelers, MUVs, LCVs, HUVs were based on various factors as given below :

1. Type and Make of Vehicle
2. Load carrying of Vehicles
3. Age of Vehicles
4. Fuel Used
5. Total kilometers Run

It was inferred that after studying the vehicles during vehicle count at various location in Haridwar which are based on above facts that vehicles were not meeting the Bharat 1, 2, 3 & 4 standards. No one standard can be taken for this kind of study.

3.5 Methodology and Emission Factor

In the present studies following methodology has been followed while determining the Emission of pollutant from Traffic:

- The Vehicle Density was determined from the three locations from where Traffic is entering into the Haridwar Town for 3 days

- The following average distances have been considered for each type of vehicles traveling distances within the Total area of Haridwar City. This was done by the actual sample survey by the Vehicle Owners.
  - Two Wheeler = 10 - 15 km/day

- Three Wheeler = 10 – 50 km/day
- Four Wheeler (Car) = 25 – 50 km/day
- Four Wheeler (Truck) = 5 - 15 km/day
- Four Wheeler (Buses) = 5 - 15 km/day
- Light Commercial Vehicles = 15 – 20 km/day

Calculation of Vehicles Emission was done by the following way:

Pollutant (CO, HC, NOx, SOx, Lead & Particulate) in Kg/day =Total Number of Vehicle which entered in the Town X Emission Factor of respective Pollutant X Average Distance traveled by Vehicle/day.

The vehicles are of mixed type, heavy load of people on the vehicles, vehicles arriving from long distances, the common Emission factors are derived as given below in **Table 3.1** :

Table : 3.1

Emission factors for the Study

S.No.	Type of Vehicle	CO gm/km	NOx gm/km	HC gm/km	Particulates gm/km
1.	**2 Wheeler, Cars (Petrol), Car (diesel), MUVs, 3 wheelers, LCVs & HUVs**	8.3	7.77	1.57	0.275

Based on the above emission factors the emission rates were calculated which are given in **Chapter 5 & 6.**

3.6 Study at Haridwar

The vehicle count was carried out manually from 7.00 a.m to 9.00 p.m (14 hours) for following type of vehicles :

- 2 Wheeler (all makes : Scooter, Mopeds, Motorcycles)
- Cars (Petrol) (all makes : four wheelers)
- Car (diesel) (all makes : four wheelers)
- Medium Utility Vehicles (MUVs) :Tata Sumo, Tavera, Qualis, Mahindra Jeeps etc.
- 3 wheelers (all makes)
- Light Commercial Vehicles (LCVs) : Four Wheelers : Bajaj Tempo, Tata 407, Force etc.
- Heavy Utility Vehicles (HCVs) : Trucks, Lorries and Buses

The tally mark method was used for counting the vehicles as given in format below in Table 3.2.

The vehicle count during the summer season at Haridwar was carried out manually in the time interval as given below :

- 7.00 a.m to 10.30 a.m.
- 10.30 a.m. to 2.00 p.m.
- 2.00 p.m to 5.30 p.m.
- 5.30 p.m to 9.00 p.m

The Incoming and Outgoing Vehicles were count separately.

Table 3.2
Format for Vehicle Count

Locations	TIME	Type	Number of Vehicles
	6.00 am to 9.00 am	**2 Wheeler**	~~IIII~~
		3 Wheeler	
		Car	
		Truck	
		Bus	
		LCV	
		TOTAL	
	9.00 am to 12.00 noon	**2 Wheeler**	
		3 Wheeler	
		Car	
		Truck	
		Bus	
		LCV	
		TOTAL	
	12.00 am to 3.00 pm	**2 Wheeler**	
		3 Wheeler	
		Car	
		Truck	
		Bus	
		LCV	
		TOTAL	
	3.00 pm to 6.00 pm	**2 Wheeler**	
		3 Wheeler	
		Car	
		Truck	
		Bus	
		LCV	
		TOTAL	
	6.00 am to 9.00 am	**2 Wheeler**	
		3 Wheeler	
		Car	
		Truck	
		Bus	
		LCV	
		TOTAL	

Summer, Post Monsoon and Winter Season : The summer season is when the religious pilgrims and tourist visits Haridwar respectively in maximum numbers during May – July every year. The maximum number of religious and tourists flow in Haridwar is during Summer season. Winter season when the religious pilgrims flow is minimum during winter season esp. from November to January every year due to cold weather conditions.

It is assumed that the vehicle entering the Haridwar will travel approximately 25 kms in the Haridwar.

3.7 Meteorological Monitoring -

A meteorological station was installed at PCRI, BHEL Haridwar to monitor the hourly Wind speed, Wind direction, Temperature and Relative Humidity. The wind rose during summer, post monsoon and winter season is prepared.

3.8 Preparation of Technical Report -

Based on the study conducted, a technical report has been prepared for Action Plan for Air Quality Improvement of Haridwar Cities.

CHAPTER 4

4.1 Description of Haridwar

Haridwar (also known as Haridwar) is a holy city in the state of Uttarakhand in northern India. Known as the Gateway to the Gods, Haridwar is considered one of the seven holiest places according to Hindus, as the devas are said to have left their footprints there. Here pilgrims float diyas on the Ganges, to commemorate their deceased ancestors. The city also stands as a gateway to three other important pilgrimage destinations: Rishikesh, Badrinath, and Kedarnath. In Haridwar you will see a great statue of Shiva at the fork of the river. If you are there for a short visit, it is definitely worth to visit the temple on top of the mountain, with a wonderful view.

Haridwar has very rich ancient religious and cultural heritage. In the ancient scriptures of India, this place is well known by the name of Mayapur. This city is also well known for many other things apart from the holy river Ganges. Haridwar has privilege of having IIT at Roorkee, formerly known as University of Roorkee, founded in 1847 as a first technical institute of India. The city has one of the "navratna PSUs of India" i.e. BHEL (Bharat Heavy Electricals India Ltd.). The tomb Piran Kaliar of Shabir Shahib in Roorkee is a living example of religious harmony in India which is visited by the people of all religious sects from all over the world. There is another University in the city called Gurukul Kangri Vishva Vidyalaya apart from the head quarter of Uttarakhand State Public Service Commission also being established at Haridwar. Besides this, Kumbh fair is organized at the interval of every 12 years in this city in which about 1 crore pilgrims from all over the world participate.

By Road - Haridwar is well connected to the major cities, it lies on the National Highway no. 58 and road network is good. The distances in km from some cities are Delhi-214 km, Agra-386 km, Ambala-168 km, Badrinath-325 km, Dehradun-52 km, Kedarnath-250 km, Saharanpur-81 km, Nainital-240 km.

Haridwar is a holy city where stands for Dwar of Hari or Gateway to God, 'Hari' meaning Vishnu and 'dwar' means gate. Haridwar is regarded as one of the seven holiest places to Hindus.

After Travailing 253 km from its source at Gaumukh, 3,139 m (10,300 ft) above sea level, at the edge of the Gangotri Glacier, Ganga enters the Indo-Gangetic Plain of North India for the first time at Haridwar and this is what gave the city its ancient name, Gangadwára , the place where the Ganges descends to the plains.

According to Hindu scriptures, Haridwar is one among the four sites where drops of the elixir of immortality, Amrit, accidentally spilled over from the pitcher, in which it was being carried away by the celestial bird Garuda, after the Samudra manthan. These four spots – Ujjain, Haridwar, Nasik, and Allahabad – have today become places, where the Maha Kumbh Mela is celebrated once every 12 years at each place. These after every 3 years Maha Kumbh Mela is celebrated in any of these four places. Millions of pilgrims, devotees, and tourists congregate here from all over the world to celebrate the event. They perform ritualistic bathing on the banks of the river Ganga.

The spot where the Amrit fell is considered to be the *Brahma Kund* at Har ki Pauri (literally, "footsteps of the Lord,"), the most sacred ghat of Haridwar; thousands of devotees and pilgrims flock here during festivals or *snan* from all over India to take a holy dip. This act is considered to be the equivalent of washing away one's sins to attain Moksha.

Figure 4.1 Landscape of Haridwar

4.1.1 Geography

Haridwar district, covering an area of about 2360 km^2, is in the southwestern part of Uttarakhand state of India. Its latitude and longitude are 29°58' North and 78°10' East respectively. *(ref: Uttarakhand.nic.in)*

Temperatures:

- Minimum Temperature : 3°C
- Maximum Temperature : 43°C

The district receives Monsoon rains, mostly during the summer.

4.1.2 Demographics

As of 2001 Indian census, the Haridwar district has a population of 14,47,187. The population of Haridwar city is 1,75,010 (2001 Census). The density of population is 14,228 /km^2 .

4.1.3 Religious festivals and fares

Being a place of intense religious significance, Haridwar also hosts several religious festivals throughout the year; popular among them are the Kavad Mela, Somvati Amavasya Mela, Ganga Dashahra, Gughal Mela,in which around 20-25 lacs (2-2.5 million) people take part.
Apart from these, there is the mammoth Kumbh Mela which takes place once in every twelve years, when the planet Jupiter (Brihaspati) comes into the sign Aquarius (Kumbha). First written evidence of the Kumbha Mela can be found in the accounts of Chinese Traveller Huan Tsang or Xuanzang (602 - 664 A.D.), who visited India in 629 AD.

Religious Place of pilgrimage

- Har ki Pauri:
- Sati Kund:
- Daksheswara Mahadev Temple
- Maya Devi Temple
- Sapt Rishi Ashram and Sapt Rishi Sarovar,
- Bhimgoda Tank
- Chandi Devi Temple
- Mansa Devi Temple

4.1.4 Transport

National Highway 58, between Delhi and Mana pass, passes through Haridwar. Indian Railways links Haridwar Junction Railway Station to all parts of India. The nearest airport is

Jolly Grant Airport, Dehradun, though Indira Gandhi International Airport in New Delhi is preferred.

Location of Haridwar in Uttarakhand and India

Latitude : 29° 58' 00''

Longitude : 78° 10' 00''

Elevation : 314 metres (1,030 ft)

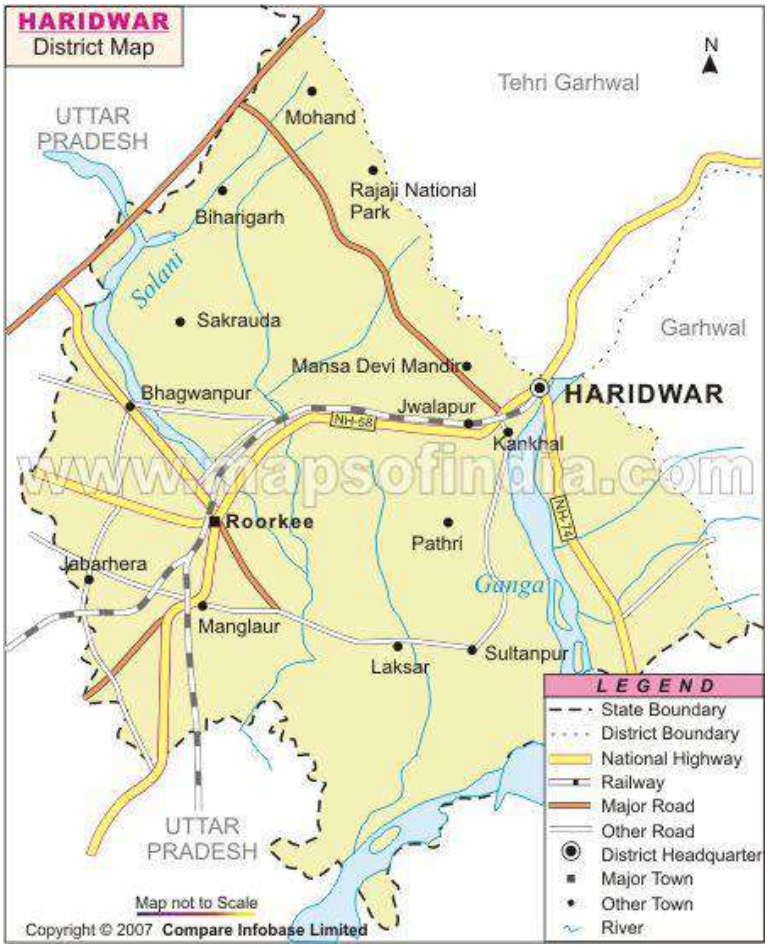


Figure 4.2 : District Map of Haridwar

Road Network

NH-58 is an important national highway serving holy shrines of Badrinath, Kedarnath, Gangotri and Yamunotri besides serving the capital of Uttaranchal state. NH-58 is from

Ghaziabad to Mana Pass and passes through Modinagar, Meerut, Khatauli, MuzaffarNagar, Roorkee and Haridwar. During any religious activities like Kavad mela in Shivratris, NH-58 is occupied by thousand of pedestrian devotees, who are going to Haridwar to fetch holy water of the river Ganga. This congestion of road seriously affects the freight and passenger traffic from Haridwar to Delhi. To make optimum use of the road network, as communication links, for all seasons a great amount of money is invested in planning and other activities of the roads.

Figure 4.3 : Major Roads Entering Haridwar

The roads which are entering to Haridwar region are as given below :

1. Delhi – Haridwar : NH 58
2. Saharanpur – Haridwar Road
3. Najibabad – Haridwar : NH 74
4. Rishikesh / Dehradun – Haridwar Road

So, the emission sources of vehicles will be from these points in the Haridwar. The locations of vehicle congestion are as given below :

1. Bahadrabad, Jawalapur Road
2. Chandracharya Chowk / BHEL Barrier No. 2
3. Laksar Road
4. Chandi Devi Bridge – Najibabad Road
5. Check Post, Dehradun / Rishikesh – Haridwar Road

The incoming vehicles to Haridwar enters from Roorkee, Laksar, Najibabad, Dehradun / Rishikesh and BHEL.

Vehicle Count Locations

Parking Locations

Recommended Overbridge

Figure 4.4 : Road Infrastructure of Haridwar

4.2 Interaction with Civil Authorities and others :

Municipal Corporation Department: The municipal Corporation Officer was contacted for the information for parking areas in Haridwar. The MCD gave the information on the parking areas and widening of road by removing the encroachment along the road. The officer at MCD briefed that the MCD is responsible for planning new roads and identifying roads that need to be widened/strengthened to enhance the carrying capacity. MCD is responsible for execution and addressing key elements for facilitating traffic and transport management. The role of the traffic police is confined to operating traffic implemented by MCD and enforcing traffic regulatory mechanisms formulated by MCD.

MCD has also given the information that the roads need to be widened in order to de-congest them and ensure free flow of traffic. The basis for the have been decided on the basis of subjective decisions. However, none of the widening proposals have been implemented.

CO Traffic : Traffic management initiatives of MCD are implemented by the Traffic Police Department, which is responsible for enforcement of traffic rules, with regard to parking regulation, regulation of truck movement in the city, and ensuring route adherence of public transport operators. Provision of signage's, traffic signals and other transport infrastructure like bus stations, bus stops, shelters, etc. vests with MCD.

Tourist and Religious authorities : the promotion of tourism in the State in a planned and environmentally sustainable manner.

Private taxi persons : The private taxi has the network to Delhi, Risikesh, Dehradun, Badrinath, Gangotri, Yamunotri. They charge based on the market fluctuations. The probable city plans for vehicular management and control vehicular pollution from Town Planners have been collected to provide input for suggesting future areas for better parking and vehicular management.

Auto Rickshaw : The auto rickshaw driver told that they do not go for PUC check . Also they told that there is no regulation of maximum number of passengers to be boarded in the Auto rickshaws.

4.3 General Characteristics of the District

Haridwar district is a district in the state of Uttarakhand, India. It is headquartered at Haridwar which is also its largest city. The district is ringed by the districts Dehradun in the north and east, Pauri Garhwal in the east and the Uttar Pradesh districts of Muzaffarnagar and Bijnor in the south and Saharanpur in the west.

A paradise for nature lovers and one of the seven holiest places of Hinduism, Haridwar presents a kaleidoscope of Indian culture and civilization. Haridwar district came into existence on 28 December 1988 as part of Saharanpur Divisional Commissionary, On September 24, 1998 Uttar Pradesh Legislative Assembly passed the 'Uttar Pradesh Reorganisation Bill', 1998', eventually the Parliament also passed the Indian Federal Legislation - 'Uttar Pradesh Reorganisation Act 2000', and thus on 9 November 2000, Haridwar became part of the newly formed Uttarakhand (then Uttaranchal), the 27th state in the Republic of India.

Population:

As of 2011 it is the most populous district of Uttarakhand (out of 13). Important towns in the district are Haridwar, BHEL Ranipur, Roorkee, Manglaur, Dhandera, Jhabrera, Laksar, Landaura and Mohanpur Mohammadpur. According to the 2011 census Haridwar district has a population of 1,927,029. This gives it a ranking of 244th in India (out of a total of 640). The district has a population density of 817 inhabitants per square kilometre (2,120 /sq mi). Its population growth rate over the decade 2001-2011 was 33.16 %. Haridwar has a sex ratio of 879 females for every 1000 males, and a literacy rate of 74.62

Melas:

Being a place of intense religious significance, Haridwar also hosts several religious festivals throughout the year; popular among them are the Kavad Mela, Somvati Amavasya Mela, Ganga Dashara, Gughal Mela, in which around 20-25 lacs (2-2.5 million) people take part. Apart from these, there is the mammoth Kumbh Mela which takes place once in every twelve years, when the planet Jupiter (Brihaspati) comes into the sign Aquarius (Kumbha). First written evidence

of the Kumbha Mela can be found in the accounts of Chinese traveller Huan Tsang or Xuanzang (602 - 664 A.D.), who visited India in 629 AD. The 1998 Maha Kumbh Mela saw over 80 million pilgrims visiting this city, to take a dip in the holy river Ganges.

Location & Geographical Area:

Haridwar district, covering an area of about 2360 sq.km. is in the western part of Uttarakhand state of India. It's latitude and longitude are 29.58 degree north and 78.13 degree east respectively. The height from the sea level is 249.7 mts. The district came into existence on 28th Dec. 1988. Prior to its inclusion in the newly created state of Uttarakhand, this district was a part of Saharanpur Divisional Commissionary. The district is ringed by Saharanpur in the west, Dehradun in the north and east, Pauri Garhwal in the east, Muzzaffar Nagar and Bijnor in the south. The district headquarter is situated in the Roshnabad, at a distance of about 12 kms from railway station. The Collectorate, Vikas Bhawan, District Judiciary, S.S.P. Office, Police line, District Jail, District sports stadium, Jawahar Navodaya Vidyalaya etc. are the prime establishments of this area. The district is administratively subdivided into three tehsils i.e. Haridwar, Roorkee and Laksar and six development blocks i.e. Bhagwanpur, Roorkee, Narsan, Bahadrabad, Laksar and Khanpur. Haridwar is one of the first towns where Ganga emerges from the mountains to touch the planes. As per the 2001 census, the population of the district is 14,44,213. Due to Haridwar's location on the bank of river Ganga, it has plenty of water resources and almost all kind of food grains are produced here in abundance.

Topography Temperatures:

- Summers: 15 °C - 42°C
- Winters: 6°C - 16.6°C

The temperature during the summer months ranges from 15 C - 42 C, while in the winter months the temperature varies within 6 C 16.6 C. Monsoon rains occurs mainly during the

summer time in Haridwar District.

4.4 Economy of Haridwar

Agriculture is the mainstay of this well irrigated district. Industrialisation had commenced with the establishment of Central Government owned Public Sector plants (PSUs) of Hindustan Antibiotics Limited and Bharat Heavy Electricals Limited, in pre-Uttarakhand 1960s period. The State Industrial Development Corporation of Uttarakhand (SIDCUL) has now established one new 'industrial development zone' in the district, adjacent to Shivalik Nagar near Haridwar, to encourage industrialization; with industrial giants like Hindustan Lever, Hero Motocorp, Mahendra & Mahendra and Havells having moved in, it is making the desired progress. Not insignificant to the district's economy is the contribution of Hindu pilgrims who visit the holy places and attend the religious fairs in large numbers.

Availability of Minerals:

In Haridwar district major minerals available are Sand, Stone and Gypsum. According to Geology and Mines Unit, Directorate of Industries, Uttarakhand, Dehradun the revnue from minerals available in District are as under PRODUCTION OF MINERAL 2010-11

S.NO.	YEAR	REVENUE EARNED (Rs)
1	2009-2010	65792755 /-
2	2010-2011	68430147 /-

MINERALS: Sand,Stone , Gypsum (RBM)

SOURCE:- GEOLOGY & MINES UNIT, Dt. Dehradun

4.5 Forest in Haridwar:

Under forest Department, there is National level Park known as Rajaji National Park.The park has been created in 1983 by amalgamation of three sanctuaries- Rajaji sanctuary (estd. 1948)

Motichur sanctuary (estd. 1964) and Chilla sanctuary(estd. 1977) after the name of renowned statesman and freedom fighter Sri C. Rajgopalachariya - The first and last Governor General of independent India popularly known as "Rajaji". The park is spread over an area of 820.42 sq. km. in three Districts- Dehradun, Haridwar & Pauri Garhwal of Uttaranchal State, India.

The Park has got the largest area representing Shiwalik Eco-system. The Shivalik trail is 10 million year old and very rich in fossils. It's fossils faunal remains include about 50 species of elephant, one of them is present today. The majestic Ganges flows through the National Park for a distance of 24km, besides the innumerable streams and brooks making it rich and diverse. It offers ample opportunities to nature lovers to enjoy the captivating landscape and wildlife.

Rajaji is thickly foliated predominantly by the Rajaji is thickly foliated predominantly by the Sal Forest and a number of other forest types which include the Western Gangetic Moist and Northern dry Deciduous and Khair-Sissoo forests. Low Alluvial Savannah Woodlands cover the drier southern margins of the park, in contrast to the Shiwalik Chir-Pine on the high reaches of the hills. The park is home to the Tiger, Leopard, Himalayan Bear, Cheetal, hog deer, barking deer, Sambar deer, wild boar, antelopes such as the Nilgai, Goral , Jackal, Hyena, Jungle Cat, Leopard Cat, Civets, Himalayan Yellow-Throated Marten, Sloth Bears, Pythons, King Cobra, Common Krait, Indian Cobra and the Monitor Lizard .

4.6 Administrative set up:

Haridwar district came into existence on 28th Dec. 1988. Prior to its inclusion in the newly created state of Uttarakhand, this district was a part of Saharanpur Divisional Commissionary. The district is headed by District Magistrate/District Collector/Deputy Commissioner. The district headquarter is situated in the Roshnabad, at a distance of about 12 kms from railway station. Good transport service is available in the form of local bus, tempo (vikram) to reach Roshnabad.

The Collectorate, Vikas Bhawan, District Judiciary, S.P. Office, Police line, District Jail, District

sports stadium, District navodaya Vidyalaya etc. are the prime establishments of this area. The district is administratively subdivided into three tehsils i.e. Haridwar, Roorkee and Laksar and six development blocks i.e. Bhagwanpur, Roorkee, Narsan, Bahadrabad, Laksar and Khanpur.

The subdivisions are headed by Sub Divisional Officer, normally called SDM. Each subdivision serves the purpose of general, criminal and revenue administration of the district. For development works, a chief development officer (CDO) is posted at district head quarter who heads a team of Block Development Officers at blocks.

The office of CDO is located in Vikas Bhawan at Roshnabad.

SOME IMPORTNANT CONTACT NUMBERS

	Office	**Residence**
District Megistrate	239440	239645,239561
District Judge	239700	-
Sr. Supdt. Of Police (SSP)	23977	239866
Addl. District Magistrate	239554	234674
Addl. S.P.	232777	225060
Chief Development Officer	239097	232755
Public Service Commission	214143, 214282	-
City Magistrate	226400	221663
SDM Haridwar	254807	229599
SDM Roorkee	01332-270794	01332-272484
SDM Laksar	01332-254401	-
Tehsildar Haridwar	254807	-
Tehsildar Roorkee	01332-272318	-
Tehsildar Laksar	01332-254401	-
Chief Medical Officer	226023	-
Secretary, HDA	226849	226375
Project Director, DRDA	239462	225612
Sr. Treasury Officer	239581	-
Treasury Officer, Roorkee	272766	-
Commandant, CISF	226292	-
Income Tax Office	225915	-
A.R.M. Roadways	226908	-
Dy. Director, Rajaji National Park	225193	-
Tourism Office	227370	-
District Eco. & Statistical	239377	-

Officer		
A.R.T.O	225421	-
Dist. Development Officer	239097	-
Dist. Panchayat raj Officer	239727	-
ADEO (Madh)	226300	-
ADEO (Basic)	216113	-
DPEP	227384	-
ADEO Panchyat/Local Bodies	239454	-
District Information Officer	226695	-
District Saving Officer	239546	-
AR (Coop.)	239378	-
G.M DIC Roorkee	01332-262452	-
Fire Station	227007	-
District Supply Officer	225125	-
Social Welfare Officer	239743	-
Supdt. District Jail	239500	-
Commercial Tax	226815	-
District Porbation Officer	239473	-
Jawahar Navodaya Vidyalaya	239910	-
Station Supdt. Railway	227461	-

4.6.1 District at a glance

S. No.	Particular	Year	Unit	Statistics
1.	**Geographical features**			
(A)	**Geographical Data**			
	i) Latitude			22°30°'N
	ii) Longitude			78°10'E
	iii) Geographical Area		Hectares	2360
(B)	**Administrative Units**			
	i) Sub divisions	2010		
	ii) Tehsils	2010		3
	iii) Community Development Block	2010		6
	iv) Nyay Panchyat	2010		46
	v) Gram Pnachyat	2010		316
	vi)Revenue villages	2010		510
	vii) Non-inhabitated villages	2010		117
	viii) nagar Nigam	2010		0
	xi) Nagar Palika	2010		3

	x) nagar Panchyat	2010		4
	xi) Cantonment area	2010		1
2	**Population**			
	Total	2011		1927029
(A)	**Sex-wise**			
	i) Male	2011		1025428
	ii) Female	2011		901601
(B)	Rural Population	2011		1199126
3.	**Agriculture**			
A.	Land Utilization			
	i) Total Area	2010-11	Hectare	170721
	ii) Forest cover	2010-11	"	72449
	iii) Follow Land	2010-11	"	6729
	v) Barren & Unculturable Land	2010-11	"	2814
	vi) Land under Non-agricultural uses	2010-11	"	16940
	vii) Permanent Pasture & other grazing land	2010-11	"	70
	viii) Net area Sown	2010-11	"	117749
4.	**Forest**			
	i) Forest	2010-11	Squre KM	746.12
5.	**Livestock & Poultry**			
A.	Cattle			
	i) Cows	2007	Nos.	97062
	ii) Buffaloes	2007	Nos.	272464
B.	Other Livestock			
	i) Goats	2007	Nos.	26115
	ii) Pigs	2007	Nos.	9850
	iii) Dogs & Bitches	2007	Nos.	13026
	iv) Railways			
	i) Length of rail line	2010-11	kms	-
	V) Roads			
	a) National Highway	2010-11	kms	111
	b) State Highway	2010-11	kms	150
	c) Main District Highway	2010-11	kms	151
	d) Other district & Rural Roads	2010-11	Kms	1470
	e) Rural road/Agriculture Marketing Board Roads	2010-11	Kms	862
	Vi) Communication			
	a) Telephone connection	2010-11	Nos.	37002

	b) Post offices	2010-11	Nos.	116
	c) Telephone center	2010-11	Nos.	35
	d) Density of Telephone	2010-11	Nos./1000 person	19.2
	e) Density of Telephone	2010-11	No. per KM.	-
	f) PCO STD	2010-11	No.	1173
	g) Mobile	2010-11	No.	177408
	VII) Public Health			
	a) District Level Hospital	2010-12	Nos.	4
	b) Allopathic Hospital	2010-12	Nos.	1
	c) Beds in Govt. Hospitals	2010-12	Nos.	542
	d) Ayurvedic Hospital	2010-12	Nos.	24
	e) Unani Hospital	2010-12	Nos.	5
	a) PHC/Additional PHC	2010-12	Nos.	28
	b) Family welfare centre	2010-12	Nos.	165
	(VIII) Banking commercial			
	a) Commercial Bank		Nos.	147
	b) Rural Bank		Nos.	3
	c) Co-operative Bank		Nos.	14
	d) Other Private commercial Bank		Nos.	10
	(IX) Education			
	a) Primary school		Nos.	1482
	b) Middle schools		Nos.	468
	c) Secondary & senior secondary schools		Nos.	160
	d) Colleges		Nos.	16
	e) Technical University		Nos.	4

Chapter-5

5.1 Existing Status of Industrial Areas in the District Haridwar

Sl. No.	Name of indl. Est.(SIDCUL/UPSIDC/Indl. Deptt. Private Indl.Est./Out side Thrust Ind.	AREA IN ACRES	No. of Units Established	Investment Rs. In Crore	EMPLOYMENT GENERATED		
					FROM UK Regular	Out side	TOTAL
SIDCUL I/A							
1	IIE Ranipur Haridwar SIDCUL	1700.00 P-630	522	8006.89	26207	12054	38261
2	Industrial Area Baharabad	132.55 P-278	120	149.16	2690	915	3605
3	Industrial Area Haridwar	106.13 P-197	60	76.37	1401	375	1776
4	Industrial Area Landhaura	102.99 P-94	2	3.88	44	15	59
5	Ancillary Industrial Estate Ranipur Haridwar	16.00 P-14	5	10.7	110	47	157
	Total	2057.67	709	8247.01	30452	13406	43858
GOVERNMENT INDUSTRIAL ESTATE							
1	Mini Industrial Estate Pipali Laxer	2.50 P-55	1	0.11	10	1	11
2	Industrial Estate Roorkee	30.227 P-56	23	12.56	324	51	375
	Total	**32.727**	**24**	**12.67**	**334**	**52**	**386**
PRIVATE INDUSTRIAL ESTATE							
1	Ranipur Industrial Area	105.00	127	563.31	3296	1205	4501
2	Ranipur Co-Operative Ranipur	34.31	22	30.02	335	95	430
3	Lakeshari Industral Area, Lakeshari	60.00	31	770.11	4037	1174	5211
4	AIS Industrial Estate Khanpur Kasauli, Latherdevahoon	121.80	6	121.36	1011	262	1273
5	KIE Infrastructure and Project Pvt. Ltd., Mundiyaki	54.00	14	92.21	504	143	647
6	Shiv Ganga Industrial Estate, Lakehari	30.88	47	106.83	889	322	1211
7	Salempur Rajputan Industrial Estate Sunhera/ Salempur Rajputan	60.11	61	44.01	773	200	973
8	Devbhoomi Industrial Estate, Bantakheri	45.31	30	166.88	1534	449	1983

9	GOLD PLUS INTEGRATED INDUSTRIAL ESTATE THATHOLA	91.46	1	414.00	280	114	394
10	JAYPRAKASH ASSOCIATS Ltd NALHERI DEHRIVAN	30.44	1	216.19	130	52	182
11	Birla Tayers Industrial Estate Khedimurakpur	106.99	2	2016.00	4712	1010	5722
12	Birla tyres unit-2 i/e khedimubarikpur	62.87	1	741.00	1388	412	1800
13	M/s PANTJALI FOOD & HARBAL PRODUCTS FERUPUR BAHADRABAD	139.54	2	580.00	1808	292	2100
14	ARO-INFRASTRUCTS PARK-II, SALEMPUR, MAHDOOD	410.48	11	468.70	1117	404	1521
15	ARO-INFRASTRUCTS, PARK-IV, BEGUMPUR, HARIDWAR	88.92	15	147.20	930	432	1362
16	M/s Vardhman Industrial Area Bahaderpur Saini	122.26	4	265.73	180	55	235
	Other		2	40.79	52	13	65
	Total		**377**	**7880.34**	**22976**	**6634**	**29610**
1	**Outside Industrial Thrust Sector**		**127**	**645.61**	**4449**	**1307**	**5456**
MEGA PROJECT							
1	PRINCE PIPE & FITTING Ltd, SALEMPUR MAHDOOD	2.13	1	52.00	598	222	820
2	M/S RANA Alloy SHIKARPUR	9.00	1	70.00	105	45	150
3	M/S AQUA PROJECTS Ltd. AKBERPUR URD PUNDERPUR, PIPALI	11.60	1	62.00	175	75	250
4	M/S RANA GLOBAL Ltd, GANGNAULI	18.70	1	55.00	38	14	52
5	M/S RANA UDHYOG DAHIYAKI	5.58	1	53.75	32	13	45
6	M/S MRIC ELECTRONICS Ltd, MUDIYAKI UNIT – I I	7.17	1	67.00	84	39	130
7	M/S TUBE INVESTMENT OF INDIA Ltd GANGNAULI	37.479	1	80.00	65	23	88
8	SHREE CEMENT AKBERPUR, URD	32.86	1	200.00	140	35	175
9	HARIDWAR IRON & ISPAT, ROLLING MILLS LTD, AKBERPUR URD	24.489	1	57.50	36	14	50
10	M/s APT packaging ltd kh-529 akberpur urd		1	50.50	103	37	140
	Total		**10**	**748.60**	**1376**	**517**	**1893**
	GRAND TOTAL		**1247**	**17534.23**	**59587**	**21916**	**81503**

5.2 INDUSTRIAL SCENERIO OF HARIDWAR

Industries at a Glance:

S. No.	Head	Unit	Particulars
1	REGISTERED INDUSTRIAL UNIT	No.	7496
2	TOTAL INDUSTRIAL UNIT	No.	7581
3	REGISTERED MEDIUM & LARGE UNIT	No.	159
4	ESTIMATED AVG. NO. OF DAILY WORKER EMPLOYED IN SMALL SCALE INDUSTRIES	No.	149
5	EMPLOYMENT IN LARGE AND MEDIUM INDUSTRIES	No.	55768
6	NO. OF INDUSTRIAL AREA	No.	38 (Govt./PRIVATE INDUSTRIAL ARE /MEGA PROJECTS)
7	TURNOVER OF SMALL SCALE INDUSTRIES	IN LACS	850374.80
8	TURNOVER OF MEDIUM & LARGE SCALE INDUSTRIES	IN LACS	108776.00 EXCLUDING LARGE INDUSTRIES

List of Companies in Sidcul Haridwar

S. No.	Companies Name	Address of Company
1	M/s Mahindra And Mahindra	Sec 5, Sidcul,, Haridwar - 249403, Uttarakhand, India
2	Ritu Tech	Plot No-9c, Industrial Park-2, Arrow Infra Ltd, Near Sidcul,, Haridwar - 249403, Uttarakhand, India
3	Galio India Private Limited	Unit- Plot No. 116-117, 136-137, Sector- Iidc, Iie, Bhel Complex, Sidcul,, Haridwar - 249307,Uttarakhand, India
4	Alf Engineering Company	Plot No. 227-231, Sec-7, Sidcul Industrial Area,, Haridwar - 249403, Uttarakhand, India
5	Hero Moto Corp Ltd.	Plot No.3, Sector-10, Sidcul,, Haridwar - 249403, Uttarakhand, India
6	Themis Medicare Ltd.	Plot No. 16, 17, 18, Sector 6-a, Sidcul Industrial Area,, Haridwar - 249403, Uttarakhand, India
7	Arvind Chemicals	S-267, Shivalik Nagar, Opp. Sidcul,Haridwar249401, Uttarakhand, India
8	Sos Oil Seals Pvt. Ltd.	Plot No 151, Sector 8 D, Sidcul,, Haridwar - 249403, Uttarakhand, India

9	Kirby Building System India (ua) Ltd.	Plant No. 2, Sidcul, Haridwar - 249403, Uttarakhand, India
10	Tiger Steel Engineering India Pvt. Ltd.	Plot No 4, Sec 12, Sidcul,, Haridwar - 249403, Uttarakhand, India
11	M/s Mahindra & Mahindra Pvt. Ltd	Block No.- 5, Sidcul, Near Bahadrabad,, Haridwar - 247667, Uttarakhand, India
12	Build Scaff	No. 34, Sector-2, IIE, Sidcul,, Haridwar - 249402, Uttarakhand, India
13	Bsl Scaffolding Ltd.	Plot No.103 & 104, Sector -7, Sidcul,, Haridwar - 249407, Uttarakhand, India
14	Prince Pipes & Fitting Pvt. Ltd.	Khasra No 1548, 49/4 & 5, Salempur Mehdood IIE, Sidcul–bahadrabad Road,, Haridwar - 267009, Uttarakhand, India
15	Vansal Narayan Engg. Works	Plot No-39, Sector-2, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
16	Agrawal Drugs Pvt. Ltd.	24/6b, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
17	Sona Trading Company	J-363, Shivalik Nagar, Near Sidcul Industrial Area, Bhel,, Haridwar - 249403, Uttarakhand, India
18	Satya Traders	New Tehri Visthapit, Sidcul, Roshnabad,, Haridwar - 249403, Uttarakhand, India
19	Lobateur Electric And Digital Systems Pvt. Ltd.	Sector-2, Plot No.:2. Sidcul,, Haridwar - 249402, Uttarakhand, India
20	Abb Ltd.	Plot No. 1, Sector 1b, Ground Floor, Integrated Industrial Estate Sidcul,, Haridwar - 249403, Uttarakhand, India
21	Novateur Electrical & Digital Systems Pvt Ltd.	Plot No 2, Sec 2 Sidcul,, Haridwar - 249402, Uttarakhand, India
22	Bml Technologies	Plot No. 31 & 41, Sector 8a, Sidcul, Bhel, Ranipur,, Haridwar - 249403, Uttarakhand, India
23	Advance Panels & Switchtchgears (p) Ltd.	Plot No. 30-31, Sec-5, Iie, Sidcul,, Haridwar - 234903, Uttarakhand, India
24	Mayank Auto Engineers Pvt. Ltd.	19/20, Sidcul Industrial Estate,, Haridwar - 429403, Uttarakhand, India
25	C & S Electric Ltd.	Plot No. 1 B, Sector-8 C, Sidcul, Ranipur,, Haridwar - 249403, Uttarakhand, India 26. Gruner India Pvt. Ltd.
26	Gruner India Pvt. Ltd.	Plot No. 25, Sector-8a, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
27	Libra Enterprises	Plot No. 1, Sector - 3a, Iie 2iie Sidcul,,

		Haridwar - 249403, Uttarakhand, India
28	Indoasian Fusegear Ltd.	Plot No 10 , Sector 4, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
29	Vijai Electricals Ltd.	Plot No. 1-a, Sector - 12, Iie Sidcul,, Haridwar - 249403, Uttarakhand, India
30	Arvind Chemicals	No. S-267, Shivalik Nagar, Opp. Sidcul,, Haridwar - 249401, Uttarakhand, India
31	K-2 Cloth	Plot No. 126-127, Sector-iidc, Sidcul, Behind Anchor Electricals,, Haridwar - 249403, Uttarakhand, India
32	International Panaacea Ltd.	Plot No. 42 To 46, Sec 5, Iid Sidcul,, Haridwar - 249403, Uttarakhand, India
33	Wipro Enterprises Ltd	Plot No. 99-104, Sector-6a , Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
34	Automat Irrigation Pvt. Ltd.	Plot No. 4 & 5, Sector-3a, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
35	Mahavira Engineering	Plot No. 59, Sec. 6a, Sidcul,, Haridwar - 249401, Uttarakhand, India
36	Raja Biscuit Udyog Pvt. Ltd.	Plot No.1-15, Sec 1-b, Iie, Sukchar, Girija, Bhel, Sidcul,, Haridwar - 249403, Uttarakhand, India
37	Roopa Electricals (p) Ltd.	No.29, Iidc Sector, Sidcul Industrial Estate Ranipur,, Haridwar - 249403, Uttarakhand, India
38	Padm Services	Plot 27, Sector 1-b, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
39	Wipro Limited	Plot No. 99-104, Sector 6 A, Sidcul Industrial Area,, Haridwar - 249403, Uttarakhand, India
40	Dynavista Industries Pvt Ltd	11-e, Sec 7, Plot 1, Sidcul,, Haridwar - 249403, Uttarakhand, India
41	ITC Ltd. Food Unit	Sec-11, Plot No-1, Sidcul Industrial Area, Alipur,, Haridwar - 249403, Uttarakhand, India
42	Fusion Chocola	Plot No. 432, Deep Ganga Apartment, Sidcul,, Haridwar - 249404, Uttarakhand, India
43	Controls And Switch Gear Contractors Limited	Near Sidcul Industrial Area, Haridwar - 249403, Uttarakhand, India
44	Ahmed Engineering	Salempur, Mahdood, Near Jama Masjid, Sidcul Road,, Haridwar - 249403, Uttarakhand, India
45	Universal Power Transformer (p) Ltd.	Plot No. 37, Sector-8a, Sidcul Haridwar - 249403, Uttarakhand, India
46	Tulsi Packaging	Plot No. 25, Sec-1b, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India

47	Sogex Engineers	No.233a, Sec-7, Near Power House, Sidcul Industrial Area,, Haridwar - 247663, Uttarakhand, India
48	Pioneer International	Plot No. 2, Sector 1-b, I.i.e, Sidcul,, Haridwar - 249403, Uttarakhand, India
49	Mahima Udyog	Plot No. 144-145, Sec IIDC Sidcul,, Haridwar - 249403, Uttarakhand, India
50	Galaxy Electronics Pvt. Ltd.	Bahadrbad, Sidcul, Near Raja Dixit Park,, Haridwar - 247001, Uttarakhand, India
51	Insta Exhibitions Pvt. Ltd.	Plot No.14, Sector - 8a, Sidcul– IIE, Haridwar - 249403, Uttarakhand, India
52	Noble Industries	Plot No. 04, Sector 11, Sidcul,, Haridwar - 249403, Uttarakhand, India
53	Ahmedabad Haridwar Transport Company	Sidcul Bye Pass, Highway Road, Bhadrabad,, Haridwar - 249402, Uttarakhand, India
54	Jupiter Sales Corporation	Plot No. 123, Sec-iidc, Sidcul,, Haridwar - 249403, Uttarakhand, India
55	Vectus Industries Ltd.	Plot No-26, Sector-2, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
56	Beeam Industries Pvt. Ltd.	Plot No. 1, Sector 1a, Sidcul,, Haridwar - 249403, Uttarakhand, India
57	Ganga Mata Products	Plot No. 32, 33, Sector-7, BHEL Ranipur, Sidcul Ind. Area,, Haridwar - 249403, Uttarakhand, India
58	Radisson Blue Hotel	Plot No. 12, Pentagon Mall, Sidcul,, Haridwar - 249603, Uttarakhand, India
59	Shree Balaji Enterprises	Shop No. 4, Sec 1-b, Ind. Area, Sidcul,, Haridwar - 249003, Uttarakhand, India
60	Corum Lifesciences Pvt. Ltd.	Plot No. 51-56, Sector 5,IIE Sidcul,, Haridwar - 249403, Uttarakhand, India
61	Protork Process Controls	Opp. Manisha Pharma, Near Radhe Radhe Flats, Nehru Nagar, Sidcul,, Haridwar - 249404, Uttarakhand, India
62	Fitline Gym	Shivalik Nagar, Near- Sidcul,, Haridwar - 249407, Uttarakhand, India
63	Penta Latex	49 & 50 Sec 2, Sidcul Ranipur,, Haridwar - 249403, Uttarakhand, India
64	Neel Metal Products Ltd.	Plot No. 4-6 & 11-16, Sect-5, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
65	Shubham Trading Company	Shop No.5, Bhagat Singh Market, Sidcul By Pass, Bhadrabad,, Haridwar - 249403, Uttarakhand, India
66	Axis Marketing	236, Deep Ganga, Plot No. 2, Sector- 5a, Sidcul,,

		Haridwar - 249403, Uttarakhand, India
67	Psychotropics India Limited	Plot 46-49, Sec 6 A, IIE, Sidcul Industrial Area, Ranipur,, Haridwar - 249403, Uttarakhand, India
68	Vishnu Natural Herbs (p) Ltd.	Plot 13, Sec-6 B, Sidcul,, Haridwar - 249403, Uttarakhand, India
69	Anamika Herbals	Plot No. 17, Sec-6 B, Iie, Sidcul(bhel),, Haridwar - 249403, Uttarakhand, India
70	Eveready Industries India Limited	Plot No-6, Sec-12, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
71	Onus Zaneka	Plot No-88, Sec IIDC, Sidcul,, Haridwar - 249403, Uttarakhand, India
72	Maxcure Drugs & Pharmaceticals Ltd.	Sector-6a, Plot No:13, Sidcul Haridwar,, Haridwar - 249407, Uttarakhand, India
73	Alkush Industries Pvt. Ltd.	Plot No. 32, Sec1b, Sidcul,, Haridwar - 249403, Uttarakhand, India
74	Arihant Elastoplast Pvt. Ltd.	Sector 12,plot No 17, Sidcul,, Haridwar - 249403, Uttarakhand, India
75	Safeguard Industries	Plot No. 30, Sector-IIDC, Sidcul,, Haridwar - 249403, Uttarakhand, India
76	Deep Traders	No.S-306, Shivalik Nagar, B.h.l, Near Sidcul Area,, Haridwar - 249403, Uttarakhand, India
77	R & A Brothers	Plot No- 22, Sector -7, IIE, Sidcul,, Haridwar - 249407, Uttarakhand, India
78	Sankhubaba International	Sector 1b, Plot No. 30-31, IIE Sidcul,, Haridwar - 249404, Uttarakhand, India
79	Classic Industries	Plot No.-27, Sec-5 IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
80	Penta Kraft	Plot No-10, Sector 3 A, Sidcul,, Haridwar - 249403, Uttarakhand, India
81	Shreeji Propack Pvt. Ltd.	Flat No 5, Sec A1, Sidcul Industrial Area, Haridwar - 249403, Uttarakhand, India
82	Concept Industries	Plot No 36, Sector 7, Sidcul,, Haridwar - 249403, Uttarakhand, India
83	Sterlite Technologies Ltd.	Sidcul, Sec-10, Main Road, Dist-haridwar,, Haridwar - 362130, Uttarakhand, India
84	Bharat Medical Devices Pvt. Ltd.	Plot No 10-11, Sector- 6b, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
85	Ombiomedic Pvt. Ltd.	Plot No. 82-83, 68-69, Sector-6a, Sidcul,, Haridwar - 249403, Uttarakhand, India
86	A.g. Industries Pvt. Ltd.	Plot No. 3/p9, Sector 10, Integrated Industrial Estate, Sidcul,, Haridwar - 249403,

		Uttarakhand, India
87	Arun Plasto Moulders (i) Pvt. Ltd.	Plot No-4, Sec-1a, IIE, Sidcul, Ranipur, Near Radisson Blu Hotel,, Haridwar - 249403, Uttarakhand,India
88	Kaane Packaging Pvt. Ltd.	Plot No. 1 & 2, Sector - 4, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
89	Ravian Life Science Pvt. Ltd.	Vivek Anand Shahi, Plot No.– 34, Sector 8-a, Sidcul, IIE,, Haridwar - 249403, Uttarakhand, India
90	Medimark Drugs & Pharmaceuticals	Plot No.-39, Sector-6 A, IIE, Sidcul, Near Metro Hospital,, Haridwar - 249403, Uttarakhand, India
91	Sgv Industries	Plot No-41/41, Sector 6-a, Sidcul, Near Metro Hospital,, Haridwar - 249407, Uttarakhand, India
92	S K Scientific Instruments Pvt. Ltd.	Plot No.- 25, Sec 8b, IIE Sidcul,, Haridwar - 249403, Uttarakhand, India
93	B.k. Print & Pack	Plot No. 26, Sec-8, Sidcul, Opposite Petrol Pump,, Haridwar - 249403, Uttarakhand, India
94	Deep Packaging	Plot No. 34, Sector-5, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
95	Durga Polyplast Pvt. Ltd.	Plot-116 Sec 6a Sidcul Industrial Area,, Haridwar - 249403, Uttarakhand, India
96	Ultimate Flexible Package Ltd.	Plot-12, S-11, Sidcul,, Haridwar - 249403, Uttarakhand, India
97	Eva Infocom	Sidcul,, Haridwar - 249407, Uttarakhand, India
98	Zoetis India Limited	F- 1/1, Sector 6b, Sidcul,, Haridwar - 249403, Uttarakhand, India
99	La Grande Herbs And Pharma Ltd.	Plot 13, Sector 6b, Sidcul,, Haridwar - 249403, Uttarakhand, India
100	Proveda Herbals	Plot No-42,43, Sec-2, I I E, Sidcul,, Haridwar - 249403, Uttarakhand, India
101	United Herbs & Herbal Co. Pvt. Ltd.	Plot No.44, Sector-6 A, Sidcul,, Haridwar - 249304, Uttarakhand, India
102	Cholayil Pvt. Ltd.	Plot No-8, Sector 6 B, Sidcul,, Haridwar - 249403, Uttarakhand, India
103	KTL Pvt. Ltd.	Plot No. 26, Sect 3 A, Sidcul Indl. Area, Haridwar - 249407, Uttarakhand, India
104	Shakti Industries	44-45, Sector Ii, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
105	Cld Electronics & Telecom Pvt Ltd.	K 52, Rajpal Nagar Ii, Plot No. 788, Sector 8b, Sidcul,, Haridwar - 249404, Uttarakhand, India
106	Sunrise Containers Limited	Plot No. 6 & 7, Sec-2, Sidcul,, Haridwar -

		249403, Uttarakhand, India
107	Graham Blow Pack Pvt. Ltd.	Plot No. 38 To 42, Sector-1b, Sidcul, Near Hindustan Unilever,, Haridwar - 249403, Uttarakhand, India
108	Polyflex International	22, Sec-3, IIE, Sidcul,, Haridwar - 249403, Uttarakhand, India
109	Amcol India Pvt. Ltd.	F-1, Sec-7, Sidcul,, Haridwar - 249403, Uttarakhand, India
110	Dev Drugs India Pvt. Ltd.	Plot No. 70, Sector-5 Iie, Sidcul,, Haridwar - 249401, Uttarakhand, India
111	Pharma Synth Formulations Ltd.	Plot No. : 18-22, Sector-6b, Sidcul-iie, Ranipur,, Haridwar - 249403, Uttarakhand, India
112	Halonix Ltd.	Plot No.5, Sector-12, Industrial Area Iie, Sidcul, Near Bharabad Police Station,, Haridwar - 249403,Uttarakhand, India
113	Eskage Pharma Pvt. Ltd.	Plot No. 31 & 32, Secgtor-6a, Sidcul,, Haridwar - 249403, Uttarakhand, India
114	Jivanta Laboratories Pvt. Ltd.	Plot No. 52, Sector-6a, Iie, Sidcul, Behind Psykhotrophia India Ltd.,, Haridwar - 249403, Uttarakhand, India
115	Advance Steel Tube Ltd.	Plot No. 3, Iie, Sidcul, Sec 2,, Haridwar - 249407, Uttarakhand, India
116	Manisha Pharmoplast Pvt. Ltd.	47/56, Sec-1-b, Iie Sidcul,, Haridwar - 249403, Uttarakhand, India
117	VlCC Personal Care Limited	11/12, Sector-6/a, Sidcul,, Haridwar - 249403, Uttarakhand, India
118	Mcnroe Consumer Products Pvt. Ltd.	Plot No. 44-46, Sec-1-e, Sidcul,, Haridwar - 249403, Uttarakhand, India
119	Nature Essenc Pvt. Ltd.	Plot No.-25, Sector-6b, Iie Sidcul, Haridwar - 249403, Uttarakhand, India
120	Genus Power Infrastructure Ltd.	Sector-4, Plot No. 12, IIE Sidcul,, Haridwar - 249401, Uttarakhand, India
121	Sunehari Exports Ltd.	Plot No.-98, Sec 5, Sidcul,, Haridwar - 249403, Uttarakhand, India
122	Kepro Technologies Pvt. Ltd.	Plot No. 54-55, Sec-iiidc, Atiie, Sidcul,, Haridwar - 249403, Uttarakhand, India
123	Chemin Springs India Private Limited	44-45, Sector 2iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
124	Rapid Moulders Pvt. Ltd.	Plot No-43, Sector-1b, Iie, Sidcul, Haridwar - 249403, Uttarakhand, India
125	Century Metals Recycling Pvt. Ltd.	Plot No.-3/p-2, Sec-10, Iie, Sidcul,, Haridwar - 249403, Uttarakhand, India
126	Supertech Hotels Pvt. Ltd.	Plot C1, Sector 12, Sidcul, Bhel,, Haridwar -

		249403, Uttarakhand, India
127	R.k. Industries	36, Sec-5, I.i.e., Sidcul , Ranipur,, Haridwar - 249403, Uttarakhand, India
128	Riya Vashu Industries	Plot-16, Sector-8b, Iie Sidcul,, Haridwar - 249403, Uttarakhand, India
129	Talent Healthcare	66-67, Sector 6-a, Sidcul, Iie,, Haridwar - 249401, Uttarakhand, India
130	Alps Industries Ltd	Plot No.-1, Sec-10, Sidcul, Roshnabad Road,, Haridwar - 239403, Uttarakhand, India
131	Classic Stripes Pvt. Ltd.	Plot No.3/p3, Sector-10, Hero Honda Compound, Iie, Sidcul Industrial Area,, Haridwar - 249403, Uttarakhand, India.

5.3 YEAR WISE TREND OF UNITS REGISTERED

YEAR	NUMBER REGISTERED UNIT	INVESTMENT RS. IN LAKHS	EMPLOYMENTS
1989-90	212	226.00	826
1990-91	315	630.00	1761
1991-92	337	299.00	1423
1992-93	336	430.00	1330
1993-94	282	307.00	790
1994-95	91	179.00	307
1995-96	359	385.00	1559
1996-97	336	297.00	1075
1997-98	366	363.00	831
1998-99	365	488.00	901
1999-2000	366	530.00	801
2000-01	222	160.00	560
2001-02	157	153-00	403
2002-03	369	350-00	806
2003-04	371	693-00	920
2004-05	398	1983-00	1077
2005-06	427	2940-86	1721
2006-07	499	19332-79	3383
2007-08	238	43582-07	6304
2008-09	241	53927-79	7181

2009-2010	394	55093.35	7333
2010-11	400	61703-37	6928
2011-12	415	39956-98	4695
TOTAL	**7496**	**644010.21**	**52955**

5.4 DETAILS OF EXISTING MICRO & SMALL ENTERPRISES AND ARTISAN UNITS IN THE DISTRICT

S.No.	Industry Group	Nos. of Large Units	Small & medium Units	No. of Units set	Investment Rs. in Crore	Employment
1	Textiles	3	25	28	466.09	4654
2	Electrical	9	185	194	1740.47	14014
3	Electronics	2	59	61	438.20	2529
4	Food processing	6	35	41	1512.34	6336
5	Pharmaceuticals	7	157	164	822.67	8619
6	Soap, Cosmetics	5	51	56	1916.67	5333
7	Automobiles	11	63	74	2904.92	6928
8	Misc. Engg.	2	153	155	467.76	5322
9	Packaging	4	90	94	226.42	4536
10	Steel	9	28	37	547.31	2617
11	Foot wears	1	15	16	49.40	2047
12	Plastics	8	168	176	795.17	6233
13	Eco- Tourism	-	12	12	49.94	368
14	Other	14	125	139	5586.87	11967
	Total	**81**	**1166**	**1247**	**17534.23**	**81503**

5.5 Major Exportable Item

- Fabric
- Automobile Parts
- UPS
- Electronic Meter
- Pharma Product
- Personal Care Products

Growth Trend

After reforming of Uttarakhand state and special concessional industrial package given by Govt. of India, the Large nos. of Micro, Small, medium & Large scale has come in the District by virtue of this the Industrial growth has raise from 5% to 19%.

Vendorisation / Ancillarisation of the Industry

Large nos of Ancillary units came up in Haridwar district. These are mainly in the field of Automobile. There are many ancillary industries of BHEL in Haridwar Industrial area.

5.6 Medium Scale Industries

List of the units in Haridwar District:

In Haridwar district there are many Medium Scale Industries/enterprises engaged to manufacturing various products to different Govt./Semi-Govt./ PSUs/Private Sector etc. The list of industries is as under

Major Exportable Item:

Major exportable items in Haridwar Districts are

- Fabric Shelter,
- Adhesives,
- Automobile Parts,
- Personal Care Products
- Pharmaceutical Products Etc.

Service Enterprises:

In Haridwar District according to DIC, Roorkee (Haridwar), service industries/enterprises are approximately 1778 Nos.

Potentials areas for service industry

- Transportation
- Computer & Related Activities,
- It Sector,
- Cyber Cafe,
- Construction Activities (Real Estate)
- Other Service Activities

Potential for new MSMEs

Major Strengths:

Major Trees	Deodar, Banj, Burn
Important Crops	Wheat, Rice, Maize, Mustered, Groungnut, Oilseeds
Important Fruits	Mango, Papaya, Lichi, Guava, Melon
Important Vegetables	Potato, Onion, Peas, Tomato, Cauliflower, Guard
Important Cereals	Soyabean, Bajra, Urd, Arhar, Masoor, Rapseeds
Major Minerals	Sand, Stone, Gypsum.
Major Tourist Places	Har ki Pauri, Gaughat, Mahadevi Mandir, Chandi Mandir, Mansadevi, Mandir, Bilbilashwar Mahadev, Saptarishi Ashram, Sati kund, Bhemgoda, Piran Kaliar, Shanti Kunj

Due to special concessional industrial package given by Govt. of India large number of Unit has set up in the District. Still Lot of Industrial Land is available in District Haridwar and good condition of Law & order. This condition makes good Environment for setting up NEW MSMEs

Other Suggestive Investment sectors for Haridwar District are:

- Tourism
- Agro based Industries
- Fabrication
- Engineering workshop
- Tool rooms
- Pre cast building material
- Fisheries
- Floriculture
- Bee keeping

CHAPTER 6

6.1 Assessment of Vehicular Pollution at Haridwar

The vehicle count was carried out at the five locations where vehicles are entering in the Haridwar city. The average of vehicles count Emission Rate for CO, HC, NOx and Particulates are as given below in Table 6.1 :

Table 6.1
Vehicle Count in Post Monsoon Season at Bahadarabad

Location	TIME	Type	Number
Bahadarabad	7.00 am to 10.30 am	**2Wheeler**	**481**
		Cars (Petrol)	**652**
		Car (diesel)	**182**
		MUVs	**331**
		3 wheelers	**65**
		LCVs	**73**
		HUVs	**334**
		TOTAL	**2118**
	10.30 am to 2.00 pm	**2Wheeler**	**512**
		Cars (Petrol)	**797**
		Car (diesel)	**499**
		MUVs	**845**
		3 wheelers	**236**
		LCVs	**227**
		HUVs	**769**
		TOTAL	**3886**
	2.00 pm to 5.30 pm	**2Wheeler**	**809**
		Cars (Petrol)	**1361**
		Car (diesel)	**401**
		MUVs	**827**
		3 wheelers	**187**
		LCVs	**73**
		HUVs	**508**
		TOTAL	**4165**
	5.30 pm to 9.00 pm	**2Wheeler**	**868**
		Cars (Petrol)	**1406**
		Car (diesel)	**394**
		MUVs	**710**
		3 wheelers	**161**
		LCVs	**565**
		HUVs	**403**
		TOTAL	**4507**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**2670**
		Cars (Petrol)	**4216**
		Car (diesel)	**1476**
		MUVs	**2713**

		3 wheelers	649
		LCVs	938
		HUVs	2014
		TOTAL	14676

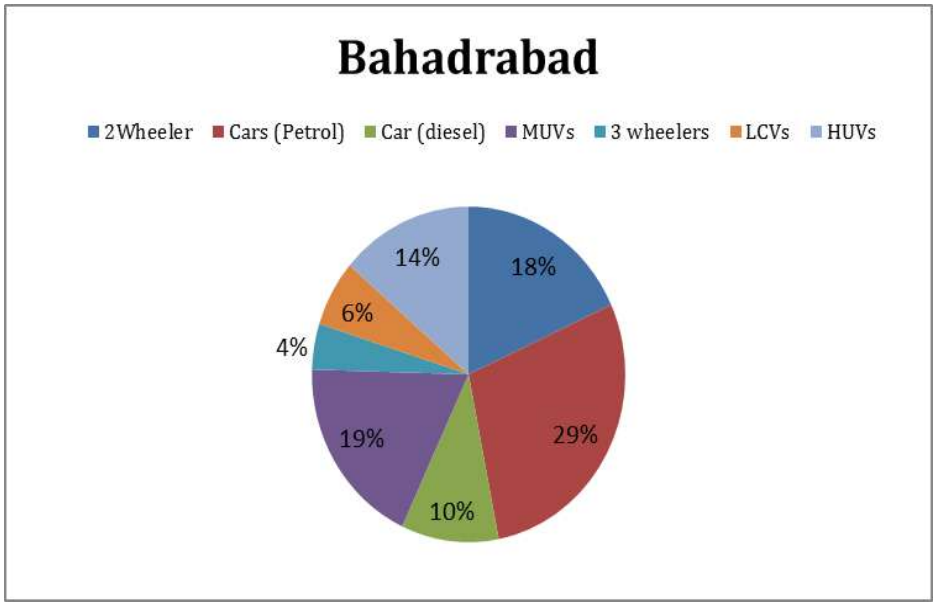


Figure 6.1-Pie chart for Vehicle Count in Post Monsoon Season

Table 6.2
Vehicle Count in Post Monsoon Season at Laksar More

Location	TIME	Type	Number
Laksar More	7.00 am to 10.30 am	**2Wheeler**	**320**
		Cars (Petrol)	**67**
		Car (diesel)	**65**
		MUVs	**70**
		3 wheelers	**49**
		LCVs	**91**
		HUVs	**71**
		TOTAL	**733**
	10.30 am to 2.00 pm	**2Wheeler**	**344**
		Cars (Petrol)	**49**
		Car (diesel)	**61**
		MUVs	**103**
		3 wheelers	**26**
		LCVs	**100**
		HUVs	**67**
		TOTAL	**751**
	2.00 pm to 5.30 pm	**2Wheeler**	**320**
		Cars (Petrol)	**121**
		Car (diesel)	**143**
		MUVs	**187**
		3 wheelers	**23**
		LCVs	**248**
		HUVs	**238**
		TOTAL	**1280**
	5.30 pm to 9.00 pm	**2Wheeler**	**292**
		Cars (Petrol)	**92**
		Car (diesel)	**107**
		MUVs	**176**
		3 wheelers	**35**
		LCVs	**78**
		HUVs	**149**
		TOTAL	**929**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**1335**
		Cars (Petrol)	**348**
		Car (diesel)	**397**
		MUVs	**572**
		3 wheelers	**140**
		LCVs	**533**
		HUVs	**554**
		TOTAL	**3879**

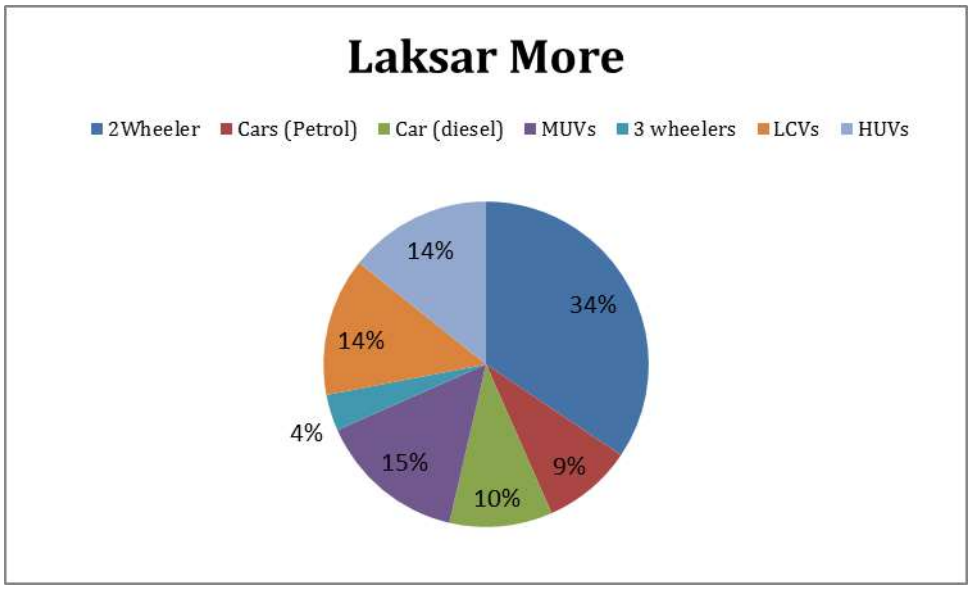


Figure 6.2-Pie chart for Vehicle Count in Post Monsoon Season

Table 6.3
Vehicle Count in Post Monsoon Season at Chandipul

Location	TIME	Type	Number
Chandipul	7.00 am to 10.30 am	**2Wheeler**	**229**
		Cars (Petrol)	**605**
		Car (diesel)	**199**
		MUVs	**323**
		3 wheelers	**224**
		LCVs	**212**
		HUVs	**347**
		TOTAL	**2140**
	10.30 am to 2.00 pm	**2Wheeler**	**599**
		Cars (Petrol)	**727**
		Car (diesel)	**95**
		MUVs	**524**
		3 wheelers	**281**
		LCVs	**104**
		HUVs	**364**
		TOTAL	**2694**
	2.00 pm to 5.30 pm	**2Wheeler**	**320**
		Cars (Petrol)	**344**
		Car (diesel)	**82**
		MUVs	**239**
		3 wheelers	**112**
		LCVs	**106**
		HUVs	**227**
		TOTAL	**1429**
	5.30 pm to 9.00 pm	**2Wheeler**	**385**
		Cars (Petrol)	**373**
		Car (diesel)	**59**
		MUVs	**178**
		3 wheelers	**172**
		LCVs	**58**
		HUVs	**121**
		TOTAL	**1345**
Per Day Density	9.00 am to 9.00 pm	**2Wheeler**	**1534**
		Cars (Petrol)	**2050**
		Car (diesel)	**434**
		MUVs	**1264**
		3 wheelers	**788**
		LCVs	**480**
		HUVs	**1058**
		TOTAL	**7608**

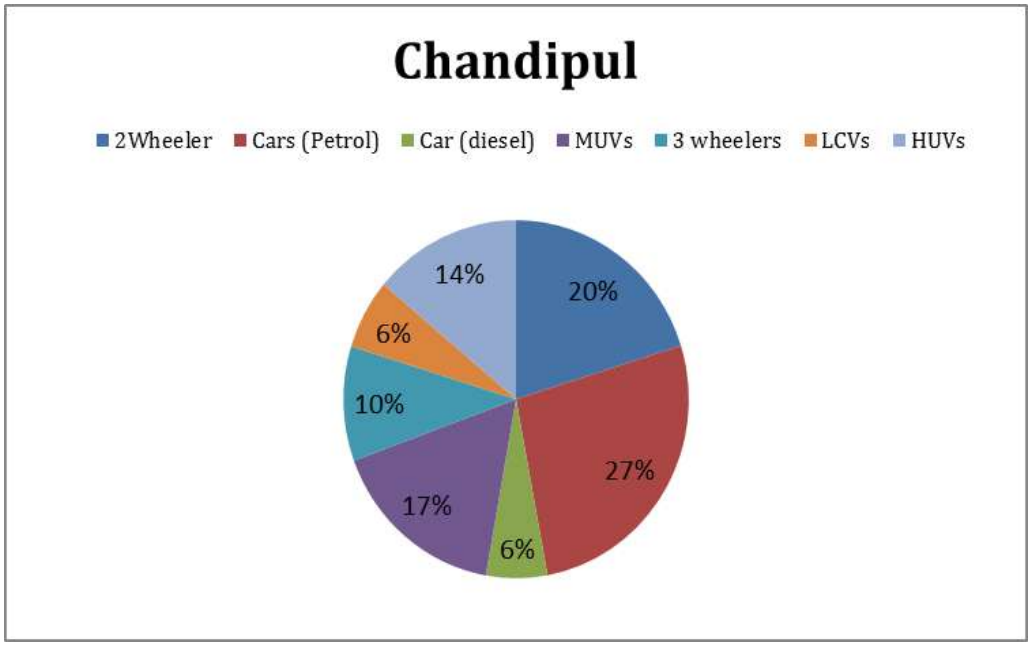


Figure 6.3-Pie chart for Vehicle Count in Post Monsoon Season

Table 6.4
Vehicle Count in Post Monsoon Season at Doon-Haridwar Road

Location	TIME	Type	Number
Dehradun -	7.00 am to 10.30 am	**2Wheeler**	**1627**
Haridwar Rd		**Cars (Petrol)**	**3172**
Near Shantikunj		**Car (diesel)**	**1345**
		MUVs	**2015**
		3 wheelers	**1322**
		LCVs	**1826**
		HUVs	**1927**
		TOTAL	**13235**
	10.30 am to 2.00 pm	**2Wheeler**	**2681**
		Cars (Petrol)	**3397**
		Car (diesel)	**1477**
		MUVs	**2657**
		3 wheelers	**2164**
		LCVs	**1358**
		HUVs	**2306**
		TOTAL	**16040**
	2.00 pm to 5.30 pm	**2Wheeler**	**1121**
		Cars (Petrol)	**1372**
		Car (diesel)	**955**
		MUVs	**1070**
		3 wheelers	**680**
		LCVs	**1198**
		HUVs	**1375**
		TOTAL	**7771**
	5.30 pm to 9.00 pm	**2Wheeler**	**385**
		Cars (Petrol)	**373**
		Car (diesel)	**59**
		MUVs	**178**
		3 wheelers	**172**
		LCVs	**58**
		HUVs	**121**
		TOTAL	**1345**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**5814**
		Cars (Petrol)	**8314**
		Car (diesel)	**3836**
		MUVs	**5920**
		3 wheelers	**4338**
		LCVs	**4440**
		HUVs	**5730**
		TOTAL	**38392**

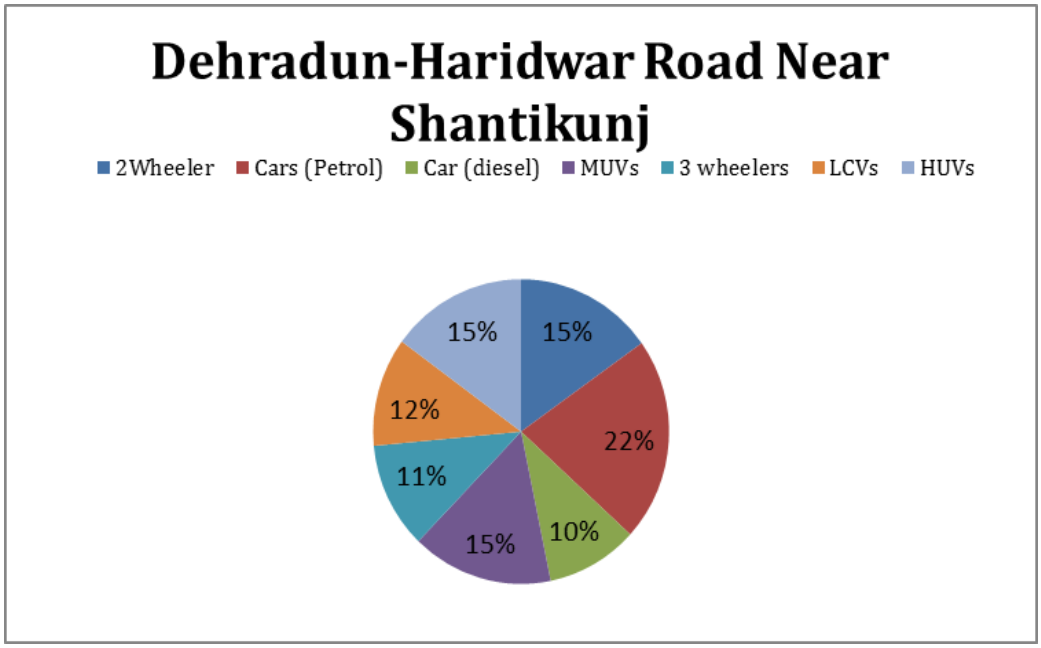


Figure 6.4-Pie chart for Vehicle Count in Post Monsoon Season

Table 6.5
Vehicle Count in Post Monsoon Season at BHEL Haridwar

Location	TIME	Type	Number
BHEL Haridwar	7.00 am to 10.30 am	**2Wheeler**	**1198**
		Cars (Petrol)	**281**
		Car (diesel)	**162**
		MUVs	**145**
		3 wheelers	**494**
		LCVs	**59**
		HUVs	**52**
		TOTAL	**2390**
	10.30 am to 2.00 pm	**2Wheeler**	**821**
		Cars (Petrol)	**203**
		Car (diesel)	**94**
		MUVs	**92**
		3 wheelers	**356**
		LCVs	**55**
		HUVs	**41**
		TOTAL	**1662**
	2.00 pm to 5.30 pm	**2Wheeler**	**523**
		Cars (Petrol)	**104**
		Car (diesel)	**67**
		MUVs	**52**
		3 wheelers	**277**
		LCVs	**32**
		HUVs	**34**
		TOTAL	**1090**
	5.30 pm to 9.00 pm	**2Wheeler**	**923**
		Cars (Petrol)	**238**
		Car (diesel)	**110**
		MUVs	**103**
		3 wheelers	**331**
		LCVs	**44**
		HUVs	**38**
		TOTAL	**1788**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**3464**
		Cars (Petrol)	**826**
		Car (diesel)	**433**
		MUVs	**392**
		3 wheelers	**1459**
		LCVs	**191**
		HUVs	**164**
		TOTAL	**6930**

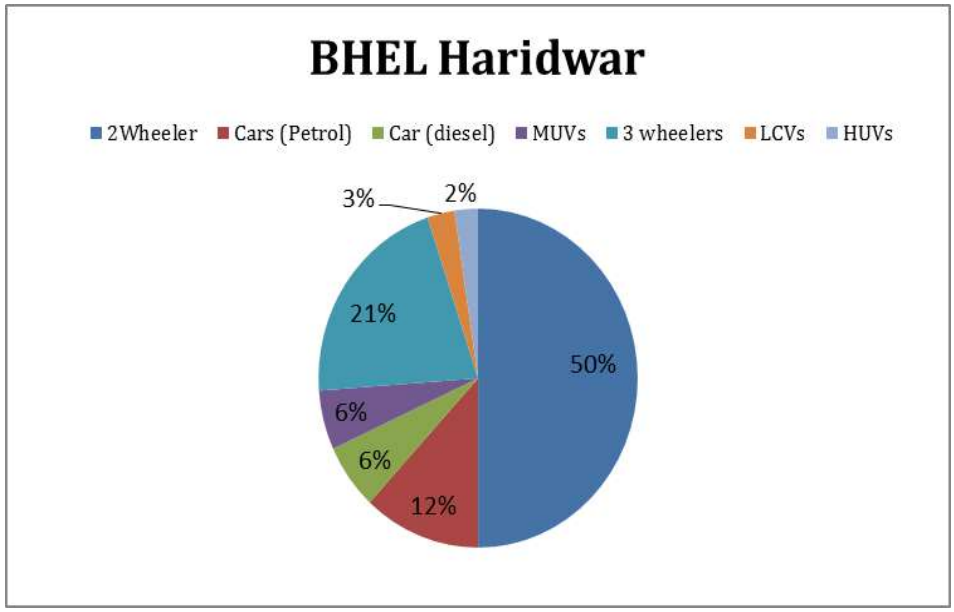


Figure 6.5-Pie chart for Vehicle Count in Post Monsoon Season

Table 6.6
Vehicle Count in Summer Season at Bahadarabad

Location	TIME	Type	Number
Bahadarabad	7.00 am to 10.30 am	**2Wheeler**	**682**
		Cars (Petrol)	**923**
		Car (diesel)	**258**
		MUVs	**469**
		3 wheelers	**92**
		LCVs	**104**
		HUVs	**473**
		TOTAL	**3001**
	10.30 am to 2.00 pm	**2Wheeler**	**726**
		Cars (Petrol)	**1129**
		Car (diesel)	**416**
		MUVs	**704**
		3 wheelers	**197**
		LCVs	**189**
		HUVs	**641**
		TOTAL	**4002**
	2.00 pm to 5.30 pm	**2Wheeler**	**674**
		Cars (Petrol)	**1134**
		Car (diesel)	**334**
		MUVs	**689**
		3 wheelers	**156**
		LCVs	**61**
		HUVs	**423**
		TOTAL	**3471**
	5.30 pm to 9.00 pm	**2Wheeler**	**723**
		Cars (Petrol)	**1172**
		Car (diesel)	**328**
		MUVs	**592**
		3 wheelers	**134**
		LCVs	**471**
		HUVs	**336**
		TOTAL	**3756**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**4769**
		Cars (Petrol)	**7409**
		Car (diesel)	**2271**
		MUVs	**4172**
		3 wheelers	**984**
		LCVs	**1403**
		HUVs	**3184**
		TOTAL	**24191**

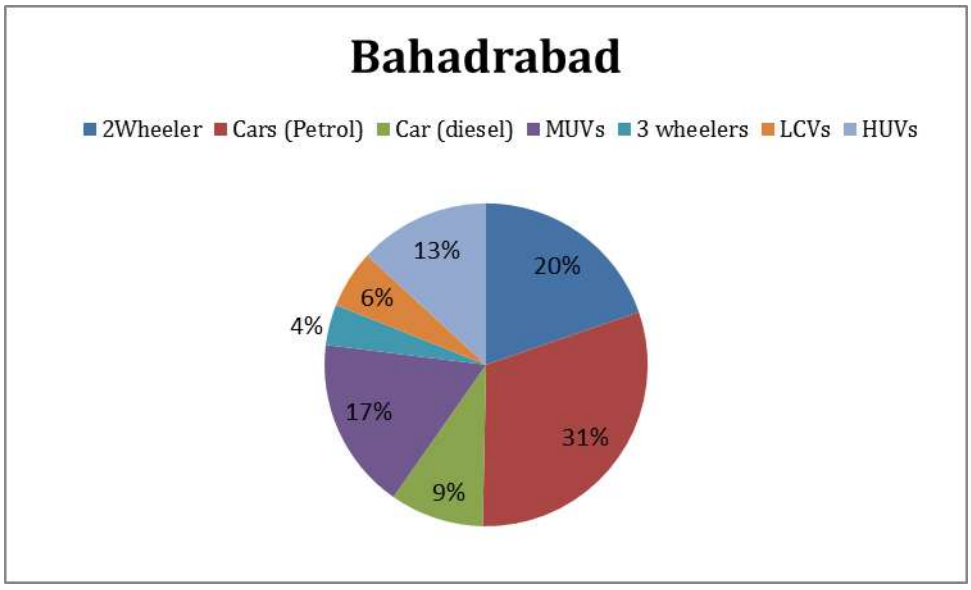


Figure 6.6-Pie chart for Vehicle Count in Summer Season

Table 6.7
Vehicle Count in Summer Season at Laksar More

Location	TIME	Type	Number
Laksar More	7.00 am to 10.30 am	**2Wheeler**	**454**
		Cars (Petrol)	**95**
		Car (diesel)	**92**
		MUVs	**99**
		3 wheelers	**70**
		LCVs	**129**
		HUVs	**100**
		TOTAL	**1039**
	10.30 am to 2.00 pm	**2Wheeler**	**488**
		Cars (Petrol)	**70**
		Car (diesel)	**87**
		MUVs	**146**
		3 wheelers	**37**
		LCVs	**141**
		HUVs	**95**
		TOTAL	**1064**
	2.00 pm to 5.30 pm	**2Wheeler**	**454**
		Cars (Petrol)	**172**
		Car (diesel)	**202**
		MUVs	**265**
		3 wheelers	**32**
		LCVs	**352**
		HUVs	**337**
		TOTAL	**1814**
	5.30 pm to 9.00 pm	**2Wheeler**	**413**
		Cars (Petrol)	**131**
		Car (diesel)	**151**
		MUVs	**250**
		3 wheelers	**49**
		LCVs	**111**
		HUVs	**211**
		TOTAL	**1316**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**1809**
		Cars (Petrol)	**468**
		Car (diesel)	**532**
		MUVs	**760**
		3 wheelers	**189**
		LCVs	**733**
		HUVs	**743**
		TOTAL	**5233**

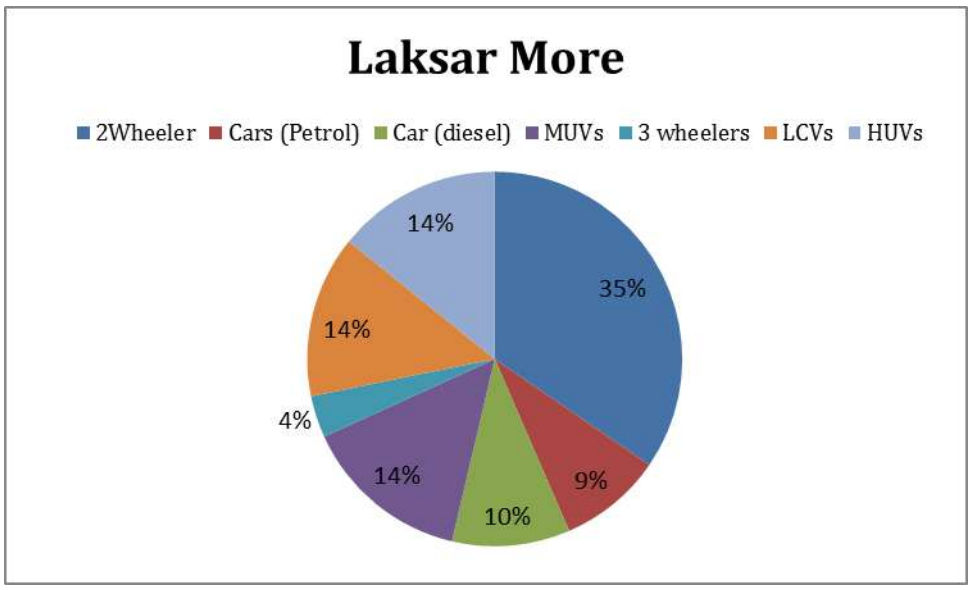


Figure 6.7-Pie chart for Vehicle Count in Summer Season

Table 6.8
Vehicle Count in Summer Season at Chandipul

Location	TIME	Type	Number
Chandipul	7.00 am to 10.30 am	**2Wheeler**	**325**
		Cars (Petrol)	**857**
		Car (diesel)	**282**
		MUVs	**457**
		3 wheelers	**318**
		LCVs	**301**
		HUVs	**491**
		TOTAL	**3031**
	10.30 am to 2.00 pm	**2Wheeler**	**848**
		Cars (Petrol)	**1030**
		Car (diesel)	**134**
		MUVs	**743**
		3 wheelers	**398**
		LCVs	**148**
		HUVs	**515**
		TOTAL	**3817**
	2.00 pm to 5.30 pm	**2Wheeler**	**454**
		Cars (Petrol)	**488**
		Car (diesel)	**116**
		MUVs	**338**
		3 wheelers	**158**
		LCVs	**150**
		HUVs	**321**
		TOTAL	**2025**
	5.30 pm to 9.00 pm	**2Wheeler**	**546**
		Cars (Petrol)	**529**
		Car (diesel)	**83**
		MUVs	**252**
		3 wheelers	**243**
		LCVs	**82**
		HUVs	**172**
		TOTAL	**1906**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**2173**
		Cars (Petrol)	**2904**
		Car (diesel)	**615**
		MUVs	**1790**
		3 wheelers	**1117**
		LCVs	**680**
		HUVs	**1499**
		TOTAL	**10778**

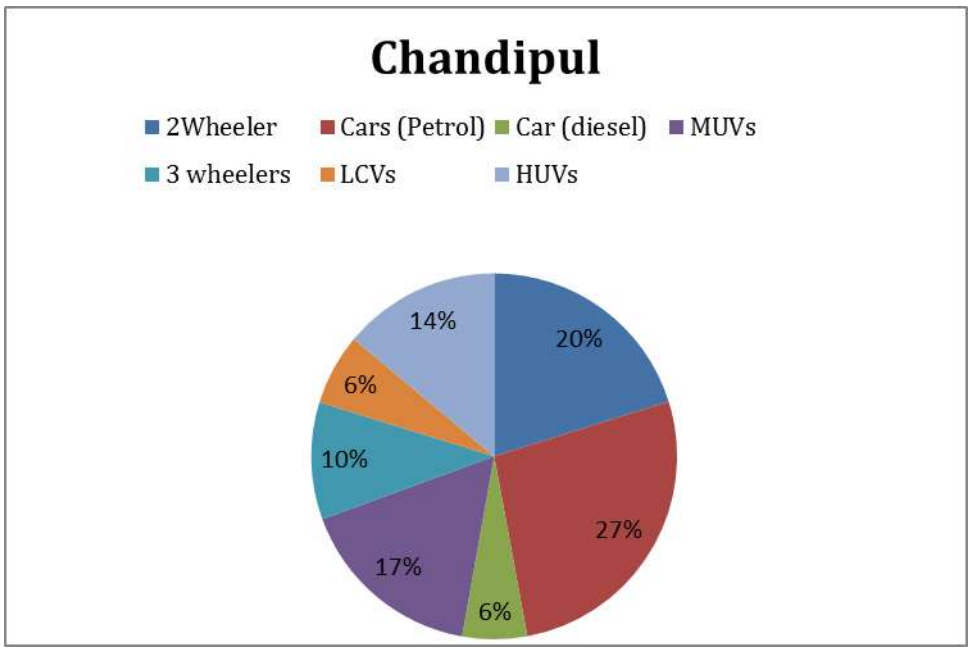


Figure 6.8-Pie chart for Vehicle Count in Summer Season

Table 6.9
Vehicle Count in Summer Season at Doon-Haridwar Road

Location	TIME	Type	Number
Dehradun - Haridwar Rd Near Shantikunj	7.00 am to 10.30 am	**2Wheeler**	**2305**
		Cars (Petrol)	**4493**
		Car (diesel)	**1906**
		MUVs	**2854**
		3 wheelers	**1873**
		LCVs	**2587**
		HUVs	**2730**
		TOTAL	**18749**
	10.30 am to 2.00 pm	**2Wheeler**	**3798**
		Cars (Petrol)	**4813**
		Car (diesel)	**2093**
		MUVs	**3764**
		3 wheelers	**3065**
		LCVs	**1924**
		HUVs	**3267**
		TOTAL	**22724**
	2.00 pm to 5.30 pm	**2Wheeler**	**1588**
		Cars (Petrol)	**1943**
		Car (diesel)	**1353**
		MUVs	**1516**
		3 wheelers	**964**
		LCVs	**1697**
		HUVs	**1948**
		TOTAL	**11009**
	5.30 pm to 9.00 pm	**2Wheeler**	**546**
		Cars (Petrol)	**529**
		Car (diesel)	**83**
		MUVs	**252**
		3 wheelers	**243**
		LCVs	**82**
		HUVs	**172**
		TOTAL	**1906**
	7.00 am to 9.00 pm	**2Wheeler**	**8237**
		Cars (Petrol)	**11778**
		Car (diesel)	**5435**
		MUVs	**8386**
		3 wheelers	**6146**
		LCVs	**6290**
		HUVs	**8118**
		TOTAL	**54388**

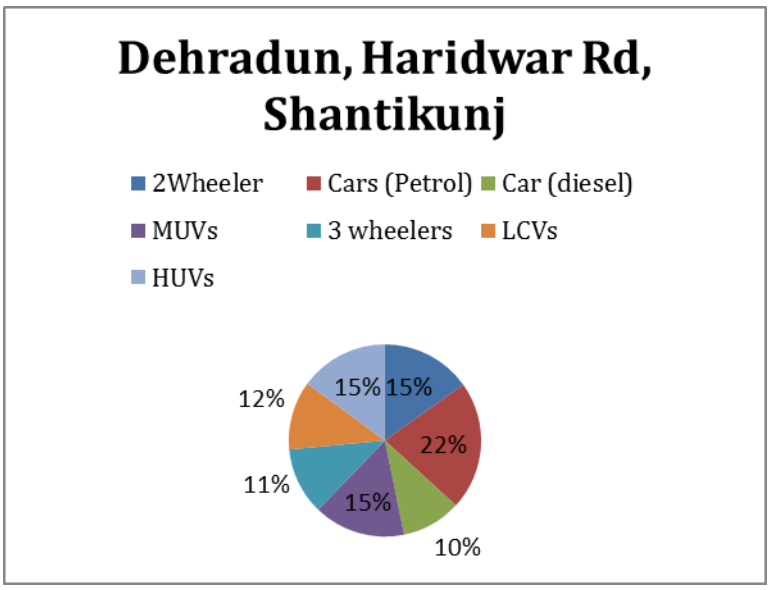


Figure 6.9-Pie chart for Vehicle Count in Summer Season

Table 6.10
Vehicle Count in Summer Season at BHEL Haridwar

Location	TIME	Type	Number
BHEL Haridwar	7.00 am to 10.30 am	**2Wheeler**	**1697**
		Cars (Petrol)	**398**
		Car (diesel)	**230**
		MUVs	**206**
		3 wheelers	**700**
		LCVs	**83**
		HUVs	**73**
		TOTAL	**3386**
	10.30 am to 2.00 pm	**2Wheeler**	**1163**
		Cars (Petrol)	**287**
		Car (diesel)	**133**
		MUVs	**131**
		3 wheelers	**505**
		LCVs	**78**
		HUVs	**58**
		TOTAL	**2355**
	2.00 pm to 5.30 pm	**2Wheeler**	**741**
		Cars (Petrol)	**148**
		Car (diesel)	**95**
		MUVs	**73**
		3 wheelers	**393**
		LCVs	**46**
		HUVs	**48**
		TOTAL	**1544**
	5.30 pm to 9.00 pm	**2Wheeler**	**1307**
		Cars (Petrol)	**337**
		Car (diesel)	**156**
		MUVs	**146**
		3 wheelers	**469**
		LCVs	**63**
		HUVs	**54**
		TOTAL	**2533**
	7.00 am to 9.00 pm	**2Wheeler**	**4908**
		Cars (Petrol)	**1170**
		Car (diesel)	**614**
		MUVs	**556**
		3 wheelers	**2067**
		LCVs	**270**
		HUVs	**233**
		TOTAL	**9818**

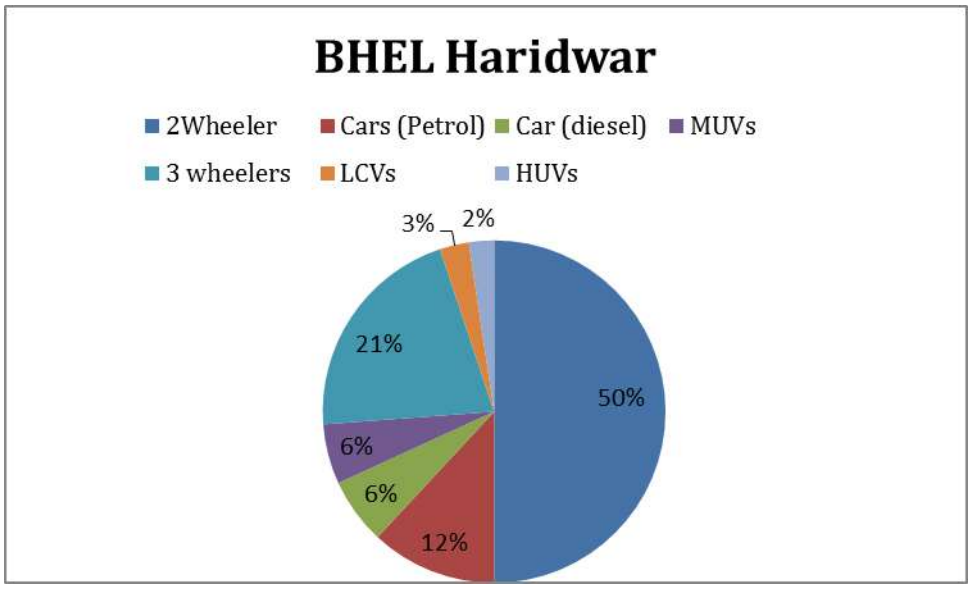


Figure 6.10-Pie chart for Vehicle Count in Summer Season

Table 6.11
Vehicle Count in Winter Season at Bahadarabad

Location	TIME	Type	Number
Bahadarabad	7.00 am to 10.30 am	**2Wheeler**	**421**
		Cars (Petrol)	**571**
		Car (diesel)	**160**
		MUVs	**290**
		3 wheelers	**57**
		LCVs	**65**
		HUVs	**292**
		TOTAL	**1856**
	10.30 am to 2.00 pm	**2Wheeler**	**448**
		Cars (Petrol)	**697**
		Car (diesel)	**437**
		MUVs	**739**
		3 wheelers	**206**
		LCVs	**198**
		HUVs	**673**
		TOTAL	**3398**
	2.00 pm to 5.30 pm	**2Wheeler**	**707**
		Cars (Petrol)	**1191**
		Car (diesel)	**351**
		MUVs	**724**
		3 wheelers	**164**
		LCVs	**64**
		HUVs	**444**
		TOTAL	**3645**
	5.30 pm to 9.00 pm	**2Wheeler**	**759**
		Cars (Petrol)	**1230**
		Car (diesel)	**344**
		MUVs	**622**
		3 wheelers	**141**
		LCVs	**495**
		HUVs	**353**
		TOTAL	**3944**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**3269**
		Cars (Petrol)	**5164.6**
		Car (diesel)	**1808.8**
		MUVs	**3325**
		3 wheelers	**795.2**
		LCVs	**1150.8**
		HUVs	**2466.8**
		TOTAL	**17980.2**

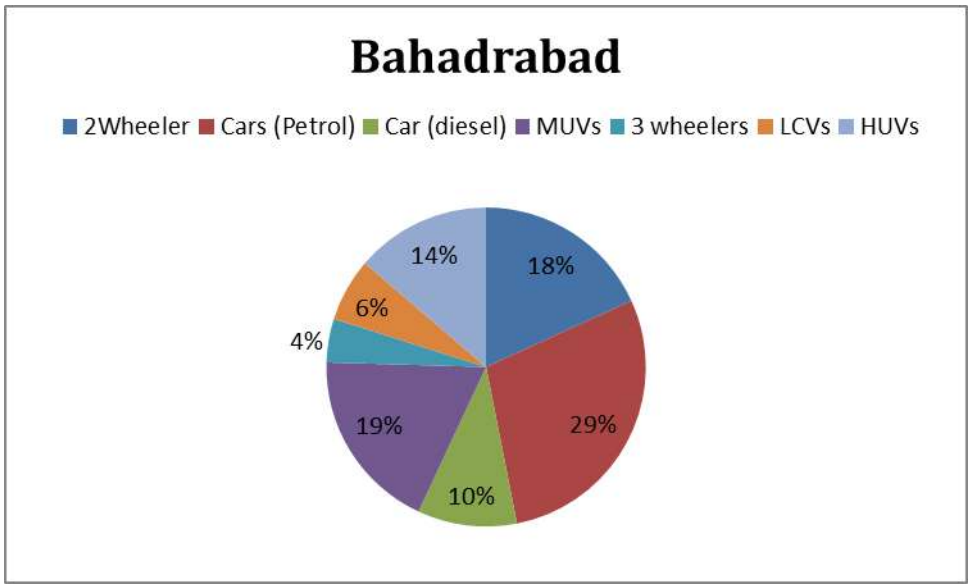


Figure 6.11-Pie chart for Vehicle Count in Winter Season

Table 6.12
Vehicle Count in Winter Season at Laksar More

Location	TIME	Type	Number
Laksar More	7.00 am to 10.30 am	**2Wheeler**	**267**
		Cars (Petrol)	**56**
		Car (diesel)	**54**
		MUVs	**58**
		3 wheelers	**41**
		LCVs	**76**
		HUVs	**59**
		TOTAL	**611**
	10.30 am to 2.00 pm	**2Wheeler**	**287**
		Cars (Petrol)	**41**
		Car (diesel)	**51**
		MUVs	**86**
		3 wheelers	**22**
		LCVs	**83**
		HUVs	**56**
		TOTAL	**626**
	2.00 pm to 5.30 pm	**2Wheeler**	**267**
		Cars (Petrol)	**101**
		Car (diesel)	**119**
		MUVs	**156**
		3 wheelers	**19**
		LCVs	**207**
		HUVs	**198**
		TOTAL	**1067**
	5.30 pm to 9.00 pm	**2Wheeler**	**243**
		Cars (Petrol)	**77**
		Car (diesel)	**89**
		MUVs	**147**
		3 wheelers	**29**
		LCVs	**65**
		HUVs	**124**
		TOTAL	**774**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**1490**
		Cars (Petrol)	**385**
		Car (diesel)	**438**
		MUVs	**626**
		3 wheelers	**155**
		LCVs	**603**
		HUVs	**612**
		TOTAL	**4309.2**

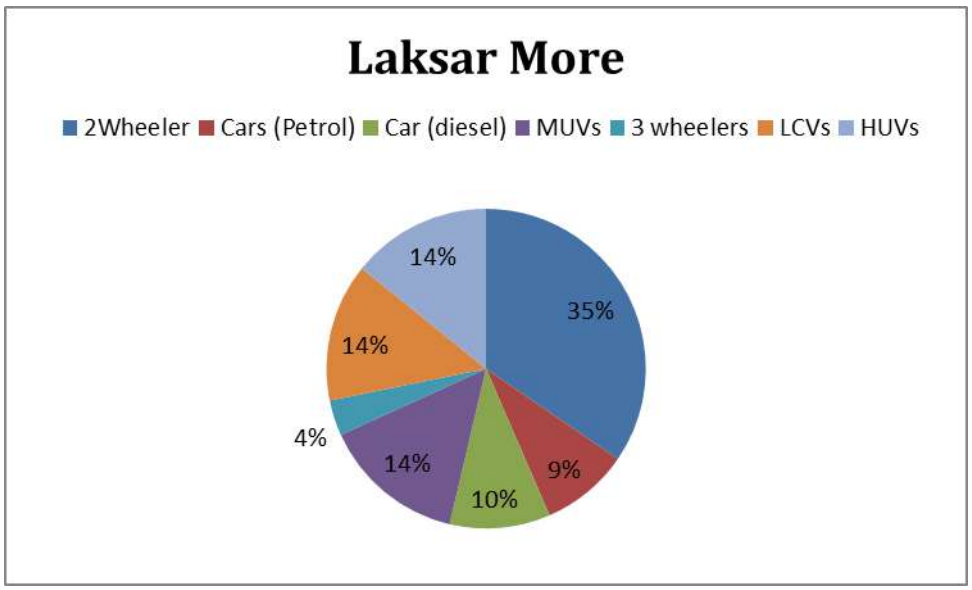


Figure 6.12-Pie chart for Vehicle Count in Winter Season

Table 6.13
Vehicle Count in Winter Season at Chandipul

Location	TIME	Type	Number
Chandipul	7.00 am to 10.30 am	**2Wheeler**	**201**
		Cars (Petrol)	**529**
		Car (diesel)	**174**
		MUVs	**269**
		3 wheelers	**187**
		LCVs	**177**
		HUVs	**289**
		TOTAL	**1826.05**
	10.30 am to 2.00 pm	**2Wheeler**	**499**
		Cars (Petrol)	**606**
		Car (diesel)	**79**
		MUVs	**437**
		3 wheelers	**234**
		LCVs	**87**
		HUVs	**303**
		TOTAL	**2245**
	2.00 pm to 5.30 pm	**2Wheeler**	**267**
		Cars (Petrol)	**287**
		Car (diesel)	**68**
		MUVs	**199**
		3 wheelers	**93**
		LCVs	**88**
		HUVs	**189**
		TOTAL	**1191**
	5.30 pm to 9.00 pm	**2Wheeler**	**321**
		Cars (Petrol)	**311**
		Car (diesel)	**49**
		MUVs	**148**
		3 wheelers	**143**
		LCVs	**48**
		HUVs	**101**
		TOTAL	**1121**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**1803**
		Cars (Petrol)	**2426**
		Car (diesel)	**518**
		MUVs	**1474**
		3 wheelers	**920**
		LCVs	**560**
		HUVs	**1235**
		TOTAL	**8936.27**

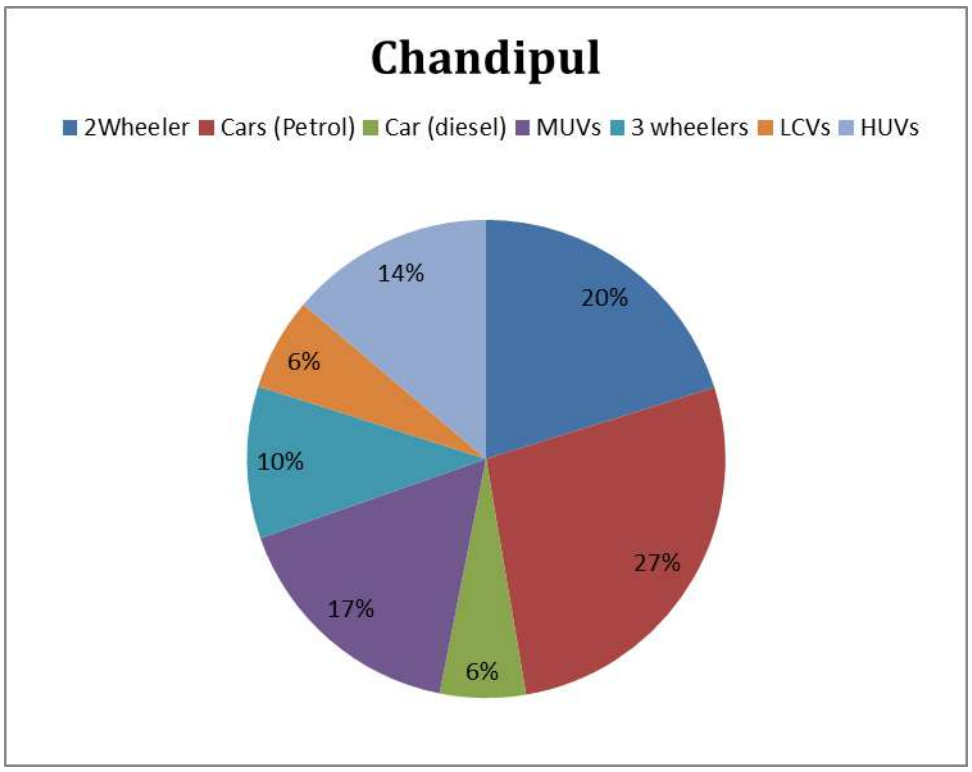


Figure 6.13-Pie chart for Vehicle Count in Winter Season

Table 6.14
Vehicle Count in Winter Season at Doon-Haridwar Road

Location	TIME	Type	Number
Dehradun - Haridwar Rd Near Shantikunj	7.00 am to 10.30 am	**2Wheeler**	**1356**
		Cars (Petrol)	**2643**
		Car (diesel)	**1121**
		MUVs	**1679**
		3 wheelers	**1102**
		LCVs	**1522**
		HUVs	**1606**
		TOTAL	**11029**
	10.30 am to 2.00 pm	**2Wheeler**	**2234**
		Cars (Petrol)	**2831**
		Car (diesel)	**1231**
		MUVs	**2214**
		3 wheelers	**1803**
		LCVs	**1132**
		HUVs	**1922**
		TOTAL	**13367**
	2.00 pm to 5.30 pm	**2Wheeler**	**934**
		Cars (Petrol)	**1143**
		Car (diesel)	**796**
		MUVs	**892**
		3 wheelers	**567**
		LCVs	**998**
		HUVs	**1146**
		TOTAL	**6476**
	5.30 pm to 9.00 pm	**2Wheeler**	**321**
		Cars (Petrol)	**311**
		Car (diesel)	**49**
		MUVs	**148**
		3 wheelers	**143**
		LCVs	**48**
		HUVs	**101**
		TOTAL	**1121**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**6783**
		Cars (Petrol)	**9699**
		Car (diesel)	**4476**
		MUVs	**6906**
		3 wheelers	**5061**
		LCVs	**5180**
		HUVs	**6685**
		TOTAL	**44790.2**

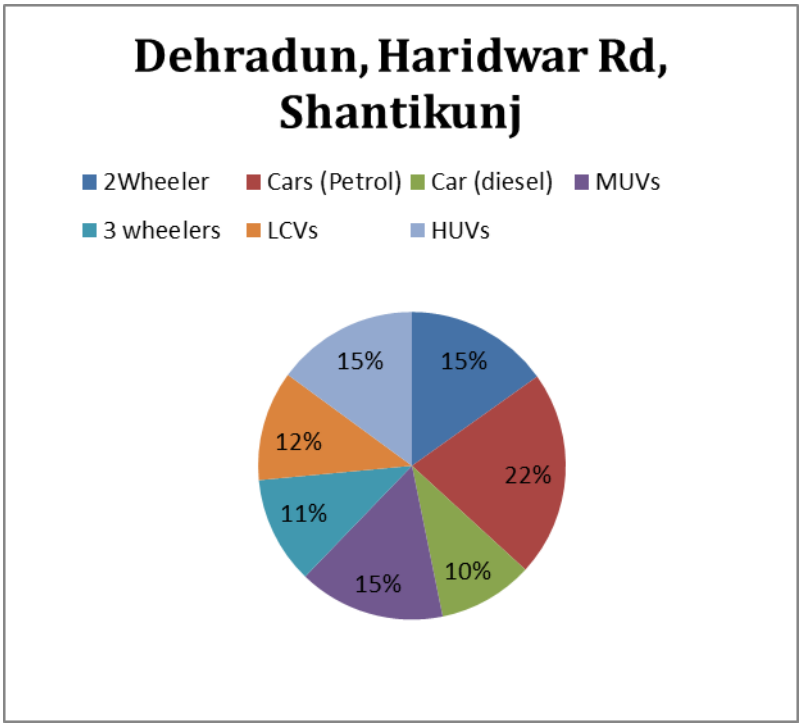


Figure 6.14-Pie chart for Vehicle Count in Winter Season

Table 6.15
Vehicle Count in Winter Season at BHEL Haridwar

Location	TIME	Type	Number
BHEL Haridwar	7.00 am to 10.30 am	**2Wheeler**	**998**
		Cars (Petrol)	**234**
		Car (diesel)	**135**
		MUVs	**121**
		3 wheelers	**412**
		LCVs	**49**
		HUVs	**43**
		TOTAL	**1992**
	10.30 am to 2.00 pm	**2Wheeler**	**684**
		Cars (Petrol)	**169**
		Car (diesel)	**78**
		MUVs	**77**
		3 wheelers	**297**
		LCVs	**46**
		HUVs	**34**
		TOTAL	**1385**
	2.00 pm to 5.30 pm	**2Wheeler**	**436**
		Cars (Petrol)	**87**
		Car (diesel)	**56**
		MUVs	**43**
		3 wheelers	**231**
		LCVs	**27**
		HUVs	**28**
		TOTAL	**908**
	5.30 pm to 9.00 pm	**2Wheeler**	**769**
		Cars (Petrol)	**198**
		Car (diesel)	**92**
		MUVs	**86**
		3 wheelers	**276**
		LCVs	**37**
		HUVs	**32**
		TOTAL	**1490**
Per Day Density	7.00 am to 9.00 pm	**2Wheeler**	**4042**
		Cars (Petrol)	**963**
		Car (diesel)	**505**
		MUVs	**458**
		3 wheelers	**1702**
		LCVs	**223**
		HUVs	**192**
		TOTAL	**8085**

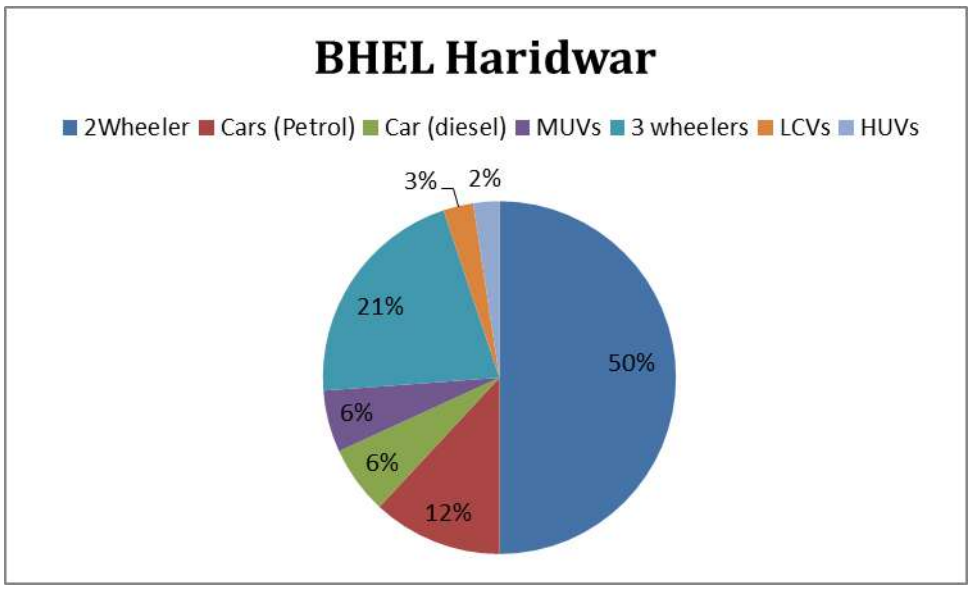


Figure 6.15-Pie chart for Vehicle Count in Winter Season

6.2 Emission rates of Incoming Vehicles to Haridwar

The average vehicle count and emission rate for Incoming vehicles for seven dates at five places as mentioned above have been calculated and given in Tables below:

Table 6.16 Vehicle Count and emission rate for vehicles during Summer Season

Location	TIME	Type	Number	CO kg/h	HC kg/h	Nox kg/h	SO2 kg/h	Particulate kg/h
Bahadarabad	6.00 am to 9.00 pm	**2Wheeler**	**4643**	64.2	60.1	12.1	0.2	0.1
		Cars (Petrol)	**7367**	101.9	95.4	19.3	0.4	0.1
		Car (diesel)	**2481**	34.3	32.1	6.5	0.1	0.0
		MUVs	**4548**	62.9	58.9	11.9	0.2	0.1
		3 wheelers	**1079**	14.9	14.0	2.8	0.1	0.0
		LCVs	**1890**	26.1	24.5	4.9	0.1	0.0
		HUVs	**3252**	45.0	42.1	8.5	0.2	0.0
		TOTAL	**25261**	304.4	285.0	57.6	1.1	0.3
Laksar More	6.00 am to 9.00 pm	**2Wheeler**	**2098**	29.0	27.2	5.5	0.1	0.0
		Cars (Petrol)	**559**	7.7	7.2	1.5	0.0	0.0
		Car (diesel)	**638**	8.8	8.3	1.7	0.0	0.0
		MUVs	**935**	12.9	12.1	2.4	0.0	0.0
		3 wheelers	**223**	3.1	2.9	0.6	0.0	0.0
		LCVs	**810**	11.2	10.5	2.1	0.0	0.0
		HUVs	**890**	12.3	11.5	2.3	0.0	0.0
		TOTAL	**6154**	72.8	68.2	13.8	0.3	0.1
Chandipul	6.00 am to 9.00 pm	**2Wheeler**	**2555**	35.3	33.1	6.7	0.1	0.0
		Cars (Petrol)	**3274**	45.3	42.4	8.6	0.2	0.0
		Car (diesel)	**674**	9.3	8.7	1.8	0.0	0.0
		MUVs	**1966**	27.2	25.5	5.1	0.1	0.0
		3 wheelers	**1287**	17.8	16.7	3.4	0.1	0.0
		LCVs	**737**	10.2	9.5	1.9	0.0	0.0
		HUVs	**1620**	22.4	21.0	4.2	0.1	0.0
		TOTAL	**12112**	145.1	135.9	27.5	0.5	0.2

Haridwar	6.00 am to 9.00 pm	**2Wheeler**	**8618**	119.2	111.6	22.6	0.4	0.1
Dehradun		**Cars (Petrol)**	**12148**	168.0	157.3	31.8	0.6	0.2
Rd. (Shantikunj)		**Car (diesel)**	**5493**	76.0	71.1	14.4	0.3	0.1
		MUVs	**8562**	118.4	110.9	22.4	0.4	0.1
		3 wheelers	**6316**	87.4	81.8	16.5	0.3	0.1
		LCVs	**6347**	87.8	82.2	16.6	0.3	0.1
		HUVs	**8238**	114.0	106.7	21.6	0.4	0.1
		TOTAL	**55722**	770.8	721.6	145.8	2.7	0.8
BHEL Barrier	6.00 am to 9.00 pm	**2Wheeler**	**5823**	80.6	75.4	15.2	0.3	0.1
Sector 1		**Cars (Petrol)**	**1405**	19.4	18.2	3.7	0.1	0.0
		Car (diesel)	**723**	10.0	9.4	1.9	0.0	0.0
		MUVs	**658**	9.1	8.5	1.7	0.0	0.0
		3 wheelers	**2396**	33.1	31.0	6.3	0.1	0.0
		LCVs	**314**	4.3	4.1	0.8	0.0	0.0
		HUVs	**271**	3.7	3.5	0.7	0.0	0.0
		TOTAL	**11591**	160.3	150.1	30.3	0.6	0.2

Table 6.17 Vehicle Count and emission rate for vehicles during Winter Season

Location	TIME	Type	Number	CO kg/h	HC kg/h	Nox kg/h	SO2 kg/h	Particulate kg/h
Bahadrabad		**2Wheeler**	**3228**	44.7	41.8	8.4	0.2	0.05
		3Wheeler	**2324**	32.1	30.1	6.1	0.1	0.03
		Car	**3666**	50.7	47.5	9.6	0.2	0.05
		Truck	**2814**	38.9	36.4	7.4	0.1	0.04
		Bus	**2516**	34.8	32.6	6.6	0.1	0.04
		LCV	**2239**	31.0	29.0	5.9	0.1	0.03
		TOTAL	**16787**	232.2	217.4	43.9	0.8	0.25
Laksar More	6.00 a.m to 9.00 p.m.	**2Wheeler**	**905**	12.5	11.7	2.4	0.0	0.01
		3Wheeler	**124**	1.7	1.6	0.3	0.0	0.00
		Car	**165**	2.3	2.1	0.4	0.0	0.00
		Truck	**357**	4.9	4.6	0.9	0.0	0.01
		Bus	**212**	2.9	2.7	0.6	0.0	0.00
		LCV	**116**	1.6	1.5	0.3	0.0	0.00
		TOTAL	**1879**	26.0	24.3	4.9	0.1	0.03
Chandipul	6.00 a.m. to 9.00 p.m.	**2Wheeler**	**1277**	17.7	16.5	3.3	0.1	0.02
		3Wheeler	**893**	12.4	11.6	2.3	0.0	0.01
		Car	**1340**	18.5	17.4	3.5	0.1	0.02
		Truck	**993**	13.7	12.9	2.6	0.0	0.01
		Bus	**627**	8.7	8.1	1.6	0.0	0.01
		LCV	**415**	5.7	5.4	1.1	0.0	0.01
		TOTAL	**5545**	76.7	71.8	14.5	0.3	0.00
Shantikunj	6.00 a.m. to 9.00 p.m.	**2Wheeler**	**1841**	25.5	23.8	4.8	0.1	0.03
		3Wheeler	**958**	13.3	12.4	2.5	0.0	0.01
		Car	**2341**	32.4	30.3	6.1	0.1	0.04
		Truck	**1474**	20.4	19.1	3.9	0.1	0.02
		Bus	**820**	11.3	10.6	2.1	0.0	0.01
		LCV	**770**	10.7	10.0	2.0	0.0	0.01
		TOTAL	**8204**	113.5	106.2	21.5	0.4	0.12

Table 6.18 Vehicle Count and emission rate for vehicles during Post-Monsoon Season

Location	TIME	Type	Number	Average Distance Travel	CO Kg/h	HC Kg/h	Nox Kg/h	SO2 Kg/h	Particulate Kg/h
Bahadrabad	6.00 a.m. to 9.00 p.m.	2Wheeler	3228	25	44.7	41.8	8.4	0.16	0.05
		3Wheeler	2324	25	32.1	30.1	6.1	0.11	0.03
		Car	3666	25	50.7	47.5	9.6	0.18	0.05
		Truck	2814	25	38.9	36.4	7.4	0.14	0.04
		Bus	2516	25	34.8	32.6	6.6	0.12	0.04
		LCV	2239	25	31.0	29.0	5.9	0.11	0.03
		TOTAL	16787		232.2	217.4	43.9	0.81	0.25
Laksar More		2Wheeler	905	25	12.5	11.7	2.4	0.04	0.01
		3Wheeler	124	25	1.7	1.6	0.3	0.01	0.00
		Car	165	25	2.3	2.1	0.4	0.01	0.00
		Truck	357	25	4.9	4.6	0.9	0.02	0.01
		Bus	212	25	2.9	2.7	0.6	0.01	0.00
		LCV	116	25	1.6	1.5	0.3	0.01	0.00
		TOTAL	1879		26.0	24.3	4.9	0.09	0.03
Chandipul		2Wheeler	1277	25	17.7	16.5	3.3	0.06	0.02
		3Wheeler	893	25	12.4	11.6	2.3	0.04	0.01
		Car	1340	25	18.5	17.4	3.5	0.06	0.02
		Truck	993	25	13.7	12.9	2.6	0.05	0.01
		Bus	627	25	8.7	8.1	1.6	0.03	0.01
		LCV	415	25	5.7	5.4	1.1	0.02	0.01
		TOTAL	5545		76.7	71.8	14.5	0.27	0.08
Shantikunj	6.00 a.m. to 9.00 p.m.	2Wheeler	1841	25	25.5	23.8	4.8	0.09	0.03
		3Wheeler	958	25	13.3	12.4	2.5	0.05	0.01
		Car	2341	25	32.4	30.3	6.1	0.11	0.04
		Truck	1474	25	20.4	19.1	3.9	0.07	0.02
		Bus	820	25	11.3	10.6	2.1	0.04	0.01
		LCV	770	25	10.7	10.0	2.0	0.04	0.01
		TOTAL	8204		113.5	106.2	21.5	0.40	0.12

6.3 Vehicle Count at Chitra Cinema, Railway Station Road

The vehicular count monitoring near Chitra Cinema, Railway Road, Haridwar, as the plying of vehicles in the area seems to be much higher. The monitoring of vehicular count was carried out on 4.2.2018 and 5.2.2018, from 9.00 a.m to 12 noon, 12.00 noon to 3.00 p.m., 3.00 p.m. to 6.00 p.m. to 9.00 p.m. Total vehicle count was done continuously for 12 hours in a day time. The vehicles covered are 2-wheeler, 3-wheeler, Car (Petrol & Diesel), MUV, LCV and HCV. The result of Vehicle count is as given below in Table 6.19:

Table 6.19: Vehicle Count at Chitra Cinema, Railway Road, Haridwar

Location	TIME	Type	Vehicle Count 4.2.18	Vehicle Count 5.2.18
Chitra Cinema, Station Road	9.00 a.m. to 9.00 p.m..	**2Wheeler**	**7804**	**8040**
4/2/18 to 5/2/18		**3Wheeler**	**9128**	**9188**
		Car	**1123**	**775**
		MUV	**329**	**204**
		LCV	**143**	**267**
		HCV	**10**	**12**
		TOTAL	**18537**	**18486**

It is observed that vehicle count at Chitra Cinema is much higher than expected. The total number of vehicles is almost similar at both days. Though, 4.2.18 was Sunday a holiday and a much traffic was observed for Cars and MUVs. This can be concluded that tourist influx on holidays is expected at an alarming rate.

Vehicles Near Chitra Cinema, Railway Road.

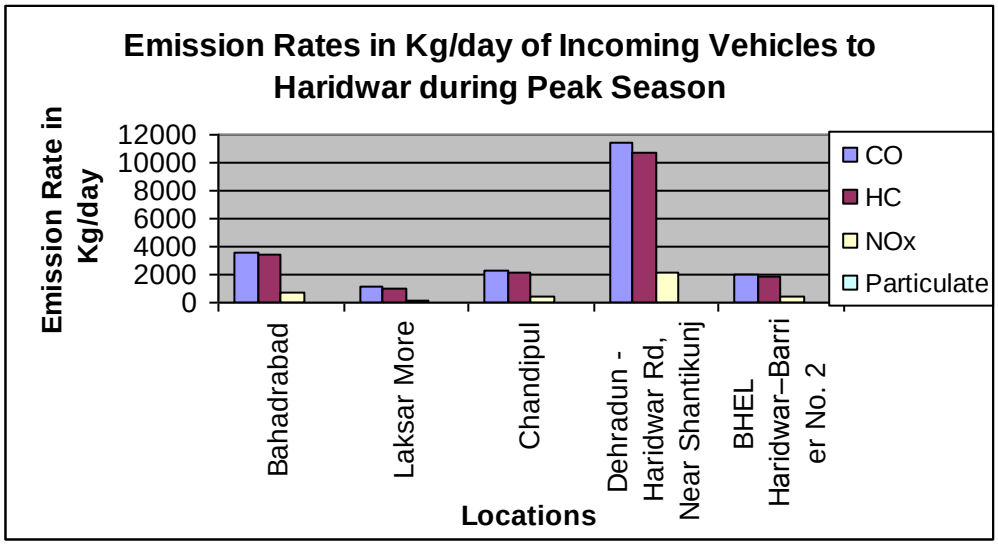


Figure 6.16

Emission Rates in Kg/day of Incoming Vehicles to Haridwar during Summer Season

It can be seen from above that the incoming emission rates of CO, HC, NOx and Particulate during summer season at Dehradun – Haridwar Rd. near Shantikunj was observed highest in comparison to other location in Haridwar. The vehicles coming from Dehradun & Risikesh at Shantikunj were found to be the maximum at this location.

Table 6.19 : Emission Rates of Incoming Vehicles in Kg/day at Haridwar during Summer Season

Location	CO	HC	NOx	Particulate
Bahadrabad	3602.7	3372.6	681.5	3.9
Laksar More	1094.9	1025.0	207.1	1.2
Chandipul	2255.2	2111.2	426.6	2.4
Dehradun - Haridwar Rd, Near Shantikunj	11380.3	10653.67	2152.67	12.34
BHEL Haridwar–Barrier No. 2	2054.25	1923.08	388.58	2.23
Total Kg/day	**20387**	**19086**	**3856**	**22**

Table 6.20 : Percentage of Total Emission Rates in Kg/day during Summer Season

Location	% age of Total Emission Rates in Kg/day during Summer Season
Bahadrabad	16.57
Laksar More	5.03
Chandipul	10.25
Dehradun - Haridwar Rd, Near Shantikunj	58.9
BHEL Haridwar–Barrier No. 2	9.23

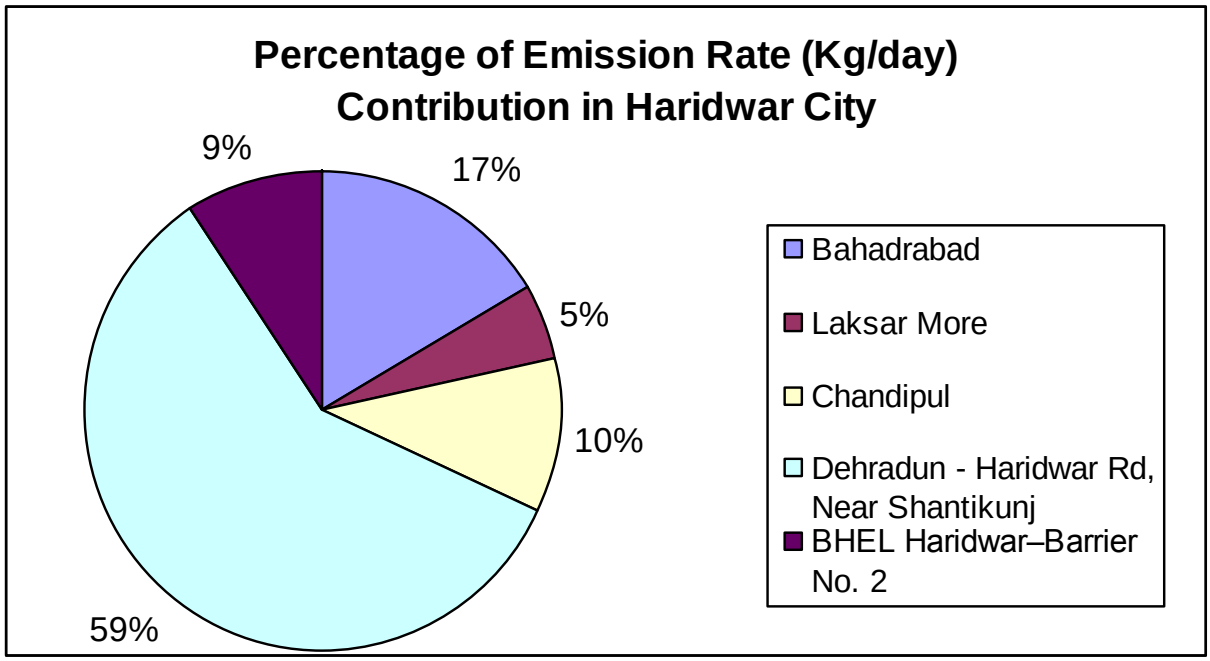


Figure 6.17 : Percentage of Emission Rate (Kg/day) contribution in Haridwar City during Summer Season

Figure 6.18: Vehicle Rush / Traffic Jam during summer season.

Windrose Diagram During Summer Season

The windrose day & night time (combined) and Day time separately is given for summer season : pollutants (such as SO2, NOx, CO)

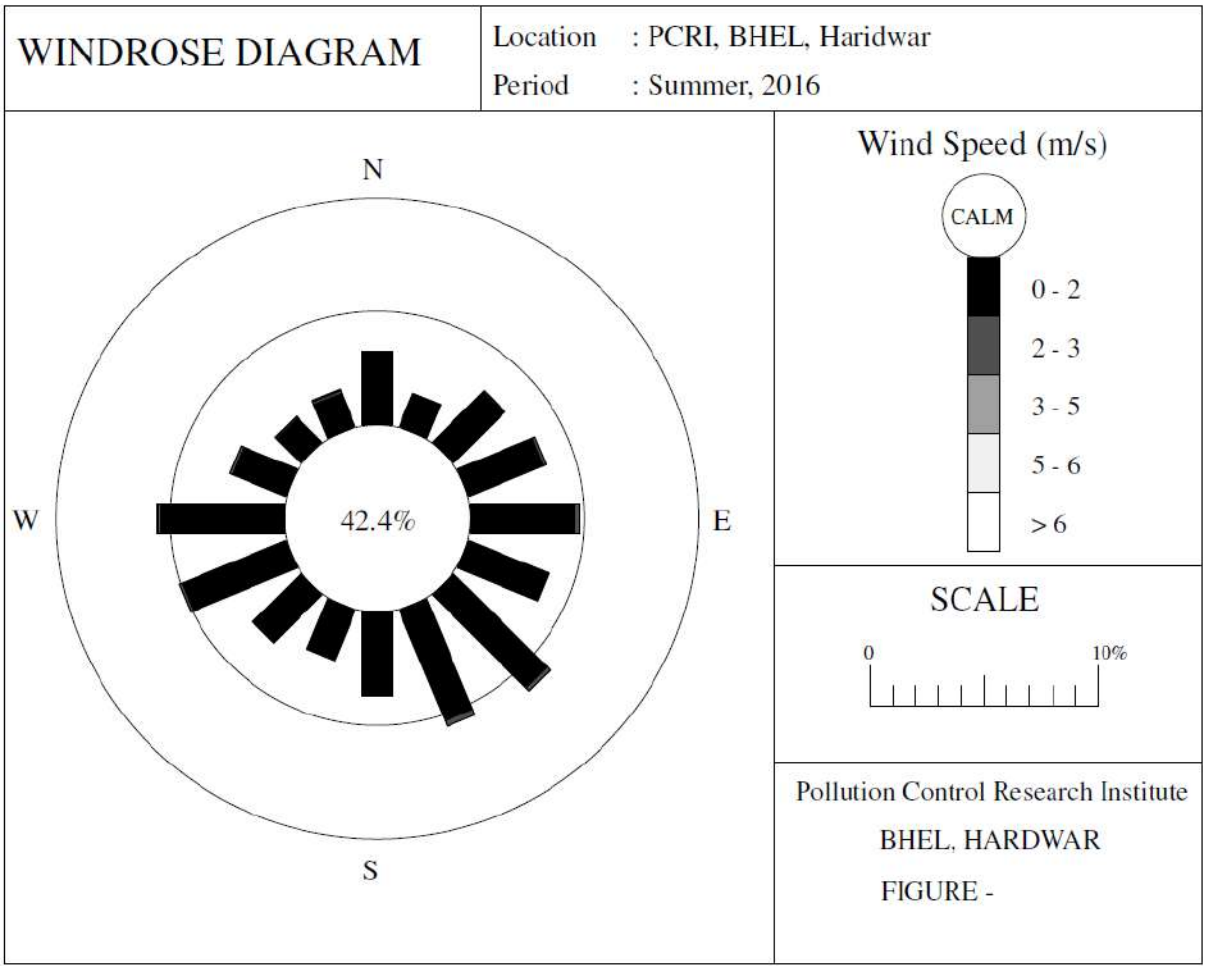


Figure 6.19 Windrose Diagram During Summer Season

The most dominant wind direction is from South-East to North-West during the summer season. In the South-East direction there is no major traffic activity. Thus, the impact on the religious place like Har Ki Pauri and other temples will be minimal.

Windrose Diagram During Post Monsoon Season

The windrose day & night time (combined) and Day time separately is given for post monsoon season : pollutants (such as SO2, NOx, CO)

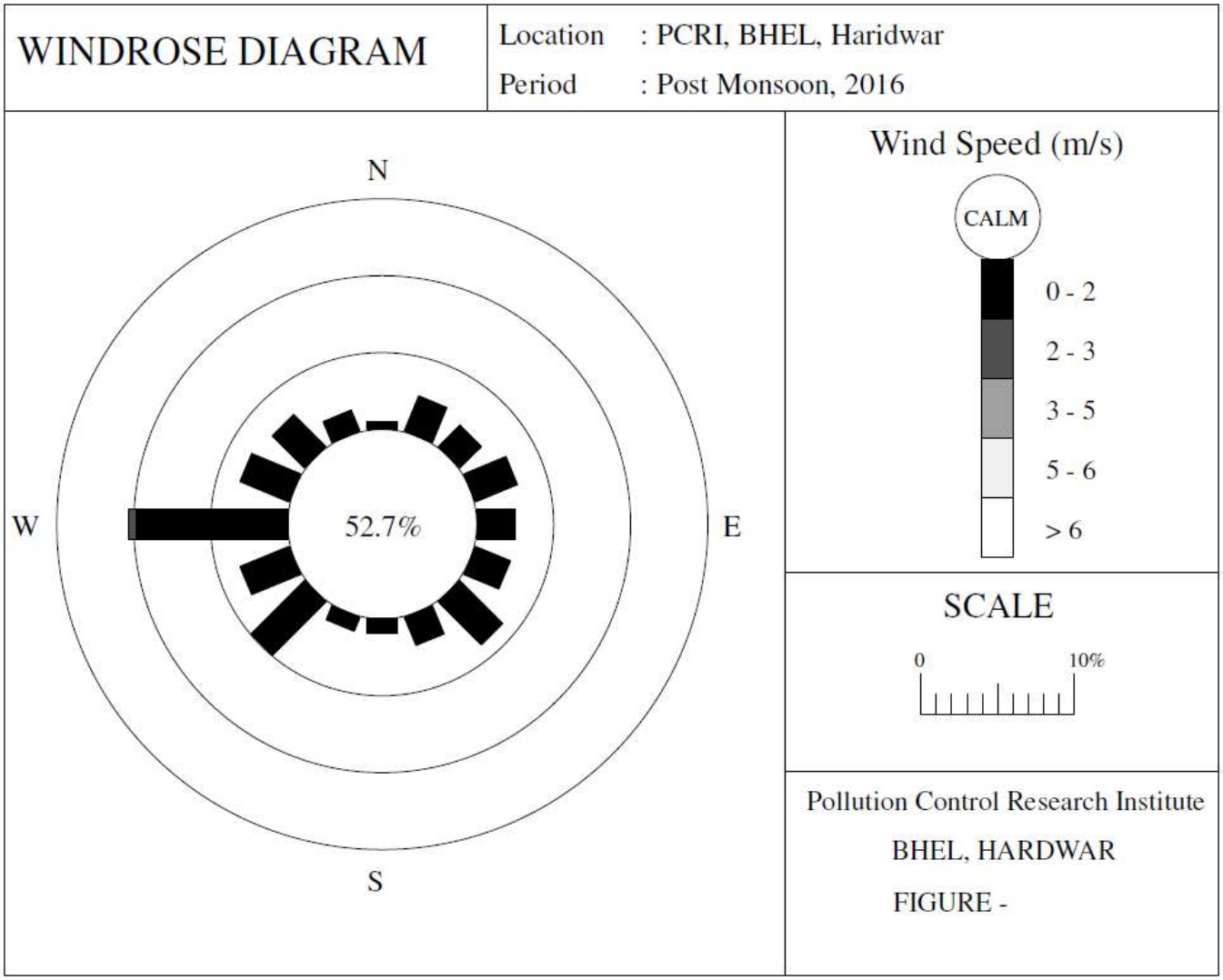


Figure 6.20 Windrose During Post Monsoon Season

Windrose Diagram during winter Season

The windrose day & night time (combined) and Day time separately is given for winter season : pollutants (such as SO2, NOx, CO)

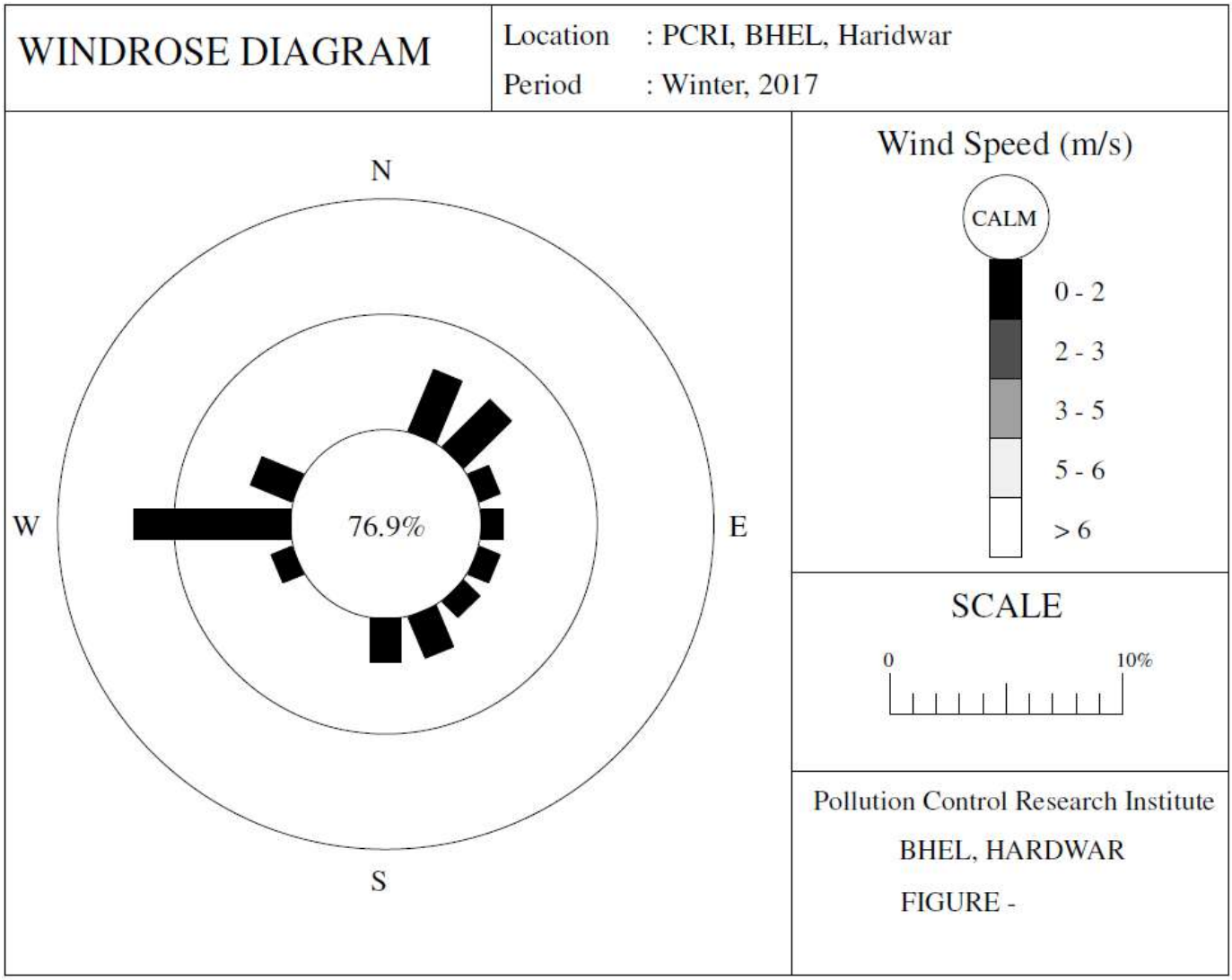


Figure 6.21 Windrose During Winter Season

6.3 Ambient Air Monitoring at Haridwar

1. The study has been carried out by monitoring ambient air quality for thirty days continuously in summer & post monsoon season at identified location. The summer season study was carried out from 16.05.2016 to 15.06.2016. The post monsoon season study was carried out from 15.10.2016 to 14.11.2016.

The brief description of sites are given below:

I. VIP Ghat, Haridwar
II. Kanya Gurukul Mahavidyalaya, Kankhal
III. Saini Ashram, Jwalapur
IV. Police Thana, Bahadrabad
V. SKF Industries, SIDCUL
VI. Industrial Area, Haridwar
VII. PCRI, BHEL, Haridwar

The locations of proposed Ambient Air Quality of Haridwar City are shown on the map.

Seven ambient air monitoring stations were installed in the summer and post moon season at locations such as near roadside, residential, industrial, outskirts (reference), commercial and sensitive areas. The monitoring of the above monitored parameters is being done as per CPCB/MoEF methods.

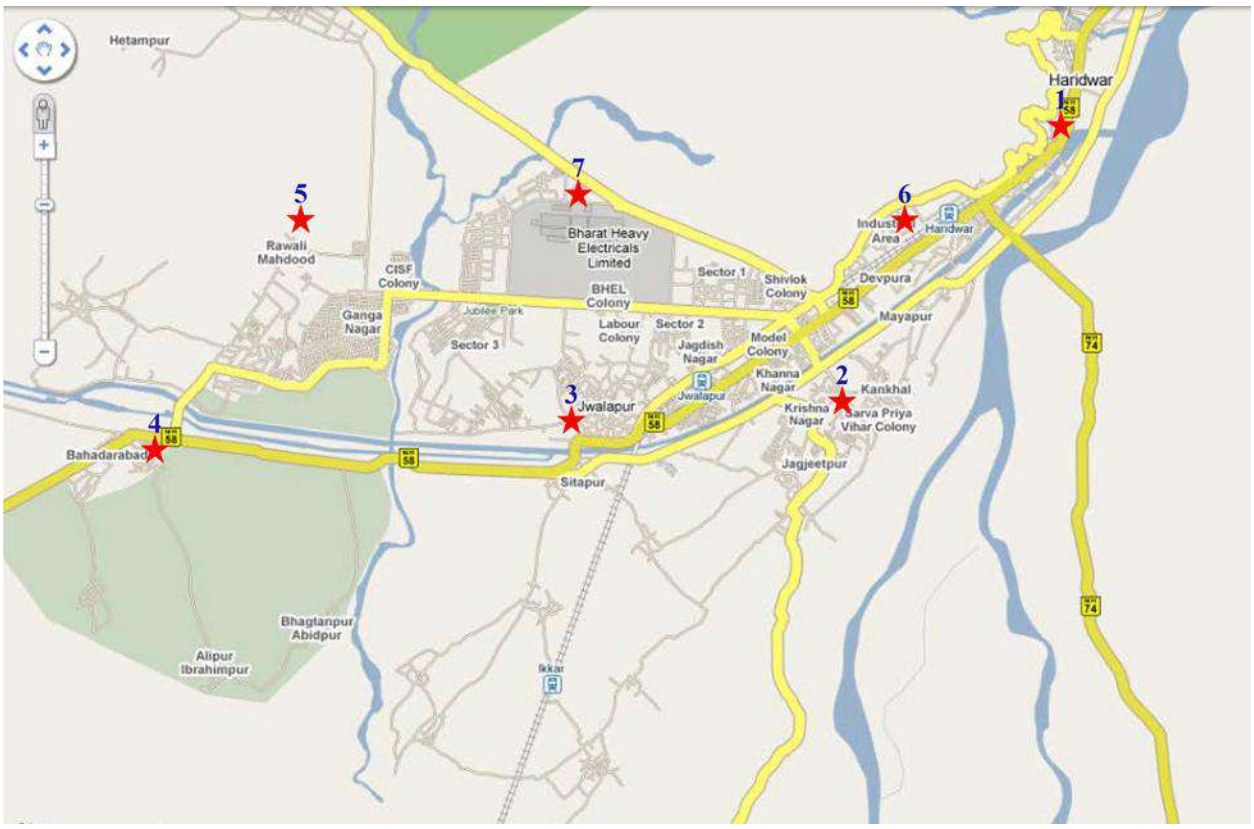


Figure 6.22 : Seven Ambient Air Monitoring Locations at Haridwar

Description of Ambient Air Monitoring Locations:

I. **VIP Ghat, Haridwar** : VIP Ghat is situated on National Highway-58 .The Traffic activity is quite prominent at this location. All types of vehicles two-wheelers, four-wheelers, six-wheelers etc. passes from this location.

II. **Kanya Gurukul Mahavidyalaya, Kankhal** : **Gurukul Kangri**, situated in Kankhal, on the banks of river Ganges, on Haridwar-Jwalapur bypass road. It is one of the oldest Universities of India Kanya Gurukul Mahavidyalya is also located on National Highway 58 . Heavy traffic can be seen on this location during peak season. Sometimes Problem of Jam also occurred over there during peak season.

III. **Saini Ashram, Jwalapur :** Saini Ashram located in Jwalapur with the surrounding of localities. It is located on Haridwar main road.

IV. **Police Thana, Bahadrabad :** Bahadrabad is situated at a distance of 11 km from Haridwar, between the towns of Haridwar and Roorkee on the National Highway 58, between Delhi and Manna Pass. It is neighboring towns are, Pathri, Jhabrera, Narsan, Jwalapur and Mohanpur Mohammadpur.

V. **SKF Industries, SIDCUL :** SKF India Ltd. is located in Village Salempur Mehdood, Sidcul (Integrated Industrial Area), Bahadrabad By-Pass Road, Haridwar.

VI. **Industrial Area, Haridwar :** Industrial area in Haridwar is located along side the bypass road ,along with railway line and the traffic is only at this road from Ranipur to Laltarau bridge**.**

VII. **PCRI, BHEL, Haridwar :** PCRI is located at the forest road and the traffic here is very less.

Tables in 6.21 - Ambient Air Monitoring at Haridwar for Summer Season

Table - 6.21.1
Average, Cumulative Percentile, Maxima & Minima
Respirable Suspended Particulate Matter (RSPM) PM10

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	205	26.0	155	250	172	186	205	228	248
A2	Kanya Gurukul, Khankhal	183	18.3	155	220	163	168	181	196	217
A3	Saini Ashram, Jwalapur	172	13.0	155	210	158	164	168	177	206
A4	Bahadrabad	216	16.4	187	246	198	203	215	203	246
A5	SKF Industries,SIDCUL	191	19.9	159	230	166	178	187	212	227
A6	Industrial area, Haridwar	214	23.0	177	250	183	191	217	236	248
A7	PCRI,BHEL, Haridwar	168	17.7	144	209	148	155	165	183	206

Table- 6.21.2
Average, Cumulative Percentile, Maxima & Minima
Particulate Matter PM2.5 (PM2.5)

All values in µg/m³

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	73	9.7	55	88	57	66	73	82	87
A2	Kanya Gurukul,Kankhal	65	6.3	53	76	58	60	65	71	76
A3	Saini Ashram, Jwalapur	66	6.2	55	80	59	62	66	68	79
A4	Bahadrabad	75	5.2	68	87	69	71	74	79	87
A5	SKF SIDCUL	67	5.6	58	78	61	63	66	73	77
A6	Industrial Area, HWR	75	6.1	65	84	67	71	76	81	84
A7	PCRI,BHEL, Haridwar	62	6.3	50	75	55	57	61	67	74

Table - 6.21.3
Average, Cumulative Percentile, Maxima & Minima
Sulphur-Dioxide (SO_2)

All values in µg/m³

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	7	1.1	4	9	6	6	7	7	9
A2	Kanya Gurukul, Kankhal	5	1.4	3	8	4	4	6	7	8
A3	Saini Ashram, Jwalapur	6	1.0	4	8	4	5	6	6	8
A4	Bahadrabad	6	1.2	4	9	5	6	6	7	9
A5	SKF SIDCUL	6	1.2	4	8	5	5	6	7	8
A6	Industrial Area, HWR	6	0.8	4	7	5	6	6	7	7
A7	PCRI, BHEL, Haridwar	5	1.2	3	7	4	4	5	6	7

Table-6.21.4
Average, Cumulative Percentile, Maxima & Minima
Oxide of Nitrogen (NOx)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	28	1.7	24	32	26	27	28	29	31
A2	Kanya Gurukul, Kankhal	21	1.4	20	24	20	20	21	23	24
A3	Saini Ashram, Jwalapur	22	1.6	20	26	20	20	21	23	26
A4	Bahadrabad	28	1.7	24	32	26	27	28	29	32
A5	SKF SIDCUL	22	1.5	20	25	20	20	22	23	25
A6	Industrial Area, HWR	22	1.6	20	26	20	21	22	24	25
A7	PCRI,BHEL, Haridwar	21	1.6	20	26	20	20	21	22	26

Table-6.21.5
Average, Cumulative Percentile, Maxima & Minima
Ozone (O_3)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	48	3.4	40	54	44	46	49	51	54
A2	Kanya Gurukul, Khankhal	46	3.1	40	52	42	43	46	48	52
A3	Saini Ashram, Jwalapur	45	3.1	39	51	40	42	45	47	51
A4	Bahadrabad	43	3.1	39	51	40	40	42	45	50
A5	SKF SIDCUL	46	3.2	41	52	42	45	46	48	52
A6	Industrial Area, HWR	43	3.1	37	49	40	41	43	46	48
A7	PCRI,BHEL, Haridwar	44	3.2	40	50	40	42	45	47	50

Table-6.21.6
Average, Cumulative Percentile, Maxima & Minima
Carbon Monoxide (CO)

All values in mg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	1.2	0.1	1.0	1.4	1.0	1.1	1.2	1.3	1.38
A2	Kanya Gurukul,Kankhal	0.9	0.1	0.7	1.2	0.72	0.78	0.9	1.0	1.2
A3	Saini Ashram, Jwalapur	0.8	0.2	0.6	1.2	0.67	0.76	0.8	1.0	1.2
A4	Bahadrabad	1.3	0.3	1.0	1.6	1.12	1.2	1.3	1.43	1.58
A5	SKF SIDCUL	0.6	0.1	0.5	0.8	0.52	0.55	0.6	0.71	0.79
A6	Industrial Area, HWR	0.9	0.05	0.7	1.1	0.72	0.79	0.9	1.02	1.1
A7	PCRI,BHEL, Haridwar	0.2	0.01	0.09	0.3	0.1	0.14	0.2	0.26	0.3

The average, minimum & maximum concentration of SPM, RSPM, SO2, NOx and CO for above data is as given in Table below :

Table 6.21.7 : Average, Minimum & Maximum concentration in Haridwar during Summer Season

	PM10	PM2.5	SO2	NOX	CO
	µg/m3				PPM
Avg.	197	69	6	26	0.84
Min.	144	50	3	20	0.09
Max.	250	88	9	32	1.6

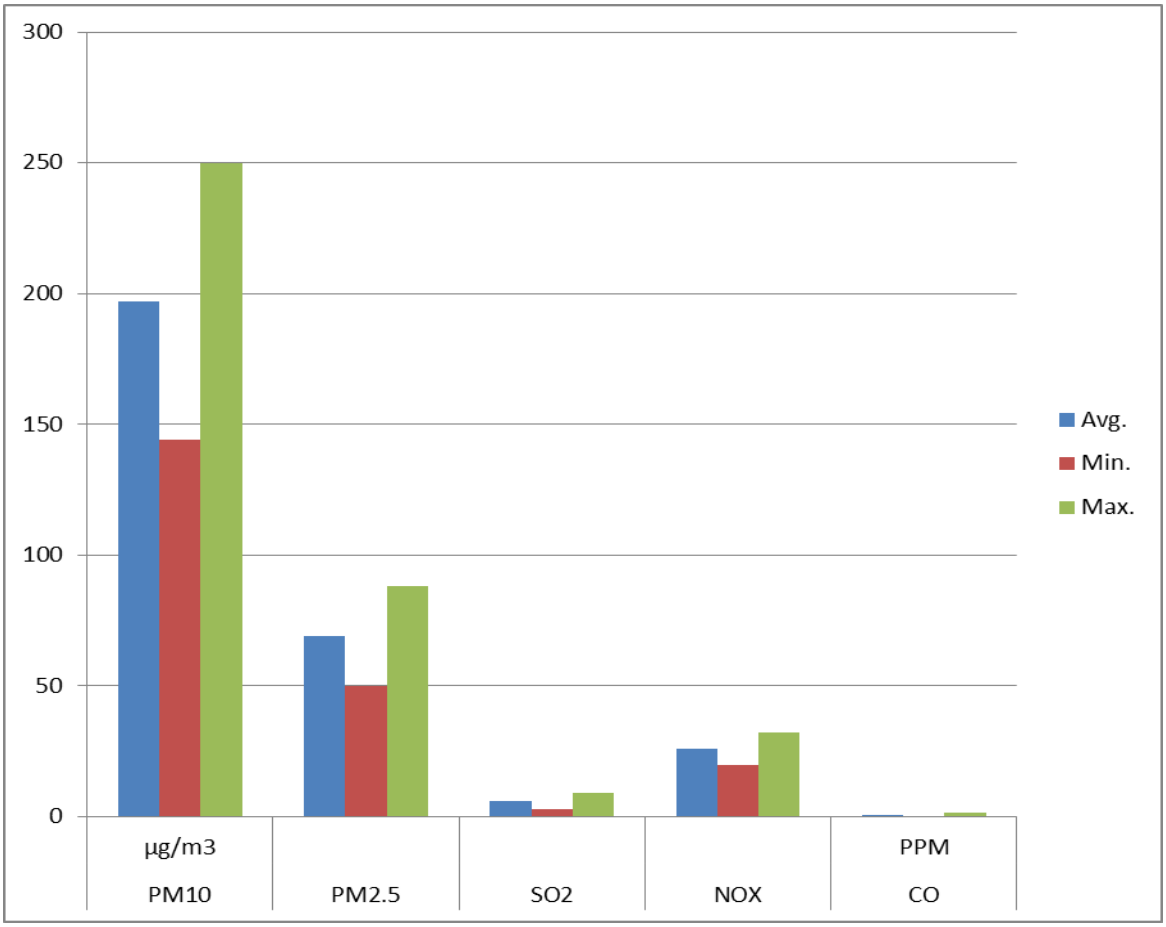


Figure 6.23: Concentration of pm10,PM2.5,SO_2 & NO_X Levels during Summer Season

Tables in 6.22 - Ambient Air Monitoring at Haridwar for Post-Monsoon Season

Table - 6.22.1

Average, Cumulative Percentile, Maxima & Minima
Respirable Suspended Particulate Matter (RSPM) PM10

All values in µg/m^3

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	82	10.4	62	100	68.8	74.4	82	91.2	99.2
A2	Kanya Gurukul, Kankhal	73.2	7.32	62	88	65.2	168	72.4	78.4	86.8
A3	Saini Ashram, Jwalapur	68.8	5.2	62	84	63.2	164	67.2	70.8	82.4
A4	Bahadrabad	86.4	6.56	74.8	98.4	79.2	203	86	81.2	98.4
A5	SKF Industries,SIDCUL	76.4	7.96	63.6	92	66.4	178	74.8	84.8	90.8
A6	Industrial area, Haridwar	85.6	9.2	70.8	100	73.2	191	86.8	94.4	99.2
A7	PCRI,BHEL, Haridwar	67.2	7.08	57.6	83.6	59.2	155	66	73.2	82.4

Table- 6.22.2
Average, Cumulative Percentile, Maxima & Minima
Particulate Matter PM2.5 (PM2.5)

All values in µg/m3

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	29.2	3.88	22	35.2	22.8	26.4	29.2	32.8	34.8
A2	Kanya Gurukul,Kankhal	26	2.52	21.2	30.4	23.2	24	26	28.4	30.4
A3	Saini Ashram, Jwalapur	26.4	2.48	22	32	23.6	24.8	26.4	27.2	31.6
A4	Bahadrabad	30	2.08	27.2	34.8	27.6	28.4	29.6	31.6	34.8
A5	SKF SIDCUL	26.8	2.24	23.2	31.2	24.4	25.2	26.4	29.2	30.8
A6	Industrial Area, HWR	30	2.44	26	33.6	26.8	28.4	30.4	32.4	33.6
A7	PCRI,BHEL, Haridwar	24.8	2.52	20	30	22	22.8	24.4	26.8	29.6

Table - 6.22.3
Average, Cumulative Percentile, Maxima & Minima
Sulphur-Dioxide (SO_2)

All values in µg/m³

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	2.8	0.44	1.6	3.6	2.4	2.4	2.8	2.8	3.6
A2	Kanya Gurukul, Kankhal	2	0.56	1.2	3.2	1.6	1.6	2.4	2.8	3.2
A3	Saini Ashram, Jwalapur	2.4	0.4	1.6	3.2	1.6	2	2.4	2.4	3.2
A4	Bahadrabad	2.4	0.48	1.6	3.6	2	2.4	2.4	2.8	3.6
A5	SKF SIDCUL	2.4	0.48	1.6	3.2	2	2	2.4	2.8	3.2
A6	Industrial Area, HWR	2.4	0.32	1.6	2.8	2	2.4	2.4	2.8	2.8
A7	PCRI, BHEL, Haridwar	2	0.48	1.2	2.8	1.6	1.6	2	2.4	2.8

Table-6.22.4
Average, Cumulative Percentile, Maxima & Minima
Oxide of Nitrogen (NOx)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	11.2	0.68	9.6	12.8	10.4	10.8	11.2	11.6	12.4
A2	Kanya Gurukul,Kankhal	8.4	0.56	8	9.6	8	8	8.4	9.2	9.6
A3	Saini Ashram,Jwalapur	8.8	0.64	8	10.4	8	8	8.4	9.2	10.4
A4	Bahadrabad	11.2	0.68	9.6	12.8	10.4	10.8	11.2	11.6	12.8
A5	SKF SIDCUL	8.8	0.6	8	10	8	8	8.8	9.2	10
A6	Industrial Area, HWR	8.8	0.64	8	10.4	8	8.4	8.8	9.6	10
A7	PCRI,BHEL, Haridwar	8.4	0.64	8	10.4	8	8	8.4	8.8	10.4

Table-6.22.5
Average, Cumulative Percentile, Maxima & Minima
Ozone (O_3)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	19.2	1.36	16	21.6	17.6	18.4	19.6	20.4	21.6
A2	Kanya Gurukul,	18.4	1.24	16	20.8	16.8	17.2	18.4	19.2	20.8
A3	Saini Ashram, Jwalapur	18	1.24	15.6	20.4	16	16.8	18	18.8	20.4
A4	Bahadrabad	17.2	1.24	15.6	20.4	16	16	16.8	18	20
A5	SKF SIDCUL	18.4	1.28	16.4	20.8	16.8	18	18.4	19.2	20.8
A6	Industrial Area, HWR	17.2	1.24	14.8	19.6	16	16.4	17.2	18.4	19.2
A7	PCRI,BHEL, Haridwar	17.6	1.28	16	20	16	16.8	18	18.8	20

Table-6.22.6
Average, Cumulative Percentile, Maxima & Minima
Carbon Monoxide (CO)

All values in mg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	0.48	0.04	0.4	0.56	0.4	0.44	0.48	0.52	0.552
A2	Kanya Gurukul,Kankhal	0.36	0.04	0.28	0.48	0.288	0.312	0.36	0.4	0.48
A3	Saini Ashram, Jwalapur	0.32	0.08	0.24	0.48	0.268	0.304	0.32	0.4	0.48
A4	Bahadrabad	0.52	0.12	0.4	0.64	0.448	0.48	0.52	0.572	0.632
A5	SKF SIDCUL	0.24	0.04	0.2	0.32	0.208	0.22	0.24	0.284	0.316
A6	Industrial Area, HWR	0.36	0.02	0.28	0.44	0.288	0.316	0.36	0.408	0.44
A7	PCRI,BHEL, Haridwar	0.08	0.004	0.036	0.12	0.04	0.056	0.08	0.104	0.12

The average, minimum & maximum concentration of SPM, RSPM, SO2, NOx and CO for above data is as given in Table below :

Table 6.22.7 : Average, Minimum & Maximum concentration in Haridwar during Post-Monsoon Season

	PM10	PM2.5	SO2	NOX	CO
	µg/m3				PPM
Avg.	78.8	28.2	2.4	10.4	1.36
Min.	57.6	21.2	1.2	8	0.09
Max.	100	35.2	3.6	12.8	0.64

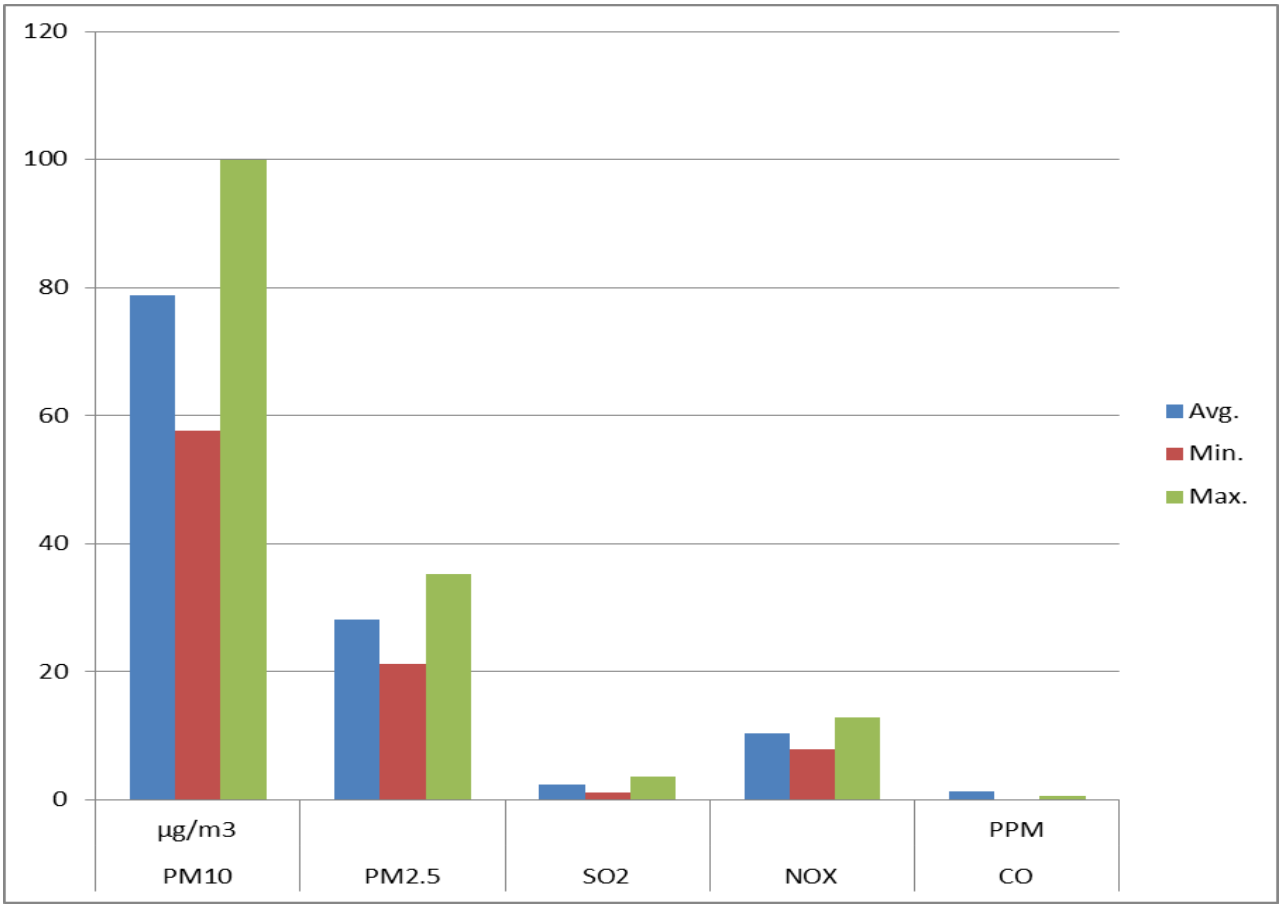


Figure 6.24: Concentration of PM10, PM2.5, SO_2 & NO_X Levels during Post-Monsoon Season

Tables in 6.23 - Ambient Air Monitoring at Haridwar for Winter Season

Table - 6.23.1
Average, Cumulative Percentile, Maxima & Minima
Respirable Suspended Particulate Matter (RSPM) PM10

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	112.75	14.3	85.25	137.5	94.6	102.3	112.75	125.4	136.4
A2	Kanya Gurukul, Kankhal	100.65	10.065	85.25	121	89.65	92.4	99.55	107.8	119.35
A3	Saini Ashram, Jwalapur	94.6	7.15	85.25	115.5	86.9	90.2	92.4	97.35	113.3
A4	Bahadrabad	118.8	9.02	102.85	135.3	108.9	111.65	118.25	111.65	135.3
A5	SKF Industries,SIDCUL	105.05	10.945	87.45	126.5	91.3	97.9	102.85	116.6	124.85
A6	Industrial area, Haridwar	117.7	12.65	97.35	137.5	100.65	105.05	119.35	129.8	136.4
A7	PCRI,BHEL, Haridwar	92.4	9.735	79.2	114.95	81.4	85.25	90.75	100.65	113.3

Table- 6.23.2
Average, Cumulative Percentile, Maxima & Minima
Particulate Matter PM2.5 (PM2.5)

All values in µg/m³

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	40.15	5.33	30.25	48.4	31.35	36.3	40.15	45.1	47.85
A2	Kanya Gurukul,Kankhal	35.75	3.465	29.15	41.8	31.9	33	35.75	39.05	41.8
A3	Saini Ashram, Jwalapur	36.3	3.41	30.25	44	32.45	34.1	36.3	37.4	43.45
A4	Bahadrabad	41.25	2.86	37.4	47.85	37.95	39.05	40.7	43.45	47.85
A5	SKF SIDCUL	36.85	3.08	31.9	42.9	33.55	34.65	36.3	40.15	42.35
A6	Industrial Area, HWR	41.25	3.35	35.75	46.2	36.85	39.05	41.8	44.55	46.2
A7	PCRI,BHEL, Haridwar	34.1	3.46	27.5	41.25	30.25	31.35	33.55	36.85	40.7

Table - 6.23.3
Average, Cumulative Percentile, Maxima & Minima
Sulphur-Dioxide (SO_2)

All values in µg/m³

Site Cod	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	3.85	0.60	2.2	4.95	3.3	3.3	3.85	3.85	4.95
A2	Kanya Gurukul,Kankhal	2.75	0.77	1.65	4.4	2.2	2.2	3.3	3.85	4.4
A3	Saini Ashram, Jwalapur	3.3	0.55	2.2	4.4	2.2	2.75	3.3	3.3	4.4
A4	Bahadrabad	3.3	0.66	2.2	4.95	2.75	3.3	3.3	3.85	4.95
A5	SKF SIDCUL	3.3	0.66	2.2	4.4	2.75	2.75	3.3	3.85	4.4
A6	Industrial Area, HWR	3.3	0.44	2.2	3.85	2.75	3.3	3.3	3.85	3.85
A7	PCRI, BHEL, Haridwar	2.75	0.66	1.65	3.85	2.2	2.2	2.75	3.3	3.85

Table-6.23.4
Average, Cumulative Percentile, Maxima & Minima
Oxide of Nitrogen (NOx)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	15.4	0.93	13.2	17.6	14.3	14.85	15.4	15.9	17.0
A2	Kanya Gurukul,Kankhal	11.55	0.77	11	13.2	11	11	11.55	12.6	13.2
A3	Saini Ashram, Jwalapur	12.1	0.88	11	14.3	11	11	11.55	12.6	14.3
A4	Bahadrabad	15.4	0.93	13.2	17.6	14.3	14.85	15.4	15.9	17.6
A5	SKF SIDCUL	12.1	0.82	11	13.75	11	11	12.1	12.6	13.7
A6	Industrial Area, HWR	12.1	0.88	11	14.3	11	11.55	12.1	13.2	13.7
A7	PCRI,BHEL, Haridwar	11.55	0.88	11	14.3	11	11	11.55	12.1	14.3

Table-6.23.5
Average, Cumulative Percentile, Maxima & Minima
Ozone (O_3)

All values in µg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	26.4	1.87	22	29.7	24.2	25.3	26.95	28.05	29.7
A2	Kanya Gurukul,Kankhal	25.3	1.705	22	28.6	23.1	23.65	25.3	26.4	28.6
A3	Saini Ashram, Jwalapur	24.75	1.705	21.45	28.05	22	23.1	24.75	25.85	28.05
A4	Bahadrabad	23.65	1.705	21.45	28.05	22	22	23.1	24.75	27.5
A5	SKF SIDCUL	25.3	1.76	22.55	28.6	23.1	24.75	25.3	26.4	28.6
A6	Industrial Area, HWR	23.65	1.705	20.35	26.95	22	22.55	23.65	25.3	26.4
A7	PCRI,BHEL, Haridwar	24.2	1.76	22	27.5	22	23.1	24.75	25.85	27.5

Table-6.23.6
Average, Cumulative Percentile, Maxima & Minima
Carbon Monoxide (CO)

All values in mg/m³

Site Code	Location	Mean	S.D	Min	Max	Percentile				
						10th	25th	50th	80th	98th
A1	VIP Ghat Haridwar	0.66	0.055	0.55	0.77	0.55	0.605	0.66	0.715	0.759
A2	Kanya Gurukul,Kankhal	0.495	0.055	0.385	0.66	0.396	0.429	0.495	0.55	0.66
A3	Saini Ashram, Jwalapur	0.44	0.11	0.33	0.66	0.368	0.418	0.44	0.55	0.66
A4	Bahadrabad	0.715	0.165	0.55	0.88	0.616	0.66	0.715	0.786	0.869
A5	SKF SIDCUL	0.33	0.055	0.275	0.44	0.286	0.302	0.33	0.390	0.434
A6	Industrial Area, HWR	0.495	0.027	0.385	0.605	0.396	0.434	0.495	0.561	0.605
A7	PCRI,BHEL, Haridwar	0.11	0.005	0.049	0.165	0.055	0.077	0.11	0.143	0.165

The average, minimum & maximum concentration of SPM, RSPM, SO2, NOx and CO for above data is as given in Table below :

Table 6.23.7 : Average, Minimum & Maximum concentration in Haridwar during Post-Monsoon Season

	PM10	PM2.5	SO2	NOX	CO
	µg/m3				PPM
Avg.	108.35	37.95	3.3	14.3	0.465
Min.	79.2	27.5	1.65	11	0.05
Max.	137.5	48.4	4.95	17.6	0.88

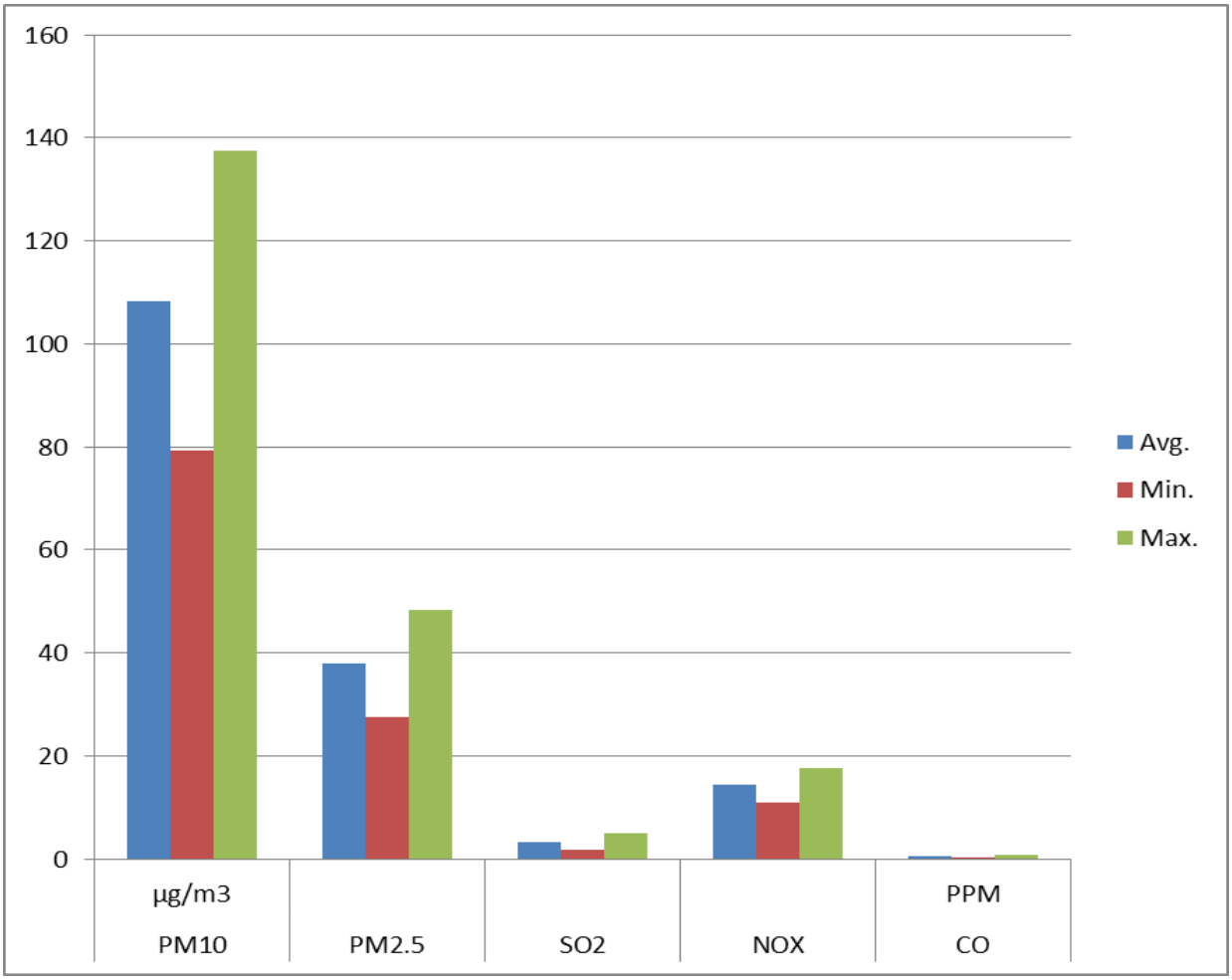


Figure 6.25: Concentration of PM10,PM2.5, SO_2 & NO_X Levels during Winter Season

6.4 Ambient Air Quality Monitoring at Mansa Devi:

The ambient air monitoring at Mansa Devi was carried out from19.01.2018 to 22.01.2018. The Udan Khatula location was selected near Mansa Devi. location is shown in the Picture as given below. The 24 hour samples were taken. The concentration of PM10, PM2.5, SO2, NOx and CO was measured. The average values are as given below:

Table 6.24: Average values of concentration of Ambient Air at Mansa Devi

All values in µg/m^3

Parameter	Average
PM 10	43.1
PM 2.5	15.4
Sulphur Dioxide (SO2)	BDL
Nitrogen Oxides (NOx)	BDL
Carbon Monoxide (CO), mg/m^3	BDL

BDL: Below Detectable Limit

The PM10, PM2.5, SO2, NOx and CO concentration at this location were found well below the NAQMS standards. As suggested, this point can be taken as the referral location of Air Quality in the Haridwar city.

Ambient air PM10 monitoring at Mansa Devi

Ambient Air PM2.5 monitoring at Mansa Devi

Chapter – 7

Action Plan for Air Quality Improvement, Recommendations

7.0 Suggested Action Plan.

A. Phase out of old vehicles in the city.

B. Option of CNG and battery operated public transport vehicles.

C. Air pollution control measure particularly dust control measures to be adopted for construction activities in the city.

D. Restriction of heavy diesel driven vehicle in Haridwar during day time.

E. Option of bye passes road/Fly over for smooth traffic movement, particulary for Delhi Dehradun highway.

F. Option of introduction of CNG/battery operated transport vehicle and private vehicle plying the Haridwar.

G. Option of parking of vehicle at outskirt of Haridwar city for vehicle coming from outside area and strengthening of local transport system.

H. Environmental audit of Road Transport Office by reputed organization for auditing of regular monitoring of vehicular pollution checking under Pollution Under Control (PUC) certificating system.

I. Restriction of vehicle in Haridwar city without having Pollution Under Control (PUC) Certificate of transport and strengthening of transport department for regular monitoring of vehicular pollution in the Haridwar city.

J. Strict implementation of provision for ban on open burning of solid waste in the city by municipalities, scientific disposal of solid waste and improving the road condition in the city.

K. Encouraging to Social Forestry plantation in Haridwar city by the Forest Department and preparation action plan for the same.

L. Recommendation of model traffic system, strengthening of traffic department and effective implementation of traffic signals in the city by the police department.

A. Phase out of old vehicles in the city.

The new policy for scrapping vehicles old than 15-years should be formed in Uttarakhand and it is aimed at curbing rising vehicular pollution in Haridwar. The policy will be formed by Transport Commissioner of Uttarakhand State. The notification should be issued regarding this. The above policy and the concept should be adopted and made applicable for Haridwar and Uttarakhand by State Transport Department Uttarakhand, the **Office of Transport Commissioner, Kulhan, Shashtradhara Road, Dehradun. The** Uttarakhand Transport Corporation (UTC) should take action for implementing the policy.

Earlier also, the Road, Transport and Highways Ministry, Govt. of India, had sent a concept note on Voluntary Vehicle Fleet Modernisation Programme (V-VMP) to the Committee of Secretaries for voluntary scrapping and replacement of old polluting vehicles.

The Road and Transport Ministry, Govt. of India is likely to push for 'mandatory' phasing out of old truck and buses from Indian roads. It is recommended that Uttarakhand Govt., State Transport Department Uttarakhand, should implement the phasing out of the Old vehicles. Considering hardening of its stand on scrapping old trucks and buses by setting 15-years.

Earlier, Road and Transport Minister that a draft policy for scrapping old vehicles was prepared and presented to the Cabinet. The government had also appointed a management consultancy to come up with a policy which entitles those disposing their old vehicle to a discount while buying a new one.

Uttarakhand Govt., State Transport Department Uttarakhand should push strongly to implement a scrap page incentive scheme that will push out 15-year-old polluting trucks and buses out of the market and generate demand for new trucks.
All of them do not get scrapped at once. Auto rickshaws run on permits and depending upon the auto rickshaw age, a decision is made at RTO office whether to scrap it or extend

or 'pass' the permit for next year. Once auto rickshaws are confirmed that they will be scrapped, they get cut into two or four pieces at the RTO office.

Figure -7.1

Figure -7.2

Compliance with the BS-IV standards for Auto Rickshaws: The Auto Rickshaws should strictly maintain the BS-III standards and upgrade to the BS-IV standards. Newly manufactured three-wheelers will have to comply with more efficient emission standards (Bharat Stage IV). Currently, auto rickshaws have to follow BS III norms introduced in 2010. Those auto rickshaws complying with BS-III/BS-IV standards can be ruled out from phasing out policy.

The State Transport Department, Uttarakhand, a notification of ministry of transport and highways should be strictly followed. The BS IV norms should be made applicable for new vehicle models of three-wheelers.

The report states that with the implementation of BS IV emission norms, three-wheelers which are predominantly carbureted will be tuned for lean operation. This will keep fuel efficiency as high as possible. Any further reduction in the NOx limits would not be possible with carbureted technology.

The low sulphur content fuel should be used for three wheelers.

B. Option of CNG and battery operated public transport vehicles.

The new technology three wheelers, electrically & battery operated should be introduced as manufactured by Auto manufacturers a shown below in the photo:

Figure – 7.3

This auto travels 85km on a single charge.

Figure – 7.4

BS V norms for gasoline, CNG, auto LPG and diesel-fuelled three-wheelers will come into effect from April 1 2020 for new models, and a year later for continuing models. The office of Transport Commissioner should put this into their Auto policy for future.

There are several alternatives to diesel or gasoline available: Natural gas is mostly used as compressed natural gas (CNG) or to a lesser extent as liquefied natural gas (LNG/GTL). CNG vehicles offer GHG mitigation potential as natural gas contains less carbon per unit of energy than petrol, but well-to-tank emissions vary depending on the gas supply structure. Cities suffering from local air pollution often use public transport vehicles fueled by CNG due to their positive effects on local air pollution compared to diesel or gasoline.

Electric vehicles offer even higher advantages in reducing local air pollution, as they do not generate any emissions during operation. Besides higher efficiency of electric propulsion systems, which produces thrust, electrification offers the possibility to integrate energy from renewables and thereby to reduce GHG emissions from transport significantly. Electric vehicles can either store the electricity on-board in batteries. While battery electric buses are in regular operation in several cities, fuel cell buses are mainly deployed in trials up to now.

As a mixed form hybrid-electric vehicles and plug-in hybrid vehicles combine electricity and conventional fuels. Electric buses or plug-in hybrid electric buses are more expensive

than diesel buses especially due to the battery costs, which are expected to decrease in future.

Today, electric buses are in often not cost-effective if only the direct costs are taken into account. Due to their positive effect on externalities (e.g. reduction of local air pollution) benefits to society as a whole can outweigh the higher investment costs.

Environmental benefits of the use of electric vehicles

Electric vehicles produce no GHG emissions, at the tailpipe. So they are considered 'green' because they have no emissions in the place where they are used. However, battery electric vehicles can be considered Zero emission engines only locally, because they produce GHG in the power plants where electricity is generated. The two factors driving these GHG emissions of Battery Electric Vehicles are:

- the Carbon intensity of the electricity used to recharge the Electric Vehicle (commonly expressed in grams of CO2 per kWh)
- the consumption of the specific vehicle (in kilometers/kWh)

Battery

Battery technology has developed from lead-acid batteries in the 19th Century which was too heavy for most types of vehicles to lithium batteries

Figure- 7.5 : Four Wheeler battery operated auto Vehicle

ELECTRIC BUSES IN INDIA

The rapid increase in private vehicle ownership is mainly due to lack of good public transport facility.

Uttarakhand Transport department should decide on introducing the Electric buses in Haridwar and Uttarakhand. These Buses travels the short distances on single charge i.e. around 85 kms. The applicability of Electric Buses will be in following areas:

1. **School Buses**
2. **City Buses**
3. **Tourism**
4. **Company vehicles**

The School Electric Buses are the best option to be introduce in the Transport traffic system. The Transport Commissioner, Uttarakhand should take the decision for **introducing Electric Buses in the Schools of Haridwar.** An example should be set up for other States also. These buses can plying from Haridwar, Khankhal, Jawalapur to SIDCUL Industries for transporting the employees avoiding the huge numbers of Auto Rickshaws which are emitting sources of particulate matter (PM10 & PM2.5), NOx and Carbon Monoxide in large quantities.

The e-auto rickshaws should also be encouraged for short distances in these areas.

The local administration of Haridwar should restrict the movement of Auto Rickshaws and promote e-rickshaws on the selected routes as suggested below:

1. Bustand/Railway Station to Har Ki Pauri areas
2. Bustand/Railway Station to Ashrams and Hotels in the Zero Zone of Haridwar city.
3. Internal movements in Haridwar city.

For the proper management of movement of e-rickshaws, the parking stands should be

planned and developed at every intersection of roads outside colonies, Bus Stand, Railway **Station and other areas.**

Ministry of Urban Development, Government of India will launch "Green Urban Transport Scheme", enabling a shift towards electric vehicles for public transport and use of non-fossil fuel for powering vehicles. The Uttarakhand Govt. should follow in these lines to build the Haridwar & Dehradun a Green City.

Currently, there are around 1.6 million registered buses in India, out of which only 170,000 are operated by public bus operators. Only 5,000 buses are operated under PPP model for city bus operation. There is need to increase the supply of buses in Indian cities to develop sustainable public transport. However, the cities should have a larger vision to curb dependence on fossil fuel and reduce CO2 emissions. It is right time that public transport vehicles shift their source of power from diesel to electricity.

Present Scenario of Electric Buses in India

The acceptance of electric and hybrid buses is slow in India, mainly due to cost factor. The average cost of hybrid or electric buses is 3-4 times higher than diesel buses. Further, with the decrease in the cost of diesel, there is not much incentive for the operators to shift to hybrid or electric buses. Some cities, like Delhi and Mumbai, are using clean fuel like CNG for the bus operation.

Another key hindrance for the introduction of electric buses is the selection of bus technology. Electric buses are classified as:

Comparison of different bus technologies

Segment	Diesel Buses		CNG	Hybrid Electric Bus	Pure Electric Bus
Model	Volvo 8400 [16] (AC)	Tata STARBUS SLF 44 [17] (AC/non-AC)	Tata STARBUS LE CNG 18 [18] (AC/non-AC)	Tata Starbus Hybrid[19] (AC/non-AC)	BYD K9[20] (AC)
Seats	32	44	18	32	31
Length	12.3 m	12 m	12 m	12 m	12 m
Width	2.5 m	2.5 m	2.55 m	2.55 m	2.55 m
Height	3.2 m	3.2 m	3.35 m	3.35 m	3.49 m
Gross weight	16,200 kg	16,200 kg	16,000 kg	16,200 kg	18,500 kg
Costs (INR)	88 lakhs	33 lakhs	30 lakhs	1.2–1.4 crores	2–3 crores
Fuel efficiency	2.2 km/L	3.5 km/L	2–3 km/kg	2.2–4km/kg	1.5 kWh/km
Fuel cost	INR 23/km	INR 15/km	INR 13–19/km	INR 10–17/km	INR 10/km
Range (km)	484	560	260–390	286–520	249
Fuel tank size	220 L	160 L	720 L	720 L	-
Charging time	–	–	–	–	3–6 h
Max power	290 BHP	177 BHP	230 BHP	230 BHP engine 44 kW battery	180 kW
Max torque	1,200 Nm	685 Nm	687 Nm	678 Nm	700 Nm
Battery type	–	–	–	Li-ion batteries	Li-ion Iron (300 kWh)
Emission standard	EURO III	BS III	BS IV	EURO III	Zero tail pipe emission

(Source: Electric Buses in India: Technology, Policy and Benefits, Global Green Growth Institute, 2016)

Figure – 7.7

Procurement of Electric Buses – Current Status

Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises is nodal agency for the sanction of funds. MORTH has constituted a committee of joint secretaries to execute a plan to deploy 10,000 electric busses. DHI has also sanctioned the following project:

I. **Navi Mumbai Municipal Transport (NMMT)** has placed an order with Volvo to procure 8400 Hybrid City Bus. Volvo has delivered 5 buses under this contract to NMMT. The Volvo 8400 Hybrid Bus also complies with the central government's Faster Adoption & Manufacturing of Electric and hybrid vehicle (FAME) scheme that has helped provide a subsidy of ₹ 6.1 million (US$ 100,000) on the total cost of ₹ 23 million (US$ 375,000).

II. **Mumbai Metropolitan Region Development Authority (MMRDA)** is procuring 25 Hybrid buses from Tata Motors. Tata Starbus Diesel Series Hybrid Electric Bus can run without the requirement of external charging infrastructures, due to integration of on-board charging, via a BSIV compliant engine & energy storage through advanced Lithium Ion Nano-Phosphate Batteries.

III. **BEST Mumbai** has received funding for the retro-fitment of 6 buses and procurement of 30 seater six electric busses with a range of 210 km. BEST has placed an order for retro-fitment with AV Motors and Impact Automotive Solutions Limited (a subsidiary of KPIT) with a grant of ₹ 100 million from the Brihanmumbai Municipal Corporation (BMC). Further, the corporation has placed an order with BYD-Goldstone and will be used the buses as feeder services to the train and metro stations

IV. **Himachal Road Transport Corporation** has received sanction from DHI to produce 25 full electric 6 seater busses. The corporation has recently conducted 10 days trial of midi electric bus in Manali-Rohtang pass and is quite convinced with electric bus technology at such high altitude of 13,000 ft. The state has also granted exemption from token tax, registration charges and value-added tax on all electric vehicles for five years to promote eco-friendly transport services in the state.

V. **Bangalore Metropolitan Transport Corporation's (BMTC)** has also submitted proposal with DHI to procure 150 electric buses on PPP model. BMTC has proposed to set up an exclusive depot for the electric buses with the required infrastructure, which would include battery rechargeable points and well-equipped workshops.

VI. **Thane Municipal Transport (TMT)** has approved the plan to introduce 100 electric buses on PPP model. The private operator will purchase and operate these buses for 10 year on selected routes. The operator will have the first right to select the routes. TMT banner and the ticket rates will be the same as approved by the Metropolitan Transport Authority.

Figure – 7.8

FAME is largely catered to private sector investment. The department has received the following proposals:

I. Bus leasing model - Myntra and Goldstone Technologies

II. Scooter Taxi in Goa (Electric)

III. Employee Commute pilot (Electric Car) - Lithium

IV. Last mile connectivity (Electric Auto-rickshaw)

Manufacturing of electric buses

The local manufacturing of the electric buses is also picking up some momentum as International players are entering into tie-up with Indian companies to setup assembly units in India. Some of key tieup are:

Local Manufacturer	International Partner
Ashok Leyland Limited	Optare, United Kingdom
JBM Auto Limited	Solaris Bus & Coach, Poland
Deccan Auto Limited	Zhongtong Auto Co, China
Goldstone Infratech Ltd	BYD Auto Industry Co, China

Green Urban Transport Scheme

Ministry of Urban Development, Government of India will launch "Green Urban Transport Scheme", enabling a shift towards electric vehicles for public transport and use of non-fossil fuel for powering vehicles. Total cost of the project will be around INR 800 billion (US$ 12.5 billion).

The government will give funding to 105 cities which will be selected through competition. The funding of the scheme will be 50:50 between states and the central government. The ministry has proposed a grant of INR 250 billion (US$ 3.85 billion), rest may come from multi-lateral banks and state governments.

Based on the above facts, the Uttarakhand Govt., Transport Department should initiate the introduction of Electric Buses and Vans atleast in Haridwar and Dehradun.

C. Air pollution control measure particularly dust control measures to be adopted for construction activities in the city.

Dust control measures

Dust and fine particle generation from construction and demolition activities can be substantially reduced through carefully selected mitigation techniques and effective management. Once particles are airborne, it is very difficult to prevent them from dispersing into the surrounding area. The most effective technique is to control dust at source and prevent it from becoming airborne, since suppression is virtually impossible once it has become airborne.

The control guidance given in the following sections sets out techniques and methods currently used by industry, with many of the methods applicable to a variety of dust and particle problems. They have not been validated under controlled conditions and therefore have yet to be subject to independent verification.

Consequential risks, such as those related to water (e.g. slips, skids, chemical reactions, electrical hazards and contamination/blockage of water services) or dust explosion in contaminated areas are outside the scope of this document and have not been dealt with.

HAULAGE ROUTES, VEHICLES AND CONSTRUCTION PLANT

Roads, surfaces and public highways

During dry and windy weather conditions, dust and mud from roads and haulage routes can become airborne through movement of vehicles, both on and outside the site.

Dust abatement measures during transportation of Construction material

The Construction and Demolition debris (C&D) is defined as all non-hazardous solid waste resulting from construction and demolition activities. C&D wastes and construction material are stored / transported generally without proper coverage and necessary precautionary measures thereby contributing to dust to the ambient air. Common dust management measures reported regarding transportation of C&D wastes / construction material include the following:

1. Transport routes for carrying construction material / C&D wastes to be identified – preferably to avoid residential, schools / institutional and hospital areas.
2. Transport material that are easily wind borne need to be covered by a sheet made of either jute , tarpaulin, plastic or any other effective material.
3. Trucks / Lorries should not be overloaded to avoid overflow of material (C&D wastes / construction material) during transportation.

Figure – 7.9

Figure – 7.10

4. As the transport vehicles move generally during night time, the transport permit should also indicate the material / waste being transported, quantity being transported and lace of loading and unloading destinations.

Adequate covering is necessary on construction works to reduces dust emissions

1. The unloading activities at temporary / intermediate C&D waste dumpsites to ensure that dust borne particles are damped either by water spray or aligning the waste disposal in such a way that minimizes dust dispersal (wind breakers).
2. The unloading activities of construction material at site / off site to ensure that dispersal of dust borne particles are minimized by either location of dumpsite or using water sprinklers or covered by a sheet made of either jute, tarpaulin, plastic or any other effective material.
3. Roads surfaces to be well maintained so that transport vehicles are not subjected to jerks resulting in ejection of C&D wastes / construction material on roads.
4. In many cases the transportation route may cover several kms, wet damping would be a major challenge, regular sweeping (or vacuum sweeping) would assist in reducing re-suspension of dust due to movement of vehicles, particularly in cities.

Dust control measures at site - construction / demolition/ Renovation activity

Dust control measures at site - construction / demolition activity to include:

i. Raise barricade along the perimeter depending on the nature of adjoining regions.

ii. Mount dust barrier sheet ex tarpaulin / plastic on scaffolding around the construction / demolition building – particularly side facing residential areas.

iii. Selective mechanization (deployment of construction / demolition) of handling material /wastes helps in better management and reduction of dust generation at site.

Overview of dust abatement measures in handling construction of C&D material / wastes

The environmental concerns during handling (loading / unloading) of Construction material and C&D wastes include:

a. Generation of dust emissions impact environmental quality both on- site and off-site.
a. Dust generated during handling (loading / unloading) release a wide range of particle sizes and material types that can *affect health and* cause problems ranging from eye, nose and throat irritation besides affect the respiratory system.
b. The larger heavier particles settle out of the air quickly and are hazardous to the workers and construction equipment (on–site) and to those in the immediate vicinity. The finer particles (usually invisible) are transported further can cause health hazards (off-site).

AQI focus on dust reduction (includes PM_{10} and $PM_{2.5}$), overview of dust abatement measures in handling of C&D material / wastes include:

1. Sprinkling of water / fine spray from nozzles to suppress dust re-suspension at site.
2. C&D wastes or construction material whether stored or transported (Lorries / tractors) to be preferably covered depending on the dust that is generated.
3. Operations of equipment / machineries include transporting (conveyor belt) crushing hammering etc deployed at site generate dust - these areas need to be bounded (enclosed) and use of water sprinklers suppress dust emissions.
4. Gensets (DG sets) be well maintained to ensure low emissions.
5. The transport vehicles engaged be well maintained (PUC compliance).
6. Routes of transport vehicles within construction site be damped by water (preferably treated waste water) sprinklers.
7. Dry sweeping of work areas to be prohibited.
8. For construction activities simultaneous development of green buffer would assist in arresting dispersal of dust (preferably shrubs & trees that have low uptake of water).
9. Workers to be provided necessary safety equipment - Workers at construction /

demolition, Loading / uploading activities are provided with face mask to prevent inhalation of fine dust.

10. All builders / contractors engaged in construction & demolition activities to submit an undertaking to the concerned government department on measures adopted to control dust.
11. Use of covering sheets (plastic, tarpaulin etc) on:
    a. Construction material heaps that are easily air borne

c. C&D debris that are dumped at temporary storage sites

d. Adequate covering on construction works, particularly side facing residential areas

12. Use of water sprinklers is commonly recommended as a dust mitigation measure, however there water is a precious commodity and its use needs to be rationalized. It is thereby important to adopt alternate measures that are effective ex location of loading / unloading sites, build higher barricades to arrest dust generated at ground levels and adopt covering (jute, plastic, tarpaulin etc.) of construction material / wastes.
13. Sale of construction material from road-sides to be prohibited.
14. Dumping (unloading) and storage of construction material for use in on-going projects on public road-sides is prohibited.
15. Dumping (unloading) and disposal of C&D wastes on non-designated sites (ex road-sides, vacant plots, water bodies, drains etc.) be prohibited.
16. Demand for construction material at site to synchronizes with its utilization, so that the storage period of un-used construction is minimal thereby reducing dust dispersal.
17. Construction projects to be encouraged to utilize products manufactured from C&D waste processing – this step improves organized collection of C&D wastes, stops indiscriminate dumping of C&D wastes thereby reducing dust load escaping into the atmosphere during dry weather.

Construction material awaiting utilization (left) & indiscriminate dumping of C&D wastes – contributes to particulate matter (dust) in ambient air

19. Inclusion of condition(s) by concerned agencies for adoption of dust mitigation measures in approvals / permits / consent provisions / environmental clearances for construction projects.

20. There is a need to highlight the environmental concerns & disseminate information on the matter.

All contractors associated in construction works and C&D waste handling need to display a board at the site indicating dust control measures being adopted, a sample display is given below for guidance:

a. Dust affects health cause problems ranging from eye, nose and throat irritation besides the respiratory system
b. This project site adopts dust reduction measures
c. All light (potential to be wind-blown) construction material is covered or put in sealed bags
d. Loading / unloading areas are barricaded
e. Water sprinkling for dust reduction is being practiced Adequate covering material shall be used to reduce dust generation
f. Workers health & safety is our concern
g. Staff at site has been apprised of CPCB's Guidelines on DUST reduction w.r.t. handling of C&D wastes & construction material.

Static and mobile combustion plant emissions

Engine exhaust emissions, especially from those operating on diesel fuel, can be a significant source of fine particle generation from construction sites. As the particles are small, they can easily be transported to beyond the site boundary and affect the local environmental air quality and health. Control guidance for these types of emissions are given in Table below:

Table Dust control guidance for static and mobile combustion plant potential dust source Dust control guidance

Visible exhaust smoke	▪ Vehicles and equipment should not emit black smoke from exhaust systems except during ignition at start-up.
Maintenance	▪ Engines and exhaust systems should be maintained so that exhaust emissions do not breach statutory emission limits set for the vehicle/equipment type and mode of operation.
Servicing	▪ This should be routinely scheduled, rather than just following breakdowns.
Operating time	▪ Internal combustion plant should not be left running unnecessarily.
Exhaust direction	▪ Vehicle exhausts should be directed away from the ground and other surfaces and preferably upwards to avoid road dust being re-suspended to the air.
Exhaust heights	▪ Exhausts should be positioned at a sufficient height to ensure adequate local dispersal of emissions.
Location of plant and equipment	▪ Plant and equipment should be operated away from residential areas or sensitive receptors near to the site.

D. Restriction of heavy diesel driven vehicle in Haridwar during day time.

The Uttarakhand Government should take the steps to restrict the entry of heavy diesel vehicles in Haridwar during day time. The entry points should be decided for non-entry of the heavy duty diesel vehicles. The entry points where the heavy duty diesel vehicles should be restricted are:

1. Shantikunj at Dehradun – Haridwar highway.
2. Laksar more, Khankhal
3. Bhadrabad – Jatwara pul
4. Chandipul

All types of Buses carrying passengers, LCV 4 wheeler should be allowed to enter in the Haridwar city for transporting the pilgrims/tourists upto the Bus stand. Plan should be made and implemented by Uttarakhand Govt. on banning of 15-year-old diesel vehicles from plying on roads in Haridwar.

This should be applied to vehicles registered in Haridwar city and vehicles coming from other areas and States.

The restrictions will apply depending on the road and the size of the vehicle.

The shifting of the city bus stand to Transport Nagar in Sarai village is to be done by district authorities. The plot of land earmarked for the bus stand in Transport Nagar should be handed over to Mandi Samiti in Jwalapur. The shifting of Bus Stand will have a positive impact on environment. This will reduce air pollution in the city area.

This should be applied to vehicles registered in Haridwar city and vehicles coming from other areas and States.

The restrictions will apply depending on the road and the size of the vehicle. The heavy vehicles in day time coming four directions as mentioned above can be parked in the outskirt parking's. Entry of heavy vehicles, including lorries, into the Haridwar city during daytime is to be banned in view of the uptrend in road congestion and as part of the efforts to ensure smooth flow of traffic. The ban on heavy vehicles is being contemplated by the law enforcing agencies as the existing restrictions on heavy vehicles and the ban on lorries from 8 a.m. to 11 a.m. and from 3 p.m. to 6 p.m. by the Traffic Police Chief has been confined to paper.

While no-entry for heavy and goods vehicles remains enforced within the city roads between 6am and 11pm Ring Road and stretch of Roorkee & Dehradun/Risikesh road as the stretches are part of National Highways.

Gradually police stations falling on the borders of the three major highways will stop trucks and other commercial vehicles at the checkpoints. The orders will be in effect between 8 am and 11 am and 3 pm and 6 pm.

E. Option of bye pass road/Fly over for smooth traffic movement, particularly for Delhi Dehradun highway.

The Government of India had entrusted to the Authority the development, maintenance and management of National Highway No.58 and from km 211.000 to km 218.200 ofNH-58 and km 165.000 to km 196.825 ofNH-72 (approx. 39.02 km).

The Authority had resolved to augment the existing road from km 211.000 to km 218.200 of NH-58 and km 165.000 to km 196.825 of NH-72 (approx. 39.02 km) on the Haridwar - Dehradun section of National Highway No58 & 72 (hereinafter called the "NH 58 & 72") in the Uttarakhand by Four-Laning on build, operate and transfer on arinuity ("BOT Annuity") basis in accordance with the terms and conditions set forth in this Agreement.

Travel time between Haridwar and Delhi may get reduced by an hour if the Centre's plan to build the six-lane access-controlled Expressway between the Capital and Meerut is implemented.

Figure – 7.11

To ease congestion on Delhi-Haridwar stretch, the Ministry of Road Transport and Highways (MoRTH) plans to convert the road into a six-lane National Highway (NH-58) from Uttar Pradesh (UP) Gate to Partapur section (6.80 km to 52.528 km). Besides constructing flyovers at Muradnagar and Modinagar to ease traffic congestion, the ministry is also working on the options of creating a bypass link.

Stretches near trijunction between NH 58 and Ghaziabad city, and Modinagar and Muradnagar get jam-packed during peak hours. However, traffic jam near Meerut morh may remain a hurdle. The project is being proposed to be developed under Delhi-Meerut Expressway project. "There is heavy traffic movement on National Highway No 58 particularly at Muradnagar and Modinagar, between Ghaziabad and Meerut. These are major headache for long-distance commuters to Haridwar, Rishikesh and Dehradun," an official said.

"A distance which could be covered in maximum four hours takes between five to six hours or even more due to congestion," he said. According to officials in the ministry, Meerut to Muzzaffarnagar stretch of National Highway No 58 has already been developed on Build-Operate-Transfer (BOT-Toll) basis from two-lane to four-lane, including bypasses at Khatauli and Muzaffarnagar.

The ministry has issued notices to the Concessionaire for expediting the work. Meanwhile, the ministry is also pressing other concessionaires to maintain the Meerut-Muzaffarnagar-Haridwar section to ensure smooth traffic flow.

Figure – 7.12

Figure – 7.13

Figure – 7.14

Figure – 7.15

The flyover at Haridwar under construction at NH 58 are shown above.

F. Option of introduction of CNG/battery operated transport vehicle and private vehicle plying the Haridwar.

As discussed in Point No. B.

G. Option of parking of vehicle at outskirt of Haridwar city for vehicle coming from outside area and strengthening of local transport system.

Pocket Parking have been buildup in various areas of Haridwar city as given below:

1. From Bhagat Singh Chowk to Railway Crossing Jawalapur
2. Chandracharaya chowk to Arya Nagar Chowk

The Motichur and Pantdeep parkings should be ear marked for the Vehicles coming from Dehradun/Risikesh side. Some open space to be developed and earmarked as parking lots.

"Since 2013 Kanwar fair, the Bairagi camp Kumbh land was converted into a parking lot, where about 40,000 four-wheelers can be kept. At least half a dozen parking lots is required, otherwise traffic movement will get choked during major festivals.

"HRDA is planning to develop the current bus stand into a multi-level parking lot, which can sustain pressure of pilgrim-tourist vehicles. As this place is less than 2 km from Har-ki-Pauri, a majority of visitors will avail of this parking lot.

Basement parking

Inadequate drainage and encroachments on drains cause water-logging in colonies and inner stretches during rainy days. For this reason, hoteliers and commercial complex owners are not keen on underground basement parking.

Sati Ghat Parking: The parking is near Daksh Tempele Khankhal as shown in the map.

Figure – 7.16

The shifting of the city bus stand to Transport Nagar in Sarai village is to be done by district authorities. The plot of land earmarked for the bus stand in Transport Nagar should be handed over to Mandi Samiti in Jwalapur. The shifting of Bus Stand will have a positive impact on environment. This will reduce air Pollution in the city area. After shifting of Bus station to Sarai, the existing Bus Stand area can be developed as a parking lot.

H. Environmental audit of Road Transport Office by reputed organization for auditing of regular monitoring of vehicular pollution checking under Pollution Under Control (PUC) certificating system.

The Environmental Audit of ARTO was carried out on 7th and 8th March 2018 and discussed on the regular monitoring of Vehicular Pollution Checking under Pollution Under Control (PUC) certifying system. There are four operational PUC check centres in Haridwar city as mentioned below:

1. Arora Tour and Travels, near Fire office
2. Bagwati Paryavaran Prudhan Nivarn Samiti, Arya Nagar
3. Hari Kripa, Petrol Pump Chandracharya Chowk
4. Kiran Motors, Shivalik nagar

These centers are having facility of PUC checks for Petrol and Diesel vehicles except Hari Kirapa which is having PUC check facility only for Petrol vehicles.

The PUC certificate issuing check was carried out at PUC centre, Kiran Motors, Shivaliknagar, BHEL Haridwar, alongwith ARTO Haridwar on 8.3.2018. The following observations were made as mentioned below:

1. The Kiran Motors is authorised for PUC check of Petrol and Diesel vehicles
2. The Instrument/machine which are being used are as mentioned below:
   AVL 437C Smoke Meter, Sr. No. 3489 for Diesel vehicles
   Honywell Electronics Pvt. Ltd. Model no. BM7777 for Petrol Vehicles
3. AMC of both the equipment exists valid. AMC is valid upto 4.3.2019.
4. Bolero, Diesel vehicle has been tested in front of ARTO and PCRI team and results were found OK.
5. The Kiran Motors is maintaining all records of PUC checks.

Figure – 7.17

The PUC check centre report with ARTO is enclosed as **Annexure – 1.**

The number of PUC check in a day is around 10 vehicles per center, so the total number PUC checks of vehicles are around 50 per day in Haridwar city. The vehicles which failed

PUC checks, software of PUC system do not allow the certificate for printing. Therefore, With the present system, the software of PUC certificate that it only prints the certificate for passed vehicles only. The average time taken for a single petrol vehicle is around 5 minutes and diesel vehicle is around 15 minutes. The AVL pollution check machines for petrol vehicles are being used at all the centres. These machines are ARAI approved. Since the PUC check method for diesel vehicles is time consuming and cumbersome method, some other technology/methods like optical ray/ sensor method should be explored and implemented.

Vehicles that are poorly maintained or malfunctioning are important contributors to air pollution. The goal of an inspection and maintenance program is to ensure that vehicles remain safe, in good working order throughout their lifetime, and do not produce excess pollution.

How the PUC Centres are licensed, monitored and by whom? It has been stated that the PUC centres are authorised by the Transport Department as per the terms and conditions detailed out in the submission. The Automotive Research Association of India under Rule 126 of CMVR has prescribed the code of practice.

What steps, if any, can be taken to check vehicular pollution randomly either through transport department or motor vehicle/traffic department concerned? The process of enforcement through challan and the basis of challan under the specific provision of law have been detailed out. The numbers of challans have also been furnished v. Whether the pollution checking centers are computerised and whether data available to it is uploaded on in the Internet?

I. Restriction of vehicle in Haridwar city without having Pollution Under Control (PUC) Certificate of transport and strengthening of transport department for regular monitoring of vehicular pollution in the Haridwar city.

It is mandatory to carry Pollution Under Control Certificate (PUC).

Notices, Display boards for pollution Checks should be made compulsory for Motor transport department/office of Haridwar. The display boards should have the Warning for not having PUC certificates. All entry locations should be earmarked with display boards.

J. Strict implementation of provision for ban on open burning of solid waste in the city by municipalities, scientific disposal of solid waste and improving the road condition in the city.

Open burning of Municipal Solid Waste (MSW) is a potential non-point source of emission, which causes greater concern especially in developing countries. Lack of awareness about environmental impact of open burning, and ignorance of the fact, i.e. 'Open burning is a source of emission of carcinogenic substances' are major hindrances towards an appropriate municipal solid waste management system. Some of Picture taken at Haridwar and Delhi is shown below:

Figure – 7.18

Penalties for people those who are burning in open is implemented in the municipal areas of Haridwar. People have been penalised in Haridwar.

Garbage, Waste, Open burning is ban as per Notification "Uttarakhand Anti Littering and Anti Spitting Act, 2016 (Uttarakhand Act no. 23, Year 2016) is enclosed as **Annexure - 2.**

The National Green Tribunal (NGT) imposed a complete ban on burning of waste in open places and announced a fine of Rs. 25,000 on each incident of bulk waste burning.

burning waste remains a common practice, particularly in rural areas, due to the lack of dumpsites or waste collection services. It is still considered the easiest method of rubbish disposal.

Open burning is an inefficient combustion process and releases significant amounts of air pollutants and ash, and dense white or black smoke. ... The smoke may include aldehydes, acids, nitrogen oxides, sulphur oxides, polycyclic aromatic hydrocarbons (PAHs), dioxins, furans, other organics and volatilised heavy metals.

"We direct that there shall be complete prohibition on open burning of waste on lands, including at landfill sites".

"For each such incident, violators, including project proponent, concessionaire, any person or body responsible for such burning, shall be liable to pay environmental compensation of Rs. 5,000 in case of simple burning, while Rs. 25,000 in case of bulk waste burning," a Bench headed by NGT Chairperson Justice Swatanter Kumar said.

To enforce and implement Solid Waste Management Rules, 2016, the green panel also asked the Environment Ministry and all States to pass appropriate directions in relation to the ban on short-life Polyvinyl Chloride (PVC) and chlorinated plastics within a period of six months.

"All State governments and Union Territories shall prepare an action plan in terms of the Rules of 2016 and the directions in this judgment within four weeks from the date

of pronouncement. The action plan would relate to the management and disposal of waste in the entire State. The steps are required to be taken in a time-bound manner.

Waste segregation

It further held that non-biodegradable waste and non-recyclable plastic should be segregated from the landfill sites and used for construction of roads and embankments in all road projects

Open burning of Municipal Solid Waste (MSW) is a potential non-point source of emission, which causes greater concern especially in developing countries such as India. Lack of awareness about environmental impact of open burning, and ignorance of the fact, i.e. 'Open burning is a source of emission of carcinogenic substances' are major hindrances towards an appropriate municipal solid waste management system in India. The paper highlights the open burning of MSW practices in India, and the current and projected emission of 10 major pollutants (dioxin, furans, particulate matter, carbon monoxide, sulphur oxides, nitrogen oxides, benzene, toluene, ethyl benzene and 1-hexene) emitted due to the open burning of MSW. Waste to Energy potential of MSW was also estimated adopting effective biological and thermal techniques. Statistical techniques were applied to analyse the data and current and projected emission of various pollutants were estimated. Data pertaining to population, MSW generation and its collection efficiency were compiled for 29 States and 7 Union Territories. Thereafter, emission of 10 pollutants was measured following methodology prescribed in Intergovernmental *Panel on Climate Change* guideline for National Greenhouse Gas Inventories, 2006. The study revealed that people living in Metropolitan cities are more affected by emissions from open burning.
While a number of institutions including schools, colleges and ashrams have decided not to allow open burning of waste in their premises, the Nagar Nigam is contemplating ways including punitive action to dissuade its employees as well as residents from indulging in the practice. "But before resorting to punishing those causing air-pollution by burning garbage in the open, Nagar Nigam will ensure that garbage is regularly collected from all 30

wards, taken to the disposal ground and treated properly," said mayor Manoj Garg.

K. Encouraging to Social Forestry plantation in Haridwar city by the Forest Department and preparation action plan for the same.

No new **Social forestry** is being envisaged by Forest department in Haridwar city. There is no scope of Social forestry in the city at present. Now it is thought that the cover the social forestry in the Namami Ganga projects along the banks of River Ganga.
Social forestry, plantation should be developed in the surroundings of outskirt of Parking areas at Pant deep, Bairagi camp, Sati ghat, Chandpul.

1. Social Forestry

This is a major scheme funded by State Government for tree plantation. Plantations is carried out on various type of community land, canals, rail, and on land available on road side to ensure the availability of timber, fuel wood, fodder, small forest produce etc., in rural areas of all the districts in the state. This ensures the availability of raw material for small timber industries for rural people. The scheme is being implemented in the following manner on the basis of financial sources

2. Social forestry in urban areas

In this scheme ornamental and shady trees are planted on the unused land alongside the roads and parks for environment protection and beautification in urban areas.

3. Green belt development scheme

Green belt development has got a priority by the Honorable chief minister.

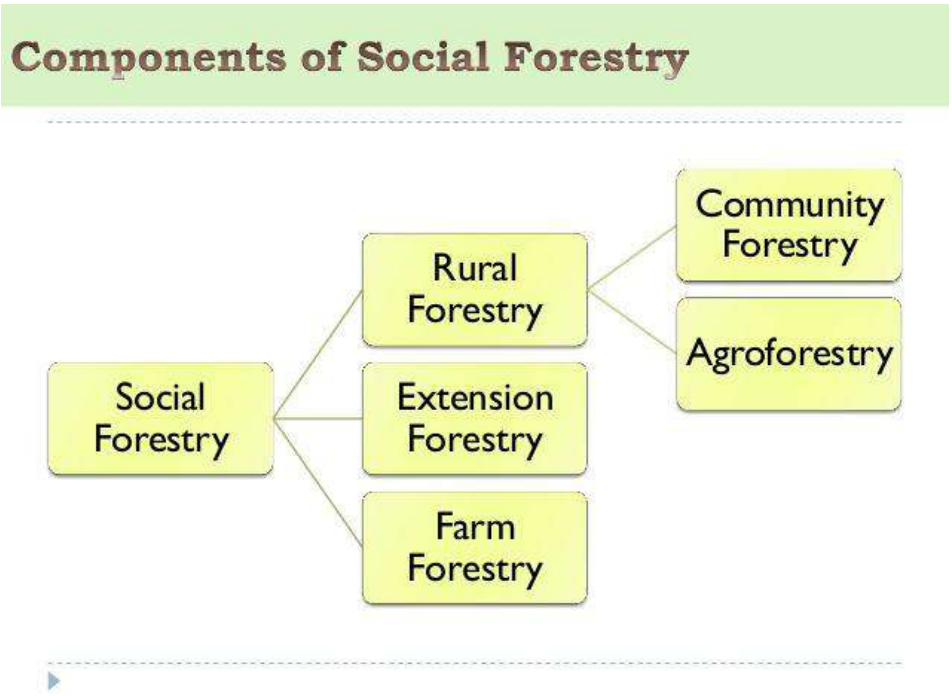


Figure – 7.19

Tree plantation along with the developing Highways should be foreseen and implemented by National Highways Authorities of India (NAHI). Realizing the importance of green corridors in National Highways development, Ministry of Road, Transport and Highways has unveiled Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy - 2015 with the vision ***"to develop eco friendly National Highways with participation of the community, farmers, NGOs, private sector, institutions, government agencies and the Forest Department for economic growth and development in a sustainable manner."***

INTEGRATED GREEN CORRIDOR DEVELOPMENT AND MANAGEMENT FOR UPCOMING HIGHWAYS PROJECTS

Plantation, transplantation, beautification and maintenance, and landscaping activities will be an integrated component for all new highways projects including road widening projects. Learning from previous highways projects, homogenous width in medians and

ROW shall be ensured by assessing land requirement for plantations and allied activities in planning stage itself. Vacant land parcels available near road alignments and flyovers shall be considered for high density plantation of commercial agroforestry crops. Provisions of funding for planning, implementation and monitoring for the green corridor development and management shall be done from 1 % of Total Project Cost of highways projects.

PLANTATION

It has been observed that plantations of exotic tree/shrub species often result in low survival rate, inferior productivity and higher cost of maintenance. Hence, priority shall be given to native trees/shrubs and grasses of particular agro climatic zone. Selection of tree/shrub species shall be strictly as per the **Plantation Species Matrix,** which has been developed for identifying suitable native tree/shrub species for roadside plantations.

The selection of tree species to be done in by the community in consultation with the local Gram Panchayat and Forest and Horticulture Departments, considering the suitability and availability of plants for arid and dry region, moist areas, marshy areas, saline areas etc.

To develop eco friendly National Highways with participation of the community, farmers, NGOs, private sector, institutions, government agencies and the Forest Department for economic growth and development in a sustainable manner should be made in the policy and NHAI and Forest department should take initaitive.

Figure – 7.20

Figure – 7.21

Figure – 7.22

Figure – 7.23

Figure – 7.24

The social Forestry should be developed along the upcoming NHAI as shown in the Figures 7.20 to 7.24 at Haridwar region.

Social Forestry in India

1. Social forestry is management and development of forest with afforestation on barren lands to achieve environmental benefit and rural development.} The term was first used by National Commission on Agriculture, Government of India, in 1976 (sixth five year plan). The aim of taking the pressure off the forests and making use of all unused and fallow land. This concept of village forests to meet the needs of the rural people is not new. It has existed through the centuries all over the country but it was now given a new character.

2. Government forest areas that are close to human settlement and have been degraded over the years due to human activities needed to be afforested.Trees were to be planted in and around agricultural fields.} Dominant rural population that still depends largely on fuelwood and other biomass for their cooking and heating.} Social forestry also aims at raising plantations by the common man so as to meet these demands.} Through the social forestry scheme, the government has involved community participation, as part of a drive towards afforestation, and rehabilitating the degraded forest and common lands.
3. Increasing Forest Area and Restoring Ecological Balance.} Meeting Basic Rural Needs: Fuel, fodder, manure and fibre.} Ensuring better Land Use: checking soil erosion, facilitating reclamation of marginal lands, checking water logging and by bringing about monolithic integration of forestry, agriculture and animal husbandry.} Generation of Employment. Controlling Pollution.
4. Social Forestry Rural Forestry Community Forestry Agroforestry Extension Forestry Farm Forestry
5. Farm Forestry Individual farmers are being encouraged to plant trees on their own farmland to meet the domestic needs of the family. Shade for the agricultural crops, as

wind shelters, soil conservation or to use wasteland. Economic benefits.} Extension Forestry Planting of trees on the sides of roads, canals and railways, along with planting on wastelands for helping in increasing boundaries of forests.

6. Rural Forestry Community Forestry Collectively implemented on communal land. Local populations participate in the planning, establishing, managing and harvesting of forest crops, and so receive a major proportion of the socio-economic and ecological benefits from the forest.¬ Agro forestry o Land use system which integrates trees and shrubs on farmlands and rural landscapes to enhance productivity, profitability, diversity and ecosystem sustainability.
7. Background Despite the limited availability of arable land in the region, agriculture is the main occupation as majority of the population (78.30%) is in the rural areas.} Although socio-economic differentiation has increased, large number of indigenous communities live in densely forested areas and depend on them for their life and livelihood.} Forests in region are a source of livelihood for rural residents and provide resources such as fodder, fuel-wood, green manure, and construction timber.
8. Community forest Management in Uttarakhand takes place in the village forests or Panchayat forests (forests as categorized into reserved, protected and village forests in by Indian Forest Act 1927). The community or Panchayat forests are managed by Van Panchayats. The area under each Van Panchayat ranges from a fraction of a hectare up to over 2,000 hectares. There are around 6069Van Panchayats in Uttarakhand. Plantation and maintenance works in these forests is done by Van Panchayats.
9. Community forests managed in accordance with Van Panchayat Act is a hybrid of state ownership and community responsibility. In its efforts to manage and control community forest use Forest committees are guided by Revenue Department rules and by the technical advice of the Forest Department. Access and use of forests is guided by rules elaborately designed and implemented by the communities.
10. Distribution of Van Panchayats.
11. Panchayat Forest in a Village in Almora district.
12. To develop and protect forests by preventing indiscriminate felling of trees. To ensure that

there is no encroachment on Van Panchayati land and that no rules are being violated. To construct and fix boundary pillars and to maintain them. To carry out the directives of the Sub-Divisional Magistrate in developing and protecting forests. To distribute its produce amongst right holders in an equitable manner. 20% of the area of the forest must be closed for grazing every year.

13. Village Joint Forest Management (VJFM), implemented by the Forest Department, in 1997. JFM Rules enables the department to become the dominant partner in the management of Van Panchayat and civil forest lands. The VJFM Rules also provide for forming Village Forest Committees (VFCs) where there is no Van Panchayats. Whereas linking community forest management institutions with those of local government is highly desirable, the order for constituting Village Forest Committees is a top down, mechanical prescription.
14. Social forestry is a noble concept in which community plays the most important role in implementation. If implemented with appropriate institutional framework proves highly successful in benefiting the environment as well as the community. Traditional institutions are an excellent example of state-people partnership which has been relatively successful in managing forest resources in the region through social forestry.These Institutions are facing challenges from unrealistic and target driven policies which would affect its democratic functioning.} There is a need to replicate such institutions in other areas rather than interfering with the existing ones.

L. Recommendation of model traffic system, strengthening of traffic department and effective implementation of traffic signals in the city by the police department.

The solution is in presenting intelligent recommender **system** that is based on the combination of several machine learning techniques used for **traffic** density estimation, and **recommending** the optimal period for accessing the crossroad. We describe the design and implementation of that **system**, and also perform a ...

ieeexplore.ieee.org/abstract/document/6960726/

In this paper, we propose a latent factor **model** based **traffic** signal timing plan **recommendation** method to address this problem. In the proposed method, we **model** the

abstract **traffic** states as the "users" in **recommendation systems**, and timing plans as the "items". And there are many explicit or implicit factors in the ...

To address this issue, we develop an intelligent network **recommendation system** supported by **traffic** big data analysis. Firstly, the **traffic model** for network **recommendation** is built through big data analysis. Secondly, vehicles are **recommended** to access an appropriate network by employing the analytic framework which ...

The architecture of the **model** as well as the main interfaces with virtual and real components of sensors for **traffic** management **systems** are also described in the paper. The paper is concluded with the **recommendation** of using the **model** in HIL platform as well as the development of an autonomic behaviour of the ...

Recommendation: Monitoring **systems** should be developed for the evaluation and assessment of environmental effects resulting from changes in the road **system**—for example, **traffic** volume, vehicle mix, structure modifications, and network adjustments. Data from monitoring could then be used to evaluate previous ...

Congestion and associated **traffic** safety are the major challenges for transportation **systems** all over the world in recent years. Congestion occurs when **traffic** demand exceeds the operational capacity of the roadway. Better management of infrastructure is required in improving the operational capacity.

Traffic Management and Control in Intelligent Vehicle Highway **Systems**. Proefschrift ter verkrijging van de graad van doctor aan de Technische Universiteit Delft, op gezag van de Rector Magnificus prof. dr. ir. J.T. Fokkema, voorzitter van het College van Promoties, in het openbaar te verdedigen op woensdag 18 november ...

Traffic Signal Image. This section supplies and maintains the following: Signalized intersections; School Flashing Lights; Flashing Warning Lights; Video Camera Sites. In the event of an emergency,

Observations & Recommendations

7.1 Observations for Haridwar

During summer season i.e. in May and June heavy vehicle load enters. The vehicles in Haridwar enters from :

1. Delhi, Meerut, Muzaffarnagar, Roorkee – enters from Bahadrabad
2. Saharanpur and Haryana, Punjab– enters from Bahadrabad
3. Najibabad – enters from Chandipul
4. Laksar – enters from Jagjitpur
5. Dehradun & Rishikesh – enters from Shantikunj
6. BHEL – SIDCUL – Barrier No.2.
7. The type of vehicles which enters Haridwar from the directions as mentioned above are Two Wheelers, Three Wheelers (mainly Vikrams), Four Wheelers (Petrol and Diesel Cars), Medium Utility Vehicles (MUVs – Trax, Sumo, Metador, Cammander, Scorpio, Travera, Innova etc.), Light Commercial Vehicles (LCVs – Telco, Volvo, Eicher, Force, Bajaj Tempo Traveller etc.) and Heavy Commercial Vehicles (HCVs – Trucks & Lorries). This leads to high air pollution levels and Noise levels.

7.2 Area Specific Vehicular Pollution Problem:

1. **Bahadrabad** : The NH 58 passes from Bahadrabad, which is entry point of Haridwar Municipal Area. The road becomes narrower at Bahadrabad and forms a neck & covers around 100m and turns right side to Jawalapur / Haridwar. This section poses major Vehicular congestion & Pollution levels. All types of incoming and outgoing vehicles at this trans section creates heavy vehicle congestion during the summer season. The vehicles like Vikrams, Buses also temporarily stops to board & deboard the passengers at this trans section.

2. **Shantikunj (Dehradun/Risikesh - Haridwar)**: The NH 58 coming from Dehradun and Risikesh have variety of vehicles. This is the entry point from Dehradun and Risikesh, The Vikrams in very high numbers commute from Risikesh to Haridwar via this route. All type of vehicles – two wheelers, three wheelers, cars, MUVs, LCVs & HCVs by NH 58 enters Haridwar. There is no other road for this route. This road passes all along the Haridwar city meeting Najibabad junction and Delhi road. The main problem is that the road passes from major parking area for Har Ki Pauri, where large numbers of vehicles are being parked at Roribelwala for the pilgrims going to take dip in Ganga river at Harkipauri. Therefore, due to heavy rush of pilgrims and vehicles at the parking area, the passing vehicles have low speed and stagnation creating a major congestion problem.

3. **Chandipul Circle** : This is a major junction where NH 58 and NH 74 meets. The Vehicles are coming from Najibabad via NH74 and vehicles Traveling at NH 58 from Delhi – Roorkee – Haridwar to Dehradun / Rishikesh passes from this intersection. The main problem is that at both the sides trucks, buses and Vikrams are temporarily parked making the movement of vehicles very slow.

4. **BHEL Barrier No. 2** : The vehicles easily enters from this barrier, there is no congestion at this point. The vehicles have to pass through the underbridge of the railway route. This underbridge is at only 50 m from the barrier, The road coming from Jawalapur and BHEL passes from this underbridge. The congestion of vehicles occurs at this point.

Other Sources of Air Pollution in the Study Area :

- The Dhabas / local restaurants in Haridwar uses wood and coal for the preparation food on Bhattis / Tandoors. This gives rise to the fugitive uncontrolled emissions and effects the nearby areas.

- During the study road building and construction activities were going on for the preparation of Kumbh Mela.
- The domestic fuel is mainly cooking gas and in the railway colony coal is being used for cooking.

7.3 Recommendations for Site Specific problems :

1. Bahadrabad :

- The by-pass of NH 58 should be made before Bahadrabad and join after BHEL more. This will avoid the heavy traffic load congestion.
- The incoming and outgoing vehicles at this junction should not be parked temporarily at one point to avoid congestion.
- The incoming vehicles should deboard the passengers at least 100 m away from this junction and proper bus stops should be made. In the same manner, the outgoing vehicles going from Haridwar should be parked temporarily to board / deboard the passengers from vehicles like Vikrams & Buses and proper Bus Stops should be made 100 m away from this junction point.
- The tractor trolleys, tangaas, bullock carts, jugars, rickshaws & vikrams should be parked away from the NH 58 to avoid any congestion of urban and rural vehicles.

2. Shantikunj (Dehradun/Rishikesh - Haridwar):

- It is recommended that the road side parking should be banned at Shanti kunj & Roribelwala.
- the heavy vehicles like trucks and lorries should not be allowed in the peak hours especially in the summer season. They should ply only during 10.00 PM & 6.00 AM.

- Lot of pilgrims visit Shantikunj, their vehicles do not have the separate parking. When buses are parked on road side, the heavy congesion occurs and Vikrams & other vehicles are stranded on the road creating heavy pollution in this area. Shantikunj have their Parking place, so all the vehicle should be parked inside the Parking Place & not the Road.
- The NH 58 coming from Dehradun and Rishikesh have variety of vehicles. This is the entry point from Dehradun and Rishikesh, The Vikrams in very high numbers commute from Rishikesh to Haridwar via this route. All type of vehicles – two wheelers, three wheelers, cars, MUVs, LCVs & HCVs by NH 58 enters Haridwar. There is no other road for this route. This road passes all along the Haridwar city meeting Najibabad junction and Delhi road. The main problem is that the road passes from major parking area for Har Ki Pauri, where large numbers of vehicles are being parked at Roribelwala for the pilgrims going to take dip in Ganga river at Harkipauri. Therefore, due to heavy rush of pilgrims and vehicles at the parking area, the passing vehicles have low speed and stagnation creating a major congestion problem. Either Road should be widened or a long over bridge from Shankar Acharaya chowk to Cable bridge.

3. **Chandipul Circle** : the red signal light should be installed on at NH 58 and NH 74 junction. The traffic police should check the road side parking to avoid congestion. The cycle rickshaw accumulation at this junction should be not be allowed to make the traffic stand still. The trucks, buses and Vikrams should not be allowed for temporarily parking.

4. **BHEL Barrier No. 2** : The option is to permit cars, three wheelers and two wheelers only from this underbridge and heavy vehicles should pass through the railway crossing. The business complexes near under bridge pose a big traffic jams as all the vehicles are parked on the road side.

The growing problem due to vehicular pollution problem and gaps are mainly due to the following :

- High vehicle density was observed in Haridwar during summer season.
- Older vehicles are predominant in vehicle vintage.
- Inadequate inspection and maintenance facilities were observed.
- Predominance of two stroke two wheelers were observed especially in Haridwar.
- Encroachment of road side land for dhabas, small hotels, estension of shops and huts etc.
- Consumption of fuel i.e. Petrol and Diesel was very high.
- Adulteration of fuel and fuel products.
- Improper traffic management system and bad road conditions.
- High levels of pollution at traffic intersections.
- Absence of effective mass rapid transport system.
- Inadequate and insufficient Parking places.

- There are no separate transport policy exists at the national and state levels and no well defined policy to promote private participation in public transport at Haridwar and Mussoorie. It is recommended that transport policy should be made for Haridwar and Mussoorie to deal with the traffic during summer days of the pilgrimage and tourism.
- The Ultra Low Sulphur Diesel (ULSD) should be made available compulsorily at all the Petrol pumps in Haridwar district.
- The local buses should be made available in sufficient numbers to ply in all the religious locations & routes.

Knowledge information and data gaps are present on strengthening of information on number of vehicles on road, vehicle usage, traffic plan during summer season.

Parkings

The parking places are not organized from Bahadrabad to Shantikunj in Haridwar. The vehicles are parked on the road side where the space is not much due to encroachment problem. The parking place for all kind of vehicles coming from Delhi and Haryana is required to be made at Rishikul, where the big empty space is available. .

- The vehicles are parked at Ram Lila Bhawan Parking and Rooribelwala. The LCVs, MUVs, tourist buses, cars are parked in the Ram Lila Bhawan parking. This parking area is in mid of the Haridwar pilgrimage area on upper road, only 1 km from Har Ki Pauri. It is recommended that the vehicles beyond railway station / shivmurti should be prohibited.

- The small parking areas for Cars / MUVs are required to be developed at along the National Highway from Bahadrabad to Shantikunj. The Hotels should make their own parking areas.

- The parking area of Haridwar Railway Station is quite big and spacious. The part of that space can be used for private parking during peak season. Also, the Bus stand (State Roadways) in front of Railway station should be permanently shifted to Rishikul area or some other adequate place i.e. Laksar Road. The big multi-storey parking place could be develop in this area for Cars, MUVs & LCVs. The newly developed multi-storey parking place at Rooribelwala (Haridwar) is shown below in the photograph. This is a model example which should be followed and adopted at other places of Haridwar.

Figure 7.1: New multi-storeyed parking place developed at Rooribelwala at Haridwar

- The Bus stand (State and Private) should be shifted to Rishikul Parking area which has good area and space. This area is partly used during Melas.

- The taxi stands (Cars & MUVs) on the main Road outside the Haridwar Railway station should be permanently shifted to new proposed Bus stand at Rishikul area.

- The **Three Inter-State Bus Terminus** (ISBT) should be build to park the Buses coming from

  - Delhi, Meerut, Muzaffarnagar , Roorkee & Saharanpur – Bus Stand at Rishikul area
  - Najibabad – Bus Stand at Rooribelwala Area
  - Dehradun & Rishikesh - Bus Sand at Shanikunj area

- Parking Areas should be developed at Bahadrabad , Rishikul , and Shantikunj to limit entry of Vehicles into City during Summer Season and Shuttle Service from Parking Area to City to be deployed.
- The parking area should be developed before the Under Bridge along the Jawalpur road for the vehicles after the BHEL Barrier No. 2 to avoid congestion at Under bridge and market place in new Haridwar.
- Bypass Road should be made prior to entry to Bahadrabad to Risikesh-Dehradun for Vehicles destined to Rishikesh/ Dehradun to avoid traffic congestion in Haridwar City and reduce vehicular pollution in the city.
- ISBT should be shifted to Rishikul to avoid traffic congestion near railway station and an over bridge to be constructed from Rishikul to Forest road.
- Entry of heavy vehicles to be restricted during peak rush hour from 10.00 a.m to 8.00 p.m.
- Regulation of traffic at the entry points to avoid accumulation of vehicles in one single road.
- Parking near Pul Jhatwara, Jawalpur just before the Ganga Canal Bridge should be made for atleast 2000 vehicles for vehicles entering from Delhi/Haryana & Punjab side. Local buses mainly battery operated should be made available at these parkings to transport the pilgrims to Haridwar.

Encroachment

- The main problem in Haridwar is of the encroachment along the road where small dhabas, other kind shops temporary construction have come up. This restricts the parking of vehicles along the road and creates heavy congestion. The main areas of encroachment are Bus Stand road, Railway station road, Hari Ki pauri area, Roribelwala, Chandipul, Shantikunj and along the National Highway. It is recommended that the vehicles should not allowed to be parked on the road side to avoid any congestion and Traffic jams.

- The slow going and stranded Vikrams / Three wheelers on the road creates havoc along the main city roads and on National Highway. The numbers of Vikrams / three wheelers have increased in last two – three years. They are plying in great concentration during the peak season and creates congestion on the road.

- Feasibility of the use of clean fuels like CNG, LPG & Electric Vehicles as a substitute to Vikrams and other Autorickshaws should be explored.

- The use of biodiesel & biofuels should be encouraged and made available at all Petrol Pumps.

Problems in vehicular pollution relate to various aspects of roadways such as alignment, geometry, pavement design including footpaths, lane markings, traffic signals, etc. Most of the problems relating to alignment and non-uniform geometry of the roads in Haridwar are a result of haphazard growth.

- Street prohibition of parking on roads with immediate effect
- Demarcate parking zones and not 'no parking zones'
- Clear footpath encroachments by hawkers, businessmen/shopkeepers, individual house owners – remove fencing/ramps on footpaths -- and construct pedestrians crossing over bridges at appropriate places
- Shift some of the government offices, road side shops, marriage halls, tourism/eco-tourism projects, etc beyond core zone/MCD area to newer townships in New Haridwar.
- Traffic police must strictly adhere to traffic plan.
- The Towing vehicles should be introduced to tow the vehicle parked at the non-parking area & on the road side.
- Use smaller buses to meet the requirements of lanes/by-lanes

- Make sure that Uttarakhand Transport Buses and Three Wheelers stop at the bays and not at the center of the road
- Introduce one day weekly-off for all personalized cars/jeeps

- Type of Multi-storey parking made in Mussorrie is recommended for Haridwar as shown in the photographs below :

Figure 7.2 : Multi-storey vehicle parking

- It is observed from the above that the tourists are least interested to park their vehicles in these type of parking area than to park at roadside. It is recommended that the vehicles should be parked in this type of parking places to avoid congestion on the road.

- The HCVs mainly trucks and Lorries should be allowed to pass through in the early and late hours of the day during the peak season.

- Common govt. parking facilities to be developed for existing hotels not having own parking facility.

- All new Hotels must have their own parking facility to avoid traffic jam on the road and undesired vehicular pollution during traffic jam.

7.4 Action Plan For Haridwar

7.4.1 Ambient Air Quality Monitoring & Management

Environmental Issues	Solution of Environmental Issues	Responsible Authorities
Ambient Air Quality Monitoring & Management	It was found that there is no ambient air quality checking facilities/data available at Haridwar-Rishikesh. At most of places the Suspended Particulate matter was more than the prescribed standard limits due to vehicular movement & their emissions of the existing and floating vehicles in Haridwar. This problem is due to existing & floating vehicle density at Haridwar-Rishikesh. Therefore the following action has been proposed for ambient air quality management : 1. There should be permanent Ambient Air Quality Stations installed for the monitoring of air pollutants like Suspended Particulate Matter, Respirable Suspended Particulate Matter, Sulfur Dioxide & Oxide of Nitrogen. 2. To reduce the Suspended Particulate Matter & Emission of Vehicular Pollutant the Vehicles must be turned off while under idling condition at parking places. 3. There is no existing mechanism to phase out old vehicles after prolonged use. Measures should be taken so the old vehicles should not be given the Fitness Certificate after the age period of vehicles from R.T.O. There should be restriction of old Model Vehicles on Road of Haridwar/Rishikesh 4. The Quality of Fuel should also be monitored. 5. The overloading in three wheelers need to be discouraged by traffic police. 6. The number of Vehicles for parking in Town should be allowed as per the capacity of parking places and the time limits for stoppage at Parking places should also be given. This should be strictly followed. This would help the authorities to maintain emission level in ambient air within the standard due to traffic congestion. 7. There should be permanent Ambient Air Quality Stations installed for the monitoring of air pollutants like Suspended Particulate Matter, Respirable Suspended Particulate Matter, Sulfur Dioxide & Oxide of Nitrogen.	1. Collector 2. State Pollution Control Board Administrator can organize Ambient Air Quality Monitoring work with SPCB. 3. Road Transport Department can control & ensure for follow-up of traffic rules in the city. 4. Fuel Supply Department like IOC, BPCL should ensure the quality of the fuel supply to Haridwar/ Rishikesh 5. Transport Manufacturers

Environmental Issues	Solution of Environmental Issues	Responsible Authorities
Ambient Air Quality Monitoring & Management	8. To reduce the Suspended Particulate Matter & Emission of Vehicular Pollutant the Vehicles must be turned off while under idling condition at parking places. 9. There is no existing mechanism to phase out old vehicles after prolonged use. Measures should be taken so the old vehicles should not be given the Fitness Certificate after the age period of vehicles from R.T.O. There should be restriction of old Model Vehicles on Road of Haridwar/Rishikesh 10. The Quality of Fuel should also be monitored. 11. The overloading in three wheelers need to be discouraged by traffic police. 12. The number of Vehicles for parking in Town should be allowed as per the capacity of parking places and the time limits for stoppage at Parking places should also be given. This should be strictly followed. This would help the authorities to maintain emission level in ambient air within the standard due to traffic congestion. 13. The arrangement should be made by the authorities to replace environmentally friendly fuel (like CNG) for Vehicles in phased manner at various religious places, so that these emissions be reduced in air during peak days of tourists visiting various religious places. 14. Vehicle manufacturers may also look into modification in engine of three wheelers for use with CNG/Propane instead of petrol/diesel. 15. RTO may register only those new three wheelers in four-stroke engine category manufactured by reputed auto manufacturers. 16. Strict implementation of standards should be enforced for vehicular emissions. 17. The compliance of vehicular emission standards needs to be ensured by the vehicle manufacturers. 18. The crowded market and residential areas should have the desired pedestrian areas. The zero zone area should be marked from Har Ki Pauri to Bhimgoda and Har ki Pauri to Laltarav Bridge. The total roads in these areas should be developed as Pedestrian.	

Environmental Issues	Solution of Environmental Issues	Responsible Authorities
Ambient Air Quality Monitoring & Management	19. Regular exercise on public awareness and a social consciousness on the issue of vehicular pollution may be conducted. 20. Signal lights & its timing system during peak hours needs to be introduced. This measure is expected to help in reducing the pollution load at various religious places. 21. Development of efficient traffic management is required with the emphasis on environmental pollution. 22. Regular monitoring of ambient air quality for CO, HC, NOx, and SOx at congested traffic intersections should be studied and the impact of vehicular pollution on air quality should be carried out.	

7.4.2 Guidelines For Action Plan

The guidelines for preparation of action plans for control of Air Pollution is as given below:

1. An action plan should be presented to prioritized the list of abatement and other measures to improve air quality, and to maintain it within pre-described levels in the short and medium term. It outlines the steps required to implement a full air quality management system in any Haridwar city, consistent with that city's circumstances, capabilities and needs.
2. The aim of the action plan should be to identify and implement a least- cost package of measures to improve air quality, such that the marginal costs equals the marginal benefits.
3. Authorities responsible for preparing action plans regarding control of air pollution in their Haridwar city base their decisions on subjective assessment of economic and social costs, benefits, feasibility and other considerations.
4. While preparing action plan for control of air pollution the following components should be taken in to consideration:

- Constitution of Working group for action plan preparation.
- Development of a working strategy .
- Air quality assessment.
- Environment damage assessment
- Evaluation of various control options
- Cost benefit analysis or cost effective analysis
- Selection of abatement measures, and
- Development of an time bound optimum pollution control strategy
- Traffic Plan

Action Plan should include the following:

- Assessment of air quality, environmental damage and abatement options are inputs into cost- benefit analysis or cost effective analysis.
- Cost- benefit analysis and cost effective analysis.
- The final result of such analysis is an optimum control strategy in the form of action plan, with prioritized abatement measures.
- All these components required for preparing an effective action plan
- Besides above said components other things that are required to be incorporated in action plan is a background note on the Haridwar city for which action plan has to be prepared. Note on the Haridwar city should take in to consideration the topography, climatic conditions, land–use pattern, historical significance of the city (if any), prominent environmental problems, health status & steps taken so far for control of air pollution in the city.
- The background may also include the road network and infrastructure facilities available in the city/town. Any major environmental episode or any serious air pollution hazard being faced by the city/ town, if any, should also find special mention in the background note. There are three developmental phases in an action plan

- Phase-I: Immediate actions.

  Strategy for immediate control of most urgent problems.
- Phase-II: Intermediate actions. Strategy for control in an intermediate time scale
  (about 5 yrs), based on current development trends.
- Phase- III: Long –term action. Strategy for control over a long- time scale (more than 10 yrs), based on long term projection. Guidelines for preparation of an effective action plan are described in details in the coming chapters which includes:
- Assessment of air quality and environmental damage, evaluation of abatement option for the control of pollution and development of Optimum control strategy in the form of an action plan.

Constitution of working group A working group has to be constituted for preparation of action plan. Working group may include representatives from CPCB, SPCB, local agencies, Development authorities, city planners, state transport department, educationalist & researchers of concerned field, representatives from public forum, NGO's etc.

Development of Work Strategy for air quality Management Working group requires to develop working strategy for air quality management at local level by referring into successful air quality management strategies & practices at international and national levels.

Assessment of air quality and environmental damage /Inventory Involves emission inventory of both mobile and stationary sources, ambient air quality monitoring, identification of non- attainment areas, and ultimately identification of most important damage categories and priority pollutants.

Evaluation of control options: This involves subjective verification and selection of all technical measures available for controlling pollution , air quality

management strategies practiced in India, feasibility of implementation by considering social, environmental, health and finally financial issues.

Optimal control strategy Ultimately optimal control strategy i.e. action plan is formulated along with time frame required for its implementation.

Constitution of air quality management &surveillance committees Requires constitution of several committees for management & maintenance of good air quality and reviewing of various actions initiated.

7.4.3 Traffic Management Problems

Environmental Issues	Solution of Environmental Issues	Responsible Authorities
Traffic Problem	All relevant traffic data should be recorded and processed by an integrated system. The information should cover all type of vehicles on traffic junctions and the control programs of traffic light systems to current traffic flows of a town will forms a perfect basis for town and traffic planning. 1. To reduce the Respirable Suspended Particulate Matter & Emissions of Vehicular Pollutants the Vehicles Engine must be turned off while stand still at Parking places in Haridwar. 2. Arrangement of Water Spray should be made thrice in a day so that SPM level could be maintained at low level in the Air. 3. There is no existing mechanism, which forces the users to phase out old vehicles after prolonged use. Measures are taken so that old vehicles do not get fitness certificates year after year from R.T.O. There should be restriction of Old Model Vehicles on Roads of Haridwar. 4. The Quality of Fuel at Haridwar should also be monitored. 5. The overloading in three wheelers need to be discouraged by traffic police. 6. The number of Vehicles for parking in Town should be allowed as per the capacity of parking places and the time limits for stoppage at Parking places should also be given. It should be strictly followed. This would help the authorities to maintain low emission level in ambient air due to traffic at Haridwar. 7. Arrangement should be made by the authorities to replace petrol/diesel with environmentally friendly fuel (like CNG) for Vehicles in phased manner at Haridwar, so that these emissions could be reduced in air during peak days of tourists visiting to Har Ki Pauri. 8. Rigorous efforts should be made by vehicle manufacturers to reduce emissions from engines. For this purpose alternative engine design with 4 stroke engines should be seriously considered and adopted. This is likely to provide twin benefits of fuel economy improvements by 25 to 40% and also 80 to 90% reduction in HC emission. 9. Vehicle manufacturers may also look into modification in engine of three wheelers for use with CNG/Propane instead of petrol/diesel. 10. RTO may register in future only three wheelers in four-stroke engine category introduced by the auto manufacturers.	1. Collector 2. State Road Transport Department. 3. Traffic Police Superintendent

	11. Strict implementation of standards enforced for vehicular emissions need to be ensured. 12. The compliance of vehicular emission standards needs to be ensured by the vehicle manufacturers. 13. The congested market and residential areas should be declared as pedestrian areas. 14. Regular exercise on public awareness and a social consciousness on the issue of vehicular pollution may be conducted. 15. Signal timing system during peak hours need to be worked out. This measure is expected to help in reducing the pollution load at Haridwar. 16. Development of efficient traffic management is required with emphasis on environmental pollution. 17. A highway should be constructed from Roorkee – Bahadrabad Road to Shantikunj (Haridwar – Dehradun Rd.) as given in the Figure 7.3. This highway should be used by the tourists / pilgrims directly going to Risikesh / Dehradun / Mussorrie / Badrinath / Chardham etc. This highwary will avoid the traffic congestion in the Haridwar. The road will require some flyovers & overbridges.	

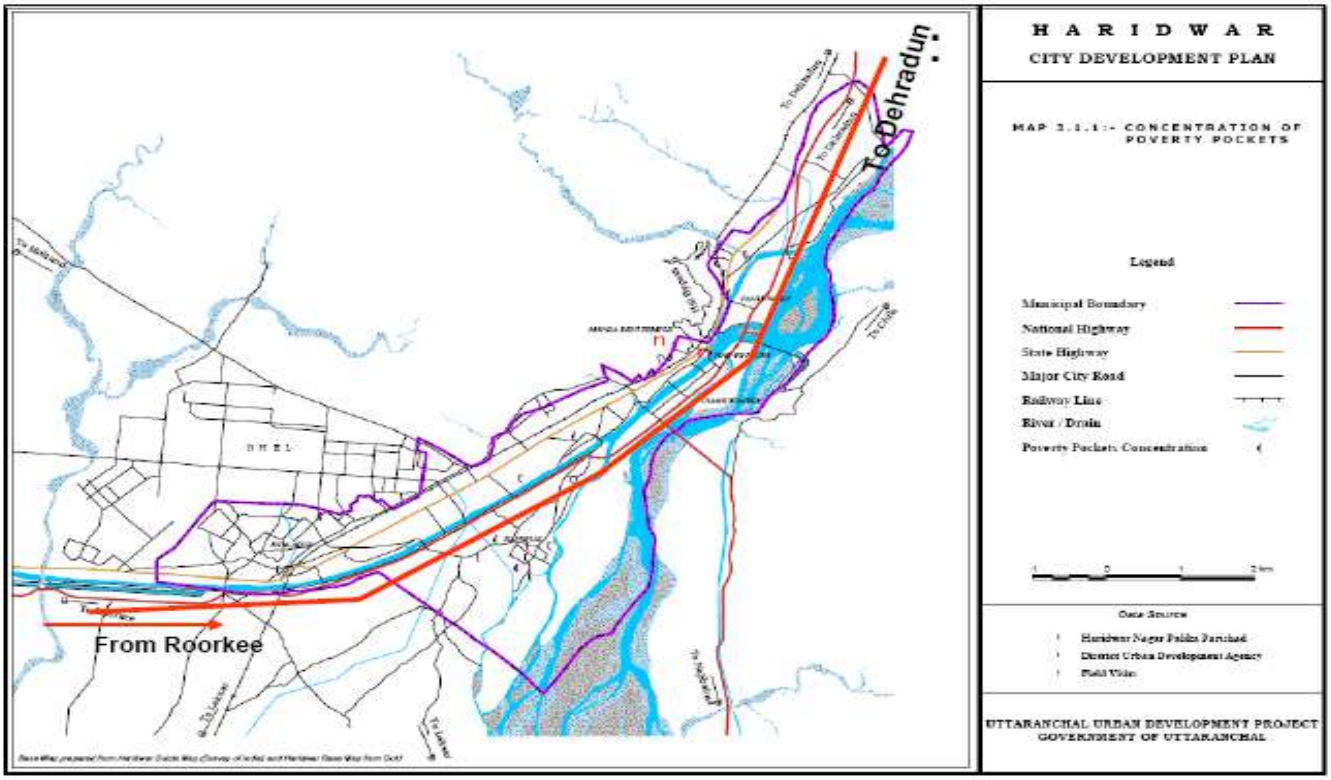


Figure 7.3

Mela Activity & Pilgrimage rush at Haridwar –increases the vehicular population

7.5 Actions for Vehicular Emission Reduction at Haridwar

The following are the assessment & observation on Vehicular Emissions :

- To reduce the Suspended Particulate Matter & Emission of Vehicular Pollutant the Vehicles must be kept off while standing at Parking places in Haridwar.
- Arrangement of Water Spray should be made thrice in a day so that low SPM level could be maintained in the Air.
- There is no existing mechanism, which forces the users to phase out old vehicles after prolonged use. Measures should be taken so that old vehicles do not get fitness certificates year after year from R.T.O. There should be restriction of Old Model Vehicles on Roads of Haridwar.
- The Quality of Fuel at Haridwar should also be monitored.
- The overloading in three wheelers need to be discouraged by traffic police.
- The number of Vehicles for parking in Town should be allowed as per the capacity of parking places and the time limits for stoppage at Parking places should also be given. It should be strictly followed. This would help to authorities to maintain emission level in ambient air due to traffic at Haridwar.
- The arrangement should be made by the authorities to replace environmentally friendly fuel (like CNG) for Vehicles in phased manner at Haridwar, so that these emissions could be reduced in air during peak days of tourists visiting to Har Ki Pauri.
- Rigorous efforts should be made by vehicle manufacturers to reduce emissions from engines. For this purpose alternative engine design with 4 stroke engines should be seriously considered and adopted. This is likely to provide twin benefits of fuel economy improvements by 25 to 40% and also 80 to 90% reduction in HC emission.
- Vehicle manufacturers may also look into modification in engine of three wheelers for use with CNG/Propane instead of petrol/diesel.
- RTO may register in future only three wheelers in four-stroke engine category introduced by the auto manufacturers.
- Strict implementation of standards enforced for vehicular emissions need to be ensured.

- The compliance of vehicular emission standards needs to be ensured by the vehicle manufacturers.
- The congested market and residential areas should be declared as pedestrian areas.
- Regular exercise on public awareness and a social consciousness on the issue of vehicular pollution may be conducted.
- Signal timing system during peak hours need to be worked out. This measure is expected to help in reducing the pollution load at Haridwar.
- Development of efficient traffic management is required with emphasis on environmental pollution.

TABLE 7.1
National Ambient Air Quality Standards
Central Pollution Control Board
NOTIFICATION
New Delhi, 18th November, 2009

NATIONAL AMBIENT AIR QUALITY STANDARDS

S.No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Area	Ecologically Sensitive Area (Notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO2), ug/m3	Annual* 24 hours**	50 80	20 80	-Improved West and Gaeke - Ultraviolat fluorescence
2	Nitrogen Dioxide (NO2), ug/m3	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10um) or PM10 ug/m3	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5um) or PM2.5 ug/m3	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O3) ug/m3	8 hours** 1 hours**	100 180	100 180	- UV photometric - Chemilminescence -Chemical Method
6	Lead (Pb) ug/m3	Annual* 24 hours**	0.05 1.0	0.05 1.0	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter

7	Carbon Monoxide (CO) mg/m3	8 hours** 1 hours**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH3)um/m3	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
9	Benzene (C6H6) ug/m3	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP)-particulate phase only , ng/m3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m3	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m3	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

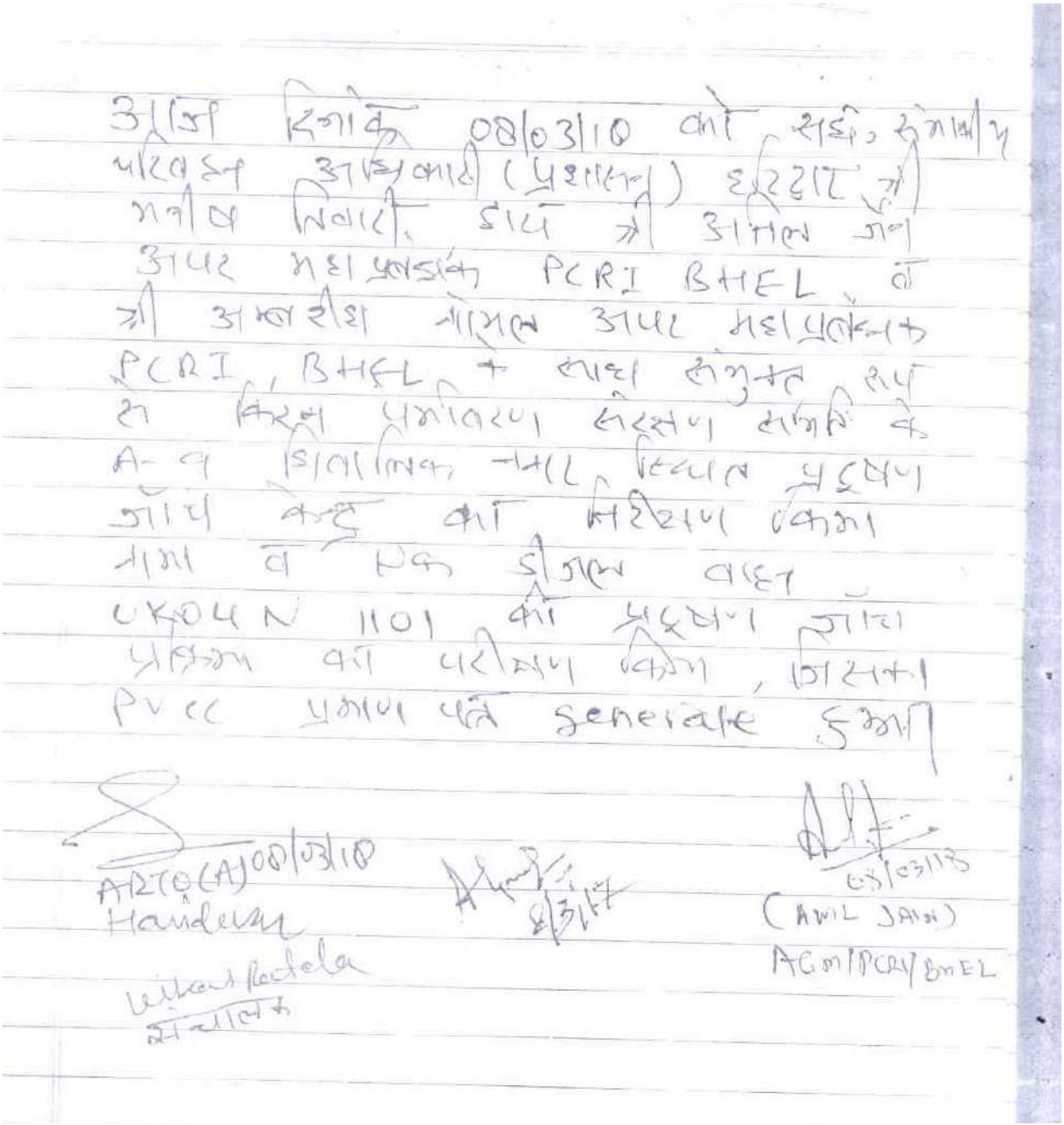
* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

**24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shell be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive day of monitoring.

Note.-Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shell be considered adequate reason to institute regular or continuous monitoring and further investigation.

Annexure – 1

PUC Centre Audit with ARTO Haridwar



उत्तराखण्ड कूड़ा फैंकना एवं थूकना प्रतिषेध अधिनियम, 2016

(उत्तराखण्ड अधिनियम संख्या 23, वर्ष 2016)

उत्तराखण्ड राज्य को स्वच्छ एवं प्रदूषण मुक्त रखने हेतु, कूड़ा कचरा, फेकना एवं थूकने को प्रतिबन्धित करने के लिए

अधिनियम

भारत गणराज्य के सड़सठ्वें वर्ष में उत्तराखण्ड विधानसभा द्वारा निम्नवत रूप में अधिनियमित हो।

संक्षिप्त नाम, विस्तार एवं प्रारम्भ :

1.(1) इस अधिनियम का नाम संक्षिप्त नाम "उत्तराखण्ड कूड़ा फेकना एवं थूकना प्रतिषेध" अधिनियम, 2016 है।
(2) यह अधिनियम राजपत्र में इसके प्रकाशन की तिथि से प्रवृत्त होगा।
(3) यह अधिनियम उत्तराखण्ड राज्य में शहरी स्थानीय निकायों के अधिकारिता के अधीन सम्पूर्ण क्षेत्र में लागू होगा।

इस अधिनियम से असंगत विधियों का प्रभाव :

2. इस अधिनियम के उपबन्ध किसी अन्य विधि में अन्तर्दिष्ट किसी बात के असंगत होते हुए भी प्रभावी होंगे;

परिभाषाएं :

3. इस अधिनियम में जब तक कि संदर्भ से अन्यथा अपेक्षित न हो: –
(क) "प्राधिकृत अधिकारी" से नगर निकाय के कार्य पालक अधिकारी, स्वास्थ्य/चिकित्सा अधिकारी, मुख्य सफाई निरीक्षक, सफाई निरीक्षक, उत्तराखण्ड पुलिस का अधिकारी जो निरीक्षक से नीचे की श्रेणी का न हो, राजस्व अधिकारी, जो राजस्व निरीक्षक से नीचे की श्रेणी का न हो, या अपनी अधिकारिता के अधीन क्षेत्र हेतु जिलाधिकारी द्वारा प्राधिकृत अधिकारी अभिप्रेत है;
(ख) "भवन" से कोई इमारत, परिसर, मकान, झोंपड़ी, स्टॉल, छतयुक्त अहाता चाहे इसका उपयोग मानवीय आवास हेतु होता हो या अन्यथा, तथा साथ ही कोई दीवार, बाड़ा, मंच, मचान, गेट, डाक, स्तंभ, अहाता, सेतु या पूर्वगामी से संबंधित कोई संरचना, समर्थन या नींव इत्यादि अभिप्रेत है;

(ग) "सामुदायिक सेवा" से सफाई करना, झाड़ू लगाना, कूड़ा एकत्र करना, दीवारों से अभिरोखण की सफाई या सामुदायिक सेवा के रूप में शहरी स्थानीय निकाय द्वारा अधिसूचित कोई अन्य कार्य अभिप्रेत है;

(घ) "उद्यान अपदूषण" से उद्यान या कृषि कार्यों से उत्तसर्जित कोई अपशिष्ट अभिप्रेत है;

(ङ) "कूड़ा" से धूल, मिट्टी, बजरी, शव, पत्थर, सीमेन्ट, कागज, पशु शव, अवशिष्ट, पत्तियां और टहनियां, घास, तिनके, बक्से, नाल, गांठें, कतरनें, बुरादा, अस्तबल अवशिष्ट, व्यवसाय अवशिष्ट, खाद, अवकर, बोतलें, शीशा, टीन, खाने के डिब्बे, खाने के रैपर, खाद्य कण या अन्य वस्तुएं या सामग्रियां सम्मिलित हैं। इसमें खुले में पालतू पशुओं या मानवों द्वारा मूत्र या मल त्याग करना भी सम्मिलित होगा ;

(च) "अध्यासी" से परिसर के वास्तविक कब्जाधारी या इसका प्रभार, प्रबंधन, नियंत्रण रखने वाला व्यक्ति तथा संपत्ति के उपविभाजित या विभिन्न किरायेदारों या ठहरने वालों को किराये पर दिये जाने के मामले में वह व्यक्ति जो तत्समय किरायेदारों या ठहरने वालों से देय किराया प्राप्त कर रहा है, चाहे वह स्वयं के हिसाब में हो या इसके लिये अधिकृत या इसमें हित रखने वाले व्यक्ति के प्रतिनिधि के रूप में सम्मिलित अभिप्रेत हैं ;

(छ) "स्वामी" से उत्तर प्रदेश नगरपालिका अधिनियम, 1916, (उत्तराखण्ड राज्य में यथा प्रवृत्त) तथा उ.प्र. नगर निगम अधिनियम, 1959 (उत्तराखण्ड राज्य में यथा प्रवृत्त) समनुदिष्ट किया गया तथा इसमें तत्समय के लिये किसी भवन या परिसर का अध्यासी भी सम्मिलित है ;

(ज) "परिसर" से ऐसी भूमि अभिप्रेत है जो किसी एकल भवन से अथवा अनेक भवनों से साझा रूप से लगी हुई हो अथवा नहीं ;

(झ) "सार्वजनिक स्थल" से प्रत्येक सार्वजनिक राजमार्ग, सड़क मार्ग, पहाड़ी दिशा, नाली, जलमार्ग; उप–मार्ग, सेतु, चौराहा, प्रांगण, गली, संकरी गली या रास्ता पैदल, पैदल मार्ग, पगडंडी, परेड, सार्वजनिक पार्क/उद्यान या खुला स्थान, (संलग्न या असंलग्न) भवन या परिसर, प्रत्येक थियेटर किसी प्रकार के सार्वजनिक मनोरंजन स्थल या सार्वजनिक आश्रय स्थल जहां प्रवेश भुगतान द्वारा अथवा उसके बिना हो सम्मिलित हैं ;

(ञ) "थूकना" से कुछ चबाने के पश्चात् या बिना चबाये थूक को स्वेच्छा से बाहर फेंकना, गले से बलगम

निकालना, नसवार सूंघने या बिना सूंघे नाक से घाण/बलगम निकालना, अभिप्रेत है ;

(ट) "अस्तबल अपदूषण" से घोड़ो, मवेशियों, भेड़ों, बकरियों तथा भैंसों, सूअरों, मुर्गियों, या अन्य पालतू पशुओं का मल और मूत्र तथा घोड़ों, मवेशियों, भेड़ों, बकरियों, भैंसों, सूअरों, मुर्गियों या अन्य पालतू पशुओं को रखने के लिये बनाये गये किन्हीं अस्तबलों या छप्पर से प्रवाहित अपशिष्ट अभिप्रेत है ;

(ठ) "सड़क" से किसी रास्ते, चौराहे, पगडंडी, वापसी गली, गलियारा या गुजरगाह जिससे जनता आ जा सके एवं किसी सार्वजनिक पुल के ऊपर, इसमें भी सम्मिलित है– मार्ग, राजमार्ग, गली खुला मैदान, प्रांगण, उद्यानपथ या ऐसी खाली जागीर जिसे सार्वजनिक इस्तेमाल में भले न लाया जा सके, नाले, नालियां, गढे, खाई जलग्रीवा एवं सड़क किनारे के खाली स्थल आदि अभिप्रेत है ;

(ड) "व्यवसायिक अपदूषण" से किसी व्यवसाय उत्पादन या व्यापार, उद्योग या भवन प्रचालन का अपशिष्ट/अवशिष्ट पदार्थ अभिप्रेत है ;

अधिनियम के अधीन शास्ति एवं अपराध :

4. कोई भी व्यक्ति जो–

(क) किसी सार्वजनिक स्थल पर कूड़ा रखता है, जमा करता है अथवा फेंकता है या रखने की अनुमति देता है ;

(ख) सार्वजनिक स्थल पर कोई खाद्य पदार्थ या अन्य पदार्थ या वस्तु सुखाता है या दूषित करता है ;

(ग) किसी सार्वजनिक स्थल पर कोई रक्त, लवण–जल फेंकता है, रखता है या इस तरह से कोई हानिकारक द्रव्य या अन्य किसी प्रकार का अस्वास्थ्यकर मैला सार्वजनिक स्थल पर छलकाता है, गिराता/फैलाता है;

(घ) किसी सार्वजनिक स्थल पर धूल, रेत, मिट्टी, कंकड़, पत्थर, घास, तिनके, कतरनें, बुरादा, राख, उद्यान अपदूषण, व्यवसायिक अपदूषण, खाद, कचरा या कोई अन्य वस्तु या पदार्थ चाहे किसी चलते हुए या खड़े वाहन से गिराता है, छलकाता है या बिखेरता है;

(ङ) कोई चूना, राख, रेत, कोयला, बाल, रद्दी कागज, पंख या किन्हीं अन्य पदार्थों को इस प्रकार छाने, हिलाये या साफ करे जिससे कि वह हवा के माध्यम से किसी सार्वजनिक स्थल तक पहुँच जाये या जिसके पहुँचने की संभावना रहे;

(च) किसी सार्वजनिक स्थल पर बोतल, ग्लास, डिब्बा, रैपर, खाद्य आवरण या अन्य वस्तुएं छोड़ना अथवा फेंकना इत्यादि;

(छ) किसी भवन निर्माण, परिवर्तन, गिराने या परिनिर्माण के दौरान या किसी भी अन्य कारणों से किसी सार्वजनिक स्थल पर बिना पूर्वानुमति के कोई पत्थर, सीमेन्ट, मिट्टी, रेत, लकड़ी या अन्य भवन सामग्री, वस्तु या पदार्थ जमा करता है, गिराता है अथवा छोड़ता है, जिससे किसी मार्ग का अवरूद्ध होना या जिसके कारण धूल, दुर्गन्ध या अपशिष्ठ पदार्थों के कणों से या कोई अन्य सामग्री से अड़ौस–पडौस के वातावरण पर उसका दुष्प्रभाव पड़े अथवा जनमानस के स्वास्थ्य, सुख एवं दैनिक जीवन के खतरे को दूर करने हेतु आवश्यक/उचित सावधानियां बरतने में नाकाम/विफल रहना इत्यादि ;

(ज) सार्वजनिक स्थल पर कोई अनुपयुक्त वाहन, पानी की टंकी, सीमेन्ट मिक्सर या कोई अन्य अनुपयुक्त वस्तु या रद्दी, धातु रखता है या जमा करता है अथवा रखने या जमा करने देता है;

(झ) सार्वजनिक स्थल पर थूकता है, तो ऐसे कृत्य इस अधिनियम के तहत एक अपराधिक कृत्य होंगे।

हटाने को आदेश

5. (1) शहरी स्थानीय निकाय का प्राधिकृत अधिकारी किसी भी संदिग्ध व्यक्ति को जो किसी भी सार्वजनिक स्थल पर गंदगी फैलाने, कूड़ा– वाहन–रद्दी–मलबा इत्यादि को फेंकते या डालते पाया जाता है, को उक्त अपशिष्ट/सामग्री को उसके उचित रखाव स्थल पर स्थानान्तरित करने का आदेश दे सकता है।

(2) जहां शहरी स्थानीय निकाय के प्राधिकृत अधिकारी द्वारा निर्देश दिये जाने के पश्चात् भी यदि संदिग्ध व्यक्ति उस कूड़े, अनुपयुक्त/अनुपयोगी वाहन, अनुपयुक्त/अनुपयोगी वस्तु को हटाता नहीं है, तो ऐसे में स्थानीय निकाय उसे स्वयं हटवा कर उचित स्थान पर स्थानान्तरित करवायेगा तथा इस पर उपगत व्यय उस व्यक्ति से भू–राजस्व के बकाया राशि के रूप में वसूला जा सकेगा।

अपराधी के संबंधों का पूर्वानुमानः

6. धारा 4 के अधीन किये गये अपराधों के लिये वाहन चालक और वाहन स्वामी को अपराधी तब तक नहीं माना जायेगा जब तक कि अपराध प्रतिकूल साबित नहीं कर दिया जाता।

भूमि अथवा भवन के अध्यासी का उत्तरदायित्वः

7. यह कि इस अधिनियम में परिभाषित कोई धूल या अन्य पदार्थ, मलबा किसी भवन, भूमि या सार्वजनिक स्थल पर जमा किया गया है, या कोई पानी या अरूचिकर तत्व किसी सड़क या नाली में डाला, फेंका या बहाया गया है तो इस अधिनियम के उल्लंघन के तहत ऐसा कृत्य उस भवन या, भूमि के अध्यासी द्वारा या उसकी अनुमति से किया गया है, समझा जायेगा।

अध्यासी द्वारा पैदल मार्ग, पृष्ठ भाग और निजी सड़क को स्वच्छ रखा जानाः

8. (1) किसी परिसर का स्वामी अपने परिसर के आसपास के क्षेत्र जिसमें साथ लगे पैदल मार्ग, पृष्ठ भाग सम्मिलित हैं, की सफाई करवायेगा और उन्हें स्वच्छ रखेगा।

(2) किसी निजी सड़क से लगे परिसर का स्वामी या अध्सायी अपने परिसर के सामने या साथ लगे सड़क के मध्य भाग तक सफाई करवायेगा।

दंड :

9.(1) कोई व्यक्ति जो इस अधिनियम का उल्लंघन या अपराध करते हुये पाया जाता है और दोष सिद्ध होने पर अधिकतम पांच हजार रूपये तक के अर्थदण्ड या अधिकतम छः माह की अवधि हेतु कारावास या दोनों साथ के लिये भागी होगा।

(2) निरंतर अपराध किये जाने की स्थिति में रूपये पांच सौ प्रतिदिन के हिसाब से अतिरिक्त अर्थदण्ड अपराध जारी रखने की अवधि तक देना होगा।

(3) इसके अतिरिक्त उपधारा (1) में उपबंधित दंड के स्थान पर इस अधिनियम के किसी उल्लंघन के फलस्वरूप या किसी व्यक्ति द्वारा निष्पादित किये जाने वाले और उसके द्वारा निष्पादित किये गये, इस अधिनियम के अधीन निर्देशित किसी कार्य के निष्पादन में, चाहे वह शहरी स्थानीय निकाय द्वारा किया गया हो या किसी ठेकेदार द्वारा, शहरी स्थानीय निकाय द्वारा उपगत व्यय और उसके साथ व्ययों का अधिकतम दस प्रतिशत अधिभार का भुगतान, नियम भंग या उस कार्य को निष्पादित न करने वाले व्यक्ति को करना होगा। जिसकी वसूली भू राजस्व के बकाया के रूप में की जायेगी।

अपराधों का शमनः

10. (1) प्राधिकृत अधिकारी, अपने प्रस्ताव में विनिर्दिष्ट समय के भीतर न्यूनतम दो सौ रूपये व अधिकतम पांच सौ रूपये की राशि स्थानीय निकाय/प्राधिकृत अधिकारी को भुगतान कर अपराध के शमन हेतु, युक्तियुक्त रूप से संदिग्ध व्यक्ति को लिखित प्रस्ताव देकर उस व्यक्ति द्वारा किये गये, शमन योग्य निर्धारित अपराध का शमन कर सकेगा।

(2) यदि कोई व्यक्ति शमन की राशि का भुगतान करने में असमर्थ है तो वह शमन राशि के बदले स्थानीय निकाय में सामुदायिक सेवा प्रदान किये जाने हेतु अपना नामांकन करवा सकता है।

(3) उपधारा (1) के अधीन प्रस्ताव, अपराध किये जाने के पश्चात् कभी भी किन्तु इसके लिये अभियोग चलाये जाने से पहले किया जायेगा तथा यदि प्रस्ताव में विनिर्दिष्ट राशि का भुगतान नहीं किया जाता है या प्रस्ताव में विनिर्दिष्ट अवधि या ऐसी विनिर्दिष्ट अवधि जो कि शहरी स्थानीय निकाय प्रदान करे, के भीतर सामुदायिक सेवा नहीं की जाती है तो इसके पश्चात् ऐसे व्यक्ति, जिसको प्रस्ताव दिया गया था, के विरूद्ध किसी भी समय अपराध के लिये अभियोग चलाया जा सकेगा।

(4) यदि उपधारा (1) के अधीन किसी अपराध का शमन किया गया है तो उसके पश्चात् अपराध के संबंध में उस व्यक्ति जिसको शमन का प्रस्ताव दिया गया हो, के विरूद्ध कोई अभियोग नहीं चलाया जायेगा।

(5) शमन हेतु प्रस्ताव ऐसे प्रारूप में होगा जैसा कि नियमों के अधीन विनिर्दिष्ट हो।

गिरफ्तारी की शक्ति

11. (1) कोई प्राधिकृत अधिकारी किसी भी ऐसे व्यक्ति को निरूद्ध कर सकता है और पुलिस की सहायता से गिरफ्तार कर सकता है जो उसकी उपस्थिति में अपराध करते हुये या जिसके संबंध में वह युक्तियुक्त रूप से विश्वास रखता है कि उसने अधिनियम के अधीन अपराध किया है।

(क) यदि उस व्यक्ति का नाम और पता उसे ज्ञात नहीं और वह व्यक्ति अपना नाम और पता बताने से इन्कार करता है; या

(ख) उसके नाम और पते के सही होने के संबंध में संदेह होने का कारण है।

(2) इस अधिनियम के अधीन गिरफ्तार किये गये व्यक्ति को निरूद्ध रखा जायेगा और चौबीस घंटे के भीतर उसे कार्यपालक मजिस्ट्रेट के समक्ष पेश किया जायेगा जब तक कि उस का सही नाम और पता निर्धारित न हो जाये।

संज्ञान लेने और अपराध विचारण हेतु न्यायालय सक्षमः

12. (1) प्रथम श्रेणी न्यायिक मजिस्ट्रेट से अन्यथा कोई न्यायालय इस अधिनियम के अधीन अपराध का संज्ञान नहीं लेगा और अपराध का विचारण नहीं करेगा।

(2) कोई न्यायालय एक प्राधिकृत अधिकारी की लिखित शिकायत के बिना किसी अपराध का संज्ञान नहीं लेगा।

अधिनियम के अपराध असंज्ञेय और जमानतीय होंगे:	13. दंड प्रक्रिया संहिता, 1973 में किसी बात के समावेशित होते हुए भी इस अधिनियम की धारा 3 के अपराध असंज्ञेय और जमानतीय होंगे।
अपराधों का संक्षिप्त विचारण:	14. इस अधिनियम के अधीन सभी अपराधों का दंड प्रक्रिया संहिता, 1973 के अधीन संक्षिप्त विचारण हेतु उपबंधित तरीके से संक्षिप्त विचारण होगा।
राज्य सरकार की नियम और विनियम बनाने की शक्ति :	15. राज्य सरकार इस अधिनियम के उपबंधों को प्रभावी बनाने के प्रयोजनार्थ नियम और विनियम बना सकेगी।

आज्ञा से,
रमेश चन्द्र खुल्वे,
प्रमुख सचिव।

No 347/XXXVI(3)/2016/53(1)/2016
Dated Dehradun, November 30, 2016

NOTIFICATION

Miscellaneous

In pursuance of the provisions of Clause (3) of Article 348 of the Constitution of India, the Governor is pleased to order the publication of the following English translation of **'the Uttarakhand Anti Littering and Anti Spitting Bill, 2016'** (Adhiniyam Sankhya 23 of 2016).

As passed by the Uttarakhand Legislative Assembly and assented to by the Governor on 29 November, 2016.

THE UTTARAKHAND ANTI LITTERING AND ANTI SPITTING ACT, 2016

(Uttarakhand Act no. 23, Year 2016)

To keep the State clean and pollution free, restriction on littering and spitting

An

Act

It is hereby enacted by the Uttarakhand Legislative Assembly in the Sixty seventh year of the Republic of India as Follows:

Short title, extent and commencement 1. (1) This Act shall be called The Uttarakhand Anti Littering and Anti Spitting Act 2016.
(2) This Act shall come into operation on the date of its publication in the Gazette.
(3) This Act shall come in to force to the whole area under the jurisdiction of the Urban Local Bodies ('ULB' for Short) in the State of Uttarakhand.

Effect of Laws Inconsistent without this Act 2. The provision of this Act shall have effect not withstanding anything inconsistent therewith contained in any other law.

Definitions: 3. In this Act, unless the context otherwise requires:
(a) "Authorized Officer" means an Executive Officer, Medical Officer of Health, Chief Sanitary Inspector, Sanitary Inspector of ULB, an Officer of the Uttarakhand Police, not below the rank of Sub Inspector, a Revenue officer not below the rank of Revenue Inspector or an officer authorized by the District Magistrate for an area under his jurisdiction.

(b) "building" includes any premises, house, hut, stall, shed or roofed enclosure, whether used for the purpose of human habitation or otherwise, and also any wall, fence, platform, staging, gate, post, pillar, paling, frame, boarding, landing-stage or bridge or any structure, support or foundation connected to the foregoing;

(c) "Community Service" means cleaning, sweeping, collecting litter, clearing graffiti from the walls, or any other tasks notified by the urban local body as community service;

(d) "garden refuse" includes any refuse from garden and agricultural operations;

(e) "litter" means any dust, sand, earth, gravel, clay, stone, cement, paper, ashes, carcass, refuse, leaves and branches, grass, straw, boxes, barrels, bales, shavings, sawdust, garden refuse, stable refuse, trade refuse, manure, garbage, bottles, glass, can, food container, food wrapper, particles of food or other things, articles or materials. It will also include urinating or defecating by pets or humans in open;

(f) "occupier" includes any person in actual occupation of any premises or having the charge, management or control thereof, and in the case of property subdivided or let to various tenants or lodgers, the person who for the time being is receiving the rent payable by the tenants or lodgers whether on his own account or as an agent for any person entitled thereto or interested therein;

(g) "owner" shall have the same meaning assigned to it in the U.P. Municipalities Act, 1916 [as adapted, amended and made applicable to Uttarakhand] and the U.P. Municipal Corporation Act,1959 [as adapted, amended and made applicable to Uttarakhand] and shall also include the occupier of any building or premises for the time being;

(h) "premises" means land, whether enclosed or not which is appurtenant to a building or commonly appurtenant to several buildings.

(i) "public place" includes every public highway, street, road, hill side, drain, waterway, sub-way, bridge, square, court, lane, alley or passage, bridle way, footway, parade,

public/park, garden or open space (enclosed or unenclosed), building or premises, every theatre, place of public entertainment of any kind or any place of public resort to which admission is obtained or to which the public has access, whether on payment or otherwise;

(j) "spitting" means voluntary ejection of saliva from the mouth after chewing or without chewing, ejection of mucus from nose after inhaling snuff or without inhaling;

(k) "stable refuse" means the dung or urine of horses, cattle, sheep, goats, buffaloes, pigs, poultry or other domesticated animals and the sweepings or refuse of drainage from any stables or sheds for keeping horses, cattle, sheep, goats, buffaloes, pigs, poultry or other domesticated animals;

(l) "street" means any road, square, footway, back lane or passage whether a thoroughfare or not, over which the public have a right of way, also the way over any public bridge, and also includes any road, footway, or passage, open court or open alley used or intended to be used as a means of access to two or more holdings, whether the public have a right of way there over or not; and all channels, drains, ditches and reserves at the side of any street shall be deemed to be part of such street;

(m) "trade refuse" means the refuse of any trade, manufacture or business, industry or of any building operation;

Offences under the Act:

4. Any person who:

(a) places, deposits or throws or causes or allows to be placed, deposited or thrown any litter in any public place;

(b) dries or desecrates any article of food or any article or thing in any public place;

(c) throws, places, spills or scatters any blood, brine, spills any noxious liquid or other offensive or filthy matter of any kind in such manner as to run or fall into any public place;

(d) drops, spills or scatters any dirt, sand, earth, gravel, clay, loam, stone, grass, straw, shavings, sawdust, ashes, garden refuse, stable refuse, trade refuse, manure, garbage or any other thing or matter in any public place, whether from a moving or stationary vehicle or in any other manner;

(e) sieves, shakes, cleans, beats or otherwise agitates any lime, ashes, sand, coal, hair, waste paper, feathers or other substances in such manner that it is carried or likely to be carried by the wind to any public place;

(f) throws or leaves behind any bottle, glass, can, food container, food wrapper, particles of food or other articles or things in any public place;

(g) during the construction, alteration or demolition of any building or erection or at any time whatsoever, deposits, drops, leaves in any public place, any stone, cement, earth, sand, wood or other building material, thing or substance, without prior permission, or who fails to take reasonable precautions to prevent danger to the life, health or well-being of persons using any public place from flying dust or falling fragments or any other material;

(h) places or deposits or causes or allows to be placed or deposited any abandoned vehicle, water tank, cement mixer or any abandoned object or scrap metal in any public place,

(i) Spits in any public place; Commits an offense under this Act.

Order to remove:

5. (1) The Urban Local Body or Authorized Officer may direct any person reasonably suspected of placing, depositing or causing or allowing to place or deposit any litter, abandoned vehicle, abandoned object or scrap metals in any public place to remove such litter, abandoned vehicle, abandoned object or scrap metals from such public place to a proper place.

(2) Where such person fails to remove such litter, abandoned vehicle, abandoned objects or scrap metals after being directed by Urban Local Body or Authorized Officer, the Urban Local Body shall execute such removal to such proper place and any expenses incurred shall be borne by such person and may be recovered as arrears of land revenue.

Presumption as to offender:

6. For the offences committed under section 4, the driver and the owner of the vehicle shall be deemed to have committed the offence unless the contrary is proved.

Occupier of land or building to be held liable:	7.	If in any case it is shown that any dust or other substance as mentioned in the above sections has been deposited in any public place in contravention of this Act from any building or land or that any such water or any offensive matter has run, drained or been thrown or put upon into any street or drain in contravention of this Act, it shall be presumed that the offense was committed by or by the permission of the occupier of such building or land.
Occupier to keep footpaths, backyard and Private Street clean:	8.	(1) The owner or occupier of any premises shall cause the immediate vicinity of his premises, including the footpaths and backyards abutting thereon to be swept and kept clean. (2) The owner or occupier of any premises abutting on a private street shall cause such portion of the street in front of, adjoining or abutting his premises and up to the centre thereof to be kept clean.
Penalties:	9.	(1) Any person who contravenes any of the provisions of this act commits an offense and shall on conviction be liable to a fine not exceeding Five Thousand Rupees or to imprisonment for a term not exceeding six months or both. (2) In the case of a continuing offense to a further fine not exceeding Five Hundred Rupees for every day during which the offense is continued. (3) In addition to or in substitution for the penalty provided in sub-section (1) any expenses incurred by the Urban Local Body in consequence of any contravention of this Act or in the execution of any work directed under this Act to be executed by any person and executed by him, whether performed by the Urban Local Body or by some contractor, together with a surcharge of not more than ten percent of the expenses, shall be paid by the person committing the breach or failing to execute such work and may be recovered as the arrears of land revenue.
Compounding of offenses	10.	(1) The Authorized Officer may compound any offense committed by any person and prescribed to be a compoundable offense by

making a written offer to the person reasonably suspected of having committed the offense to compound the offense upon payment to the Urban Local Body/ Authorized Officer of an amount not less than two hundred Rupees but not exceeding five hundred rupees within the time specified in the offer.

(2) If the person is unable to pay the compounding amount / Fine, he/she can enroll for community service in the Urban Local Body in lieu of the compounding amount / Fine.

(3) An offer under paragraph (1) may be made at any time after the offense has been committed but before any prosecution for it has been instituted, and if the amount specified in the offer is not paid or the community service is not done within the period specified in the offer or within such extended period as the Urban Local Body may grant, prosecution for the offense may be instituted at any time after that against the person to whom the offer was made.

(4) If an offense has been compounded under paragraph (1), no prosecution shall be instituted after that in respect of the offense against the person to whom the offer to compound was made.

(5) An offer to compound shall be in such form as specified under the rules.

Power to arrest:

11. (1) Any Authorized Officer may detain any person and have him arrested, with police help, whoever commits an Offence in his presence or whom he reasonably believes to have committed any offence under this act, if:

(a) the name or address of the person is unknown to him and the person declines to give his name and address; or

(b) there is any reason to doubt the accuracy of his name or address.

(2) Any person arrested under this Act shall be detained and shall be brought before an Executive Magistrate within twenty four hours, unless his true name and exact address are sooner ascertained.

Court competent to take cognizance and try offenses:

12. (1) No Court other than the Court of a Judicial Magistrate First Class shall take cognizance of, and try an offense under this Act.

(2) No court shall take cognizance of any offense except on a complaint in writing of an Authorized Officer.

Offenses under the Act to be non cognizable and bailable:	13.	Notwithstanding anything contained in the Code of Criminal Procedure 1973, offenses under section 3 of this Act shall be non-cognizable and bailable.
Summary trial of offenses:	14.	All offenses under this act shall be tried summarily in the manner provided for summary trial under the Code of Criminal Procedure 1973.
Power of State government to make rules & regulations:	15.	The State Government shall make rules and regulations, for the purposes of carrying out into effect the provisions of this Act.

By Order,

RAMESH CHANDRA KHULBE,
Principal Secretary.