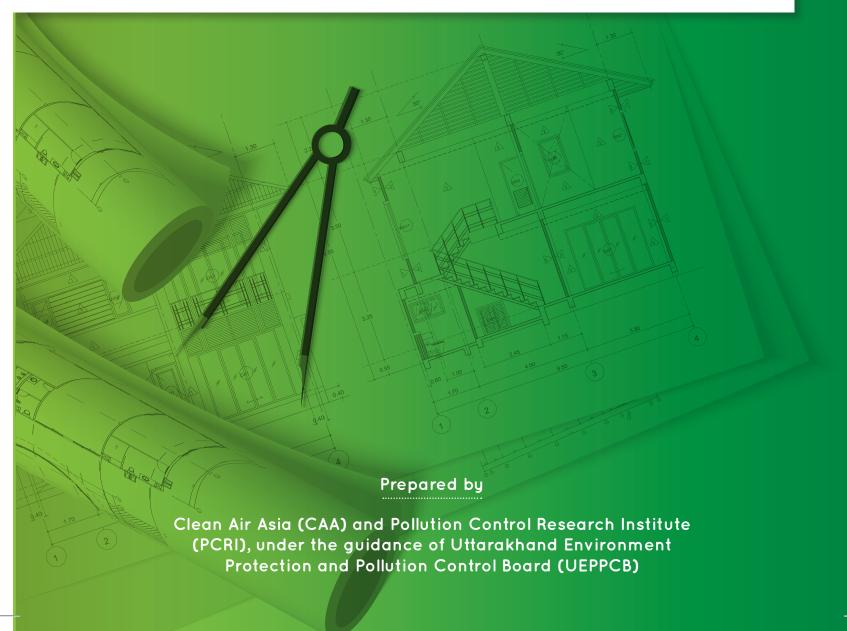




DEHRADUNCITY CLEANAIRACTION PLAN 2018-2022





DEHRADUNCTY CLEANAIRACTION PLAN 2018-2022



TABLE OF CONTENTS

I. Background	
II. Why Clean Air Action Plan	. 5
III. Dehradun City Clean Air Action Plan- Need Assessment	6
a) Consultative Meetings for Clean Air Action Planb) Clean Air Asia Assessment 2016-17- Clean Air Scorecard Tool	
IV. Emissions Inventory for Dehradun	9
V. Clean Air Action Plan for Dehradun City	11
List of Annexures	
Annexure 1: Consultations Held- Summary of Discussions	17
Annexure 2: Results of ambient air quality and vehicular emissions	20
Annexure 3: Air Quality Data for Dehradun	30





BACKGROUND

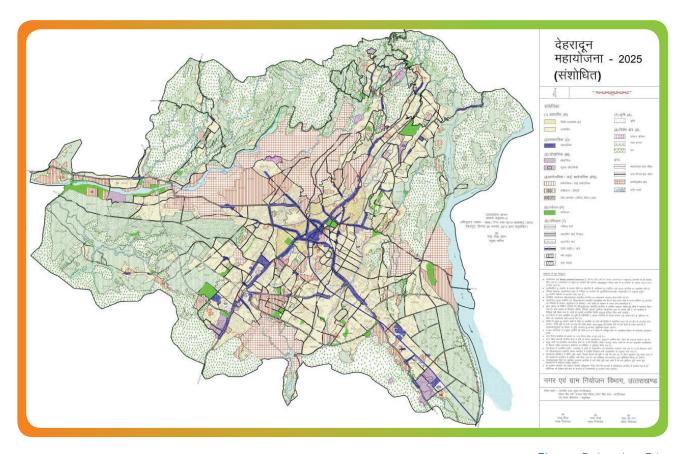


Figure: Dehradun City **Source:** Mussoorie Dehradun Development Authority

Dehradun, the capital of Uttarakhand is positioned in the fertile region of the Doon Valley between the rivers Yamuna and Ganga. The city is spread over an area of 64.4 Sq. Km with a population of 569,578 as per the census of 2011. The city's population density is 8633/km2 with a decadal population growth rate of 37.4%. With a steady rate of population growth and urbanization there is increasing pressure on resources in the city and the air quality of the city has been steadily declining.

More than a decade ago, air pollution was discussed in the context of limestone mining, but this was banned in 1986 by the Supreme Court. Since then SPM levels have shown a downward trend over the years but there are reports including the

Greenpeace report, Apocalypse 2017 that states that city's annual average PM10 levels was more than thrice the permissible limit making Dehradun city in Uttarakhand an entrant in the list of 10 worst cities with an annual average of 238 $\mu g/m3$. The report also suggests that these top most polluted cities need to improve monitoring and management of air quality and a stricter time bound air action plan is the need of the hour.

At present Dehradun city has three stations to measure PM 10 levels but none for them measure PM 2.5. The city administration has planned to put up a station to measure PM 2.5. According to the the Central Pollution Control Board (CPCB)'s report on air quality index of 273 cities, released in January 2018,

Dehradun stood at 241, which was higher than Ghaziabad (235) Noida (176) and Moradabad (196) (Times of India; 12th April 2018). Further, another study conducted by Pollution Control Research Institute (PCRI) at Bharat Heavy Electronics Limited (BHEL) in Haridwar it was found that the level of PM 10 and PM 2.5 was 5-7 times more than standard values (Dainik Jagran; 12th April 2018). This study also forms the basis of the CAAP Dehradun and other findings are available as Annexure 3

Today, vehicular emissions are being discussed as the main source of air pollution. According to the road transport authority, only 10,000 vehicles were registered in Dehradun between 1937 and 1967. At present,

there are more than 126,452 vehicles plying on the roads with more than 100,000 of these are two-wheelers. However, the length and width of roads have increased only marginally.

A study by the Dehradun-based People's Science Institute (PSI), a non-governmental organisation, says that the high levels of pollution in Dehradun are mainly due to natural dust and particulate-laden smoke from diesel-fuelled vehicles, especially vikrams, trucks, buses and three-wheelers. Another cause for concern mentioned in the same report are two-wheelers.

All this emphasizes the need for a Clean Air Action Plan for Dehradun.

AIR ACTION PLAN?

India with an emerging economic development, faces enormous challenges when it comes to maintaining pace with the burgeoning population and parallel increase in urban development. This has been the scenario not only in mega cities but also in medium and small sized urban areas for the past many years now. Studies indicate that multiple factors are responsible for air pollution that emerges from sectors like power, transport, industry, residential, construction and waste. Despite having national standards and checks for various sources of emissions, many Indian cities are suffering from alarmingly high rates of air pollution emissions. While India has specified national ambient air quality standards, many cities have not been able to meet these standards. It is in view of this and the growing demand for clean air, the central government under the National Clean Air Programme (NCAP) announced a comprehensive plan to overcome the challenges in over a hundred non- attainment cities

The objective of the proposed clean air action plans is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated timeframe.



Within the Clean Air Action Plan the NCAP suggests the following actions

- To augment and evolve effective and proficient ambient air quality monitoring network across the country for ensuring comprehensive and reliable database
- To have efficient data dissemination and public outreach mechanism for timely measures for prevention and mitigation of air pollution and for inclusive public participation in both planning and implementation of 3 the programmes and policies of government on air pollution
- To have a feasible management plan for prevention, control and abatement of air pollution.

It has been proposed under the NCAP that the city action plans need to be guided by a comprehensive science based approach involving

- i. identification of emission sources:
- ii. assessment of extent of contribution of these sources;
- iii. prioritizing the sources that need to be tackled;
- iv. evaluation of various options for controlling the sources with regard to feasibility and economic viability; and
- v. formulation of action plans.

III. DEHRADUN CITY CLEAN AIR ACTION PLAN- NEED ASSESSMENT

1. CLEAN AIR ASIA ASSESSMENT 2016-17-CLEAN AIR SCORECARD TOOL

Air pollution is an intrinsically complicated issue that varies from city to city. In other words, air pollution is not just about the level of pollutants in a city or the number of monitoring stations, or city level policies, or health impact studies or rigorous scientific assessments to determine the sources of air pollution such as emission inventories or source apportionment studies, but a

composite of all these features. Moreover, it is a well thought out combination of all these factors that can together systematically and sustainably address the issues of air pollution, or what can be called air quality management (AQM). AQM refers to the entire process of protecting the air quality of a city, region or nation. The process involves determining emission sources, assessing



air quality status and its impacts and formulating and implementing solutions that are effective and target main pollution sources. While various tools exist to measure environmental performance, there is no generally accepted methodology for an objective, comprehensive assessment of a city's management of air pollutants and greenhouse gas emissions that also identifies areas in which it has improved.

Recognizing this need, Clean Air Asia (CAA) developed a comprehensive analysis tool for understanding the air quality management status in cities – the Clean Air Scorecard Tool (CAST). CAST is an excelbased tool which incorporates three indices: (i) Air Pollution and Health, (ii) Clean Air Management Capacity, and (iii) Clean Air Policies and Actions, which taken together give the AQM status of a city.



The CAST assessment brought out that the city of Dehradun has three manual stations that are under the jurisdiction of the Uttarakhand Environment Protection and Pollution Control Board (UEPPCB). The monitoring stations calculate the ambient air quality of three pollutants - PM10, NOx and SOx. Based on ambient air quality levels the pollutant of concern is PM10. As the monitoring stations are manual, real time air quality data for the city is not available, which means that air quality index (AQI) cannot be calculated or air quality advisories be issued for the citizenry at large. An AQI is defined as an overall scheme that transforms weighted values of individual air pollution related parameters (PM10, PM2.5, SO2, CO, visibility, etc.) into a single number or set of numbers. Specifically, it establishes the relationship between human exposure, health effects and air quality. This is aggravated by the fact that there is a dearth of city specific air quality health effect studies and assessments for Dehradun. Such assessments are important when it comes to framing policy and taking city specific decisions.

The Clean Air Management Capacity Index brought out that there is a lack of city specific source apportionment and emissions inventories. Source apportionments and emissions inventories are the technical assessments that allow for an identification of sources that are affecting the air quality in varying degrees in a specific region.

A source apportionment study is an important tool in framing policy as every city has different sources of air pollution depending of city specifics such as levels of urbanization, land use patters and topology. For instance, Dehradun is prone to the temperature inversions which affect air pollution because they change the dynamics of air movement. Further, industry is not a major cause of air pollution in the city as red category industries are not allowed to operate in Dehradun. This is an important factor when framing policy and determining air actions. Thus, there is a need to increase and invest in source apportionment studies, emission inventories and increasing the monitoring framework in the city to include real time monitoring stations.

The Clean Air Policies and Actions Index brought out that though there are policies in place there is a need to facilitate collaborations across departments at the city level so that air quality actions can be mainstreamed in all urban development related decisions. A clean air action plan is one of the main mean to achieve this coordination and systematic action.

2. CONSULTATIVE MEETINGS FOR CLEAN AIR ACTION PLAN

To discuss the findings from the CAST assessment and work towards better air action for Dehradun, Clean Air Asia organised a consultation in Dehradun on 12th April 2018. Relevant stakeholders discussed the main pollutants that are contributing to the deteriorating air quality as well as the possible sources of pollution. Officials present at the meeting agreed that the need for a Clean Air Action Plan for the city was strongly felt by all.

The consultation identified that the main sources of air pollution in the city were vehicular emissions, open air burning of municipal solid waste, dust from construction and demolition and resuspended dust.

Following the stakeholder consultation the Chief Secretary of Uttarakhand, Shri. Uttpal

Kumar Singh IAS, convened a meeting in the secretariat with relevant stakeholders from different departments in the



city administration to address air quality issues in Dehradun on 24th April 2018. The UEPPCB was appointed the nodal agency to facilitate co-ordination amongst the transport department, municipal corporation, forest department, public works department, traffic police and other relevant agencies to improve the air quality management status of the city of Dehradun.

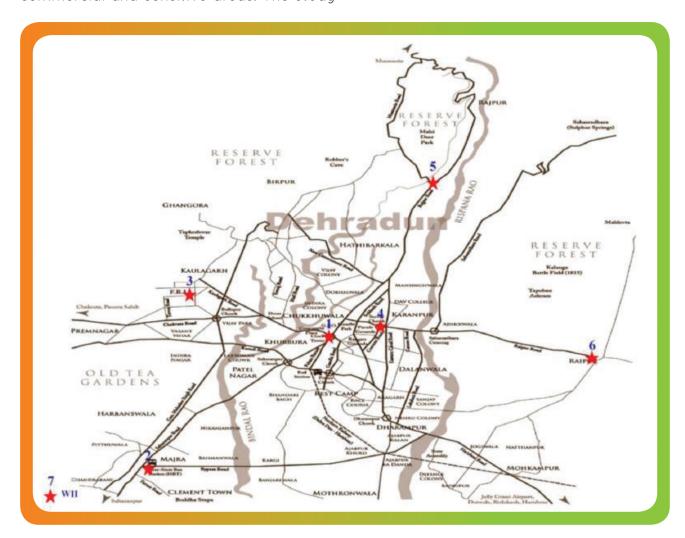
Details of the Meeting and Participants is available as Annexure 1.



INVENTORY FOR DEHRADUN

In 2016-2017, PCRI undertook an intensive study to measure baseline pollutants and air toxic levels at different locations of Dehradun city which includes residential, industrial, background (reference), commercial and sensitive areas. The study

included monitoring ambient air quality for 30 days continously in three seasons (summer, post-monsoon and winter) at seven identified locations in the city where air monitoring stations were installed.



The summer season study was carried out from 15-06-2016 to 14-07-2016. The post monsoon season study was carried out from 1-11-16 to 30-11-16 and winter season was carried out from 9-12-16 to 28-01-17. The seven sites were selected to cover ambient air quality near roadsides, residential, commercial, industrial, outskirts, commercial and senstitive areas. The seven sites are detailed along with a map depicting their positioning below:

- i. Ghanta Ghar Center of the city.
- ii. ISBT Main bus terminal of the city.
- iii. ONGC/FRI Research institutes with expanse of green area.
- iv. Survey Area Busy area with high vehicular population.
- v. Rajpur Road Commericial Area.
- vi. Raipur Residential area.
- vii. Wildlife Institute of India Outskirts of City.

The pollutnats monitored at all seven sites were - SO2, NOx, CO, SPM, PM10 and PM2.5. Additionally, in order to get a wider cross-section of vehicles in-use/on-road, a systematic survey of vehicle population in the city was undertaken at the following sites:

- i. Ghanta Ghar Center of the city.
- ii. ISBT Main bus terminal of the city.
- iii. ONGC/FRI Research institutes with expanse of green area.
- iv. Survey Area Busy area with high vehicular population.

All emission factors used for assesment were those approved by the CPCB or the Automative Research Institute of India.

Results of the Emission Inventory are presented in detail in Annexure 3.

City: Dehradun

Pollutant of Concern: PM 10, PM 2.5

Main Sources: Vehicular emissions, re-suspended dust, construction and demolition activities and municipal solid waste burning.

Air Pollution Levels: Details in Annexure 2 and Annexure 3

Type of Action: The recommended action have been designated as either policy, regulatory and implementation. Their explanation is given below:

i. Policy Action: This refers to an action that requires the fraiming of a new policy at the city or state level.

ii. Regulatory Action: This refers to an action that requires better/differnet implementation of an exiting policy or rule.

iii. Implementation Action: This refers to an action that requires local execition of an activity.

Time Period of Implementation: Depending on estimated time for implementation of the action the time periods were divided into short (less than 6 months), medium (6 months to 2 years) and long (2 years and greater). The time period for the Clean Air Action Plan is envisaged as 2018-2022- (5 year period)



S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	Remarks
		Air Quality Monitoring to be strengthened by installation of real time sensors and monitors Implementation	UEPPCB	М	1 year	Besides the 3 manual monitoring stations, UEPPCB has agreed to setting up of 4 sensors in collaboration with the Clean Air Asia. The real time data from these sensors is already being generated. CAA will provide a strategy for use of this data for improving access to information.
		Capacity building on how to strengthen air quality management for the city to be carried out for all departments that are involved in city adminstartion.	UEPPCB	М	1 year	Capacity building needs to be identified by UEPPCB and training organised
1	Data, Research and Management of Air Quality	Centre of Excellence on air quality to be set up by pooling in all technical orgnaisations in the city. The technical organsations will promote and aid the city adminstartion and UEPPCB in undertaking air quality research.	UEPPCB and designated institutions	L	3 years	This will require a coordinating agency to facilitate the process.
		Steering Committee for monitoring and evaluation of clean air action plan to be set up.	UEPPCB	М	1 years	This will require a coordinating agency to facilitate the process
		Air Quality Index to be calculated after setting up of real time air quality monitoring stations and data to be communicated via social media, websites, mobile applications and display boards. Regulatory	UEPPCB	М	1 years	AQI can also be calculated by putting up reliable sensors that can generate real time data. This will be more cost effective than the AQ monitoring stations. However the data may not be useful for policy decisions. It can be used for informing public.



S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	Remarks
		A city wide drive will be launched to check and curtail polluting vehicles Implementation	Transport Department, City petrol units (Traf- fic police), Municipal Corporation	М	1 yr	Checking underway by transport department. Traffic police and MC need o be empowered and capacity built for the same. Sensors can be acquired under smart city programme to track polluting vehicles and penalize owners of polluting vehicles.
		A public awareness campaign will be launched to inform the public about anti-idling measures, vehicle maintanance, eco-drivinig, use of public transport etc.	District Ad- minstration, Municipal Corporation, Transport Department and UEPPCB	S (and to be continued)	6 months	Civil society and citizen groups, educational institutes will be involved
2	Vehicular Emissions	Prevent parking of vehicles in non-designated areas. - Determination of hotspots to launch action in phased manner Determine best stragety for positive outcome. -Branch out to other parts of the city. Regulatory	Transport Department, Traffic Police and Municipal Corporation	М	1 year	8.5 lakhs vehicles in the city (floating population is added to this in touris population), roads are narror, thus roadside parking is leading to congestion. Designated areas for parking are inadequate.
		Checking for fuel adultration periodically and random checking of fuel to be initiated.	Transport Department and District Administar- tion.	S (and to be continued)	6 months	
		Plan to be prepared for widening of busy roads and decongestion of traffic.	Urban De- velopment Deptart- ment	L	5 years	Can be taken under Smart City Mission
		Expressway/bypass and flyovers to be built to decrease vehicular congestion. Policy	Urban De- velopment Deptart- ment	L	5 years	



S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	Remarks
	Vehicular Emissions	Battery operated vehicles and e-ricksaws to be introduced Determination of areas that most need last mile connnectiviy to initiate launch Determine need and capacity for city Launch more e-rickshaws accordingly.	Transport Department	L	2 years	Underway (901 e-rickshaws have been registered alreay)
2		Non-motorised transport such as bicycle sharing to be introducedDevise plan for bicycle sharingConsruct cycle pathsCarry out awarness camapign Launch plan	Municipal Corporation & Transport Department	Medium	1 year	Align with Smart Cities Mission
		Regulatory				
		Public transport to move to cleaner fuels such as CNG in a phased manner. Policy	Transport Department	Long	5 years	
		Better traffic management/ intelligent traffic system to be launched for monitoring and de- congestion (Smart Traffic)	Transport Department & Urban De- velopment	Medium	1 year	Can be integrated within the Smart City Mission
		Regulatory				
		No registratoin of diesel vehilcles that are 15 years old	Transport Department	Long	2 years	
		Policy				

S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	Remarks
		Roads to be regularly monitored to ensure maintaneance Policy	Urban De- velopment Deptart- ment	L	5 years	Digging of roads for multiple purposes by multiple agencies to be monitored/approved at a single point/agency
		Green buffers to be introduced on either sides of traffic corridors Implementation	Municipal Corpora- tion, De- velopment Authority & Mussorie Dehradun District Ad- ministartion	L	2 years	Grasses, shrubs and small flowering trees should be given prominence. Forest department can be engaged.
	Re- suspension of road dust and other fugitive emissions	Greening of open areas, schools, gardens, community places and housing societies.	Municipal Corporation & Mussorie Dehradun Devel- opment Authority & Forest Dept	L	5 years	Can be done under Smart City Mission
3		Ensure sidewalks are present in major parts of the city for pedestrians Policy	Urban De- velopment Deptart- ment	L	5 years	Can be done under Smart City Mission
		Creation of green lungs in the city through city forestation. Implementation	Municipal Corpora- tion, Forest Department and District Administar- tion	L	5 years	
		Introduction of vertical gardens in the city. Implementation		L	3 years	Can be done under Smart city Mission

S No.	Source Group	Action	Agency Re- sponsible	Type of Implementation (Short, Medium and Long)	Time Target	Remarks
	Open Burnng of Municipal Solid Waste	Launch extensive campaign against open burining of waste, leaves, bio-fuel etc. Implementation	Municipal Corporation and UEPPCB and District Administartion	S	6 months	Civil society and citizen groups, educational institutes will be involved
		Regular check and control of burning of municipal solid wastes. Implementation	Municipal Corporation and District Adminsitartion	M (and continued)	1 year	An online public portal to be created for citizen cmplaints and suggestions
4		Promotion and implmenetion of compositing in all public parks, housing societies, official buildings, school etc.	Municipal Corporation and District Adminstartion	М	1 year	
		Regulatory				
		Issue fines against buriing of MSW	Urban De- velopment	М	1 year	
		Regulatory	Department			

S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	De- tailed Status
		Enforecement of construction and demolition rules 2016 Implementation	Mussorie Dehradun De- velopment Authority and District Adminstration	S	6 months	
5	Control of Construction and	Water sprinkling, curtains, barriers and dust suppression units to be used during all construction and demolition activities Implementation	Mussorie Dehradun De- velopment Authority and District Adminsitration	М	1 year	
	Demoliton Activities	Ensure construction material is transported and carried in close containers Implementation	Municipal Corporation, Transport Department and Traffic Police	М	1 year	
		Identification of designated place/ areas for disposal of demolition waste Regulatory	District Adminstartion & Municipal Corporation	М	1 year	

S No.	Source Group	Action	Agency Responsible	Type of Implementation (Short, Medium and Long)	Time Target	Detailed Status
6	Clean Energy/ Clean Cooking	Ensure 100% spread of LPG connection for cooking purposes in the city. Regulatory	District Administartion	L	5 year	



ISTOF ANNEXURES

ANNEXURE 1

SUMMARY OF DISCUSSIONS FROM CONSULTATIONS AND MEETINGS

During the Stakeholder Consultation held by Clean Air Asia and UEPPCB in Dehradun, attended by key people from the government, academics and civil society, major sources of air pollution were discussed.

Since red category industries are not allowed inside the city, it was agreed upon that industrial emissions are not a major source of air pollution in the city. That said, based on the ambient air quality data for the city the air quality is deteriorating with the levels of PM10 progressively increasing. The national ambient air quality standards establish the annual average safe levels of PM 10 at 60 μ g/m3, whereas the levels for 2017 for Dehradun were as high as 302.35 μ g/m3 at ISBT in the city. The NOx and SO2 levels were within the prescribed limits (see annexure 1 for more details). Thus, the pollutant of concern for the city is PM 10. This is also the most detrimental in terms of health and there is a need for different city level departments and civil society organisations at the city level to come together to implement the Clean Air Action Plan and improve the air quality of the city.

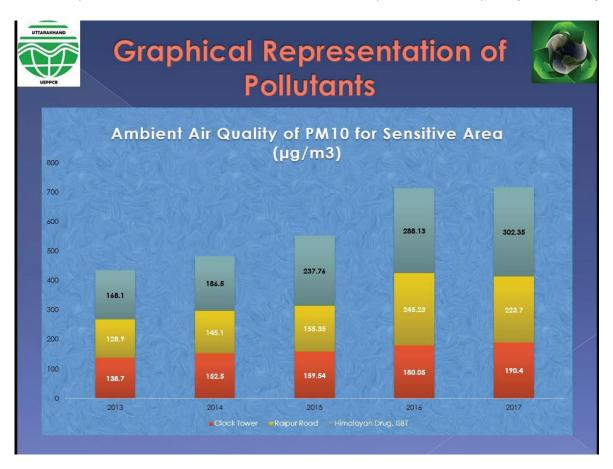


Figure: Ambient Air Quality of PM 10 in sensitive areas of Dehradun Source: UEPPCB

At a meeting convened by the Chief Secretary of Uttrakhand, Shri. Uttpal Kumar Singh IAS, with relevant stakeholders from different departments in the city administration to address air quality issues in Dehradun on 24th April 2018, the UEPPCB was appointed the nodal agency to facilitate co-ordination amongst the transport — department, municipal corporation, forest—department, public works—department, traffic police and other relevant agencies to improve the air quality—management status of the city of Dehradun. According to the UEPPCB, the main—pollutants in Dehradun as specified in a presentation were: vehicluar emissions, construction and demolition, municipal solid waste burning and re-suspended dust.

The Secretary of Transport, Uttarakhand, Shri. D, Senthil Pandyan, shared that by December 2018, a CNG pipline will come to the city. Following this he said CNG vehicles will be encouraged in the city. Further, 901 e-rickshaws have been registered in the city to improve last mile connectivity and tax emption is being offered to all vehicles operated by e-batteries and solar power.

PUC are in the process of being linked to vehicle IV software. He further shared that there are 103 PUC centers in the state of Uttrakahnd of which 26 are in Dehradun. Currently there are 25.61 lakh vehicles in the state of which 8.68 lakhs are in Dehradun, which is 33.89% of the state share of vehicles. Additionally, 2 lakh vehicles are registed every year in the city.





PARTICIPANT LIST: STAKEHOLDER MEETING

(12TH APRIL 2018)

S. No.	Name	Designation	Organisation
1	S.A. Murugesan	District Magistrate	Uttarakhand Govt.
2	Dr. V. K. Joshi	Scientific Officer	UEPPCB
3	Sunil Pathak	Sr. Scientist	CSIR
4	H.C.S. Rana	Ex-Engineer	M.D.D.A
5	Soumya Prasad	Research Associate	Nature Science Institute
6	Seema Sharma	Special Correspondent	The Times of India
7	Shri S.P. Subudhi	Member Secretary	UEPPCB
8	Chandan Singh	CEO	UEPPCB
9	Sumeet Dwivedi	Sub Editor	Amar Ujala
10	Dr. V.K. Bahuguna	Ex- Principal Secretary	Forest Dept.
11	Anoop Nautiyal	Head	Gati Foundation
12	Dr. Tripti Bahuguna	Additional Director	Health Department
13	Ruchi Singh Rao	Designer	Citizens for Green Doon
14	Lokesh Ohri	Convener	INTACH
15	Sargam Mehra		INTACH
16	Poonam Gupta		IIP
17	Nihi Sharma	Principal Correspondent	Hindustan Times
18	Ambrish Goel	Additional General Manager	PCRF, BHEL Haridwar
19	Prof. Naveen Singhal	Dean (AA)	DIT University
20	Sudhanshu Garg	RTO	Dehradun
21	A.K. Jain	Chief Scientist	Indian Institute of Petroleum
22	Dr. RBS Rawat	Former-PCCF-UK	Forest Dept.
23	Dr. D.C. Pandey	Principal Technical Officer	CSIR-IIP Dehradun
24	Dr. R.K. Pandey	Asst. Dean	IIM Kashipur
25	Dr. Uday Gaur	Range Officer	Forest Deaprtment
26	S.P. Singh	Executive Engineer	UEPPCB
27	Dr. V.K. Joshi	Senior Officer	UEPPCB
28	Dr. K.K. Raina	VC	DIT University
29	Vinay Mohan Raturi	Sub D.F.O.	Forest Dept.
30	Priya Ranjan	Programme Specialist	CEDAR



ANNEXURE 2

RESULTS OF AMBIENT AIR QUALITY AND VEHICULAR EMISSIONS SUMMER SEASON

Ambient Air Monitoring at Dehradun for Summer Season Average, Cumulative Percentile, Maxima & Minima Respirable Suspended Particulate Matter (RSPM) PM₁₀

All values in $\mu g/m^3$

Site	Location	Maga	C D	Min	Max	Percentile				
Code		Mean	S.D			10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	205	26	155	250	172	186	205	228	248
A2	Survey Area	302	30	256	363	269	277	299	323	358
А3	ONGC/FRI	206	16.4	187	241	198	203	215	221	239
A4	ISBT	191	15	171	241	182	189	193	204	240
A5	Rajpur Road	191	19.9	159	230	166	178	187	212	227
A6	Raipur	353	38	292	413	302	315	358	389	409
Α7	Wildlife Institute of India	168	17.7	144	209	148	155	165	183	206

Average, Cumulative Percentile, Maxima & Minima Particulate Matter PM_{2.5} (PM2.5)

Site	Looption	Mann	C D	Min	Max			Percentile		
Code	Location	Mean	S.D	MIIN	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	123	16	93	150	103	112	123	137	149
A2	ISBT	196	20	164	229	169	175	188	204	228
А3	ONGC/FRI	106	9	107	137	115	118	125	118	139
A4	Survey Area	119	9	107	143	109	113	116	122	141
A5	Rajpur Road	115	12	95	138	100	107	112	127	136
A6	Raipur	209	23	172	249	181	189	215	212	247
Α7	Wildlife Institute of India	96	11	76	121	90	93	99	110	119



Average, Cumulative Percentile, Maxima & Minima Sulphur-Dioxide (SO₂)

All values in $\mu g/m^3$

										1 2
Site	Location	Mean	S.D	Min	Max			Percentile		
Code	Locution	rieun	3.0	171111	Hux				80 th	98 th
A1	Ghanta Ghar	5	1	3	6	4	4	5	5	6
A2	ISBT	4	1	4	6	3	3	4	5	6
А3	ONGC/FRI	4	1	3	6	3	4	4	4	5
A4	Survey Area	4	1	3	6	4	4	4	5	6
A5	Rajpur Road	4	1	3	6	4	4	4	5	6
A6	Raipur	4	1	3	5	4	4	4	5	6
A7	Wildlife Institute of India	4	1	BDL	5	3	3	4	4	5

BDL: Below Detectable Limit

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

All values in $\mu g/m^3$

									1010001	
Site	Location	Mean	S.D	Min	Max			Percentile		
Code	Location	Mean	را.د	MIII	Max		25 th		80 th	98 th
A1	Ghanta Ghar	15	1	14	14	14	15	15	17	20
A2	ISBT	15	1	14	14	14	15	17	19	23
А3	ONGC/FRI	15	1	14	14	14	14	15	16	18
A4	Survey Area	15	1	14	14	14	14	15	16	18
A5	Rajpur Road	20	1	17	22	18	19	20	16	22
A6	Raipur	20	1	17	22	18	19	20	20	22
Α7	Wildlife Institute of India	15	1	14	14	14	14	15	15	16

Average, Cumulative Percentile, Maxima & Minima Ozone (\mathcal{O}_3)

Site	Location	Mean	6.0	Min	Max			Percentile		
Code	Location	Mean	S.D	MIII	Max				80 th	98 th
A1	Ghanta Ghar	36	3	30	41	33	35	37	38	41
A2	ISBT	35	2	30	39	32	32	35	36	39
А3	ONGC/FRI	34	2	29	38	30	32	34	35	38
A4	Survey Area	32	2	29	38	30	30	34	34	38
A5	Rajpur Road	32	2	31	39	30	34	34	34	39
A6	Raipur	32	2	28	37	30	31	34	35	36
A7	Wildlife Institute of India	33	2	30	30	30	32	34	35	36

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

All values in $\mu g/m^3$

Site	Location	Mana	£ 0	Min	Maria	Percentile				
Code	Location	Mean	S.D	MIIN	Max				80 th	98 th
A1	Ghanta Ghar	0.84	0.07	0.70	1.40	0.98	0.77	0.84	0.91	0.97
A2	ISBT	0.63	0.07	0.49	1.20	0.84	0.55	0.63	0.70	0.85
А3	ONGC/FRI	0.56	0.14	0.42	1.20	0.84	0.53	0.56	0.70	0.84
A4	Survey Area	0.91	0.21	0.70	1.60	1.12	0.84	0.91	1.00	1.11
A5	Rajpur Road	0.42	0.07	0.35	0.80	0.56	0.39	0.42	0.50	0.55
A6	Raipur	0.63	0.04	0.49	1.10	0.77	0.55	0.63	0.71	0.77
A7	Wildlife Institute of India	0.14	0.01	0.06	0.30	0.21	0.10	0.14	0.18	0.21

POST MONSOON

Ambient Air Monitoring at Dehradun for Post Monsoon Season Average, Cumulative Percentile, Maxima & Minima Respirable Suspended Particulate Matter (RSPM) PM₁₀

All values in $\mu g/m^3$

Site	Location	Mean	S.D	Min	Max	Percentile				
Code	Location	rieun	3.0	Pilit	Mux				80 th	98 th
A1	Ghanta Ghar	180	23	136	220	151	164	180	201	218
A2	Survey Area	272	27	230	327	242	249	269	291	322
А3	ONGC/FRI	177	14	161	207	170	175	185	190	206
A4	ISBT	160	13	144	202	153	158	162	171	202
A5	Rajpur Road	174	18	148	209	151	162	170	193	207
A6	Raipur	176	19	145	205	150	157	178	194	204
A7	Wildlife Institute of India	143	15	122	178	126	132	140	156	175

Average, Cumulative Percentile, Maxima & Minima Particulate Matter PM_{2.5} (PM_{2.5})

Site	Location	Mean	S.D	Min	Max			Percentile		
Code	Location	Mean	ر.c	Pilli	Mux				80 th	98 th
A1	Ghanta Ghar	126	16	95	154	106	115	126	140	153
A2	Survey Area	185	18	157	222	165	170	183	198	219
А3	ONGC/FRI	115	9	105	135	111	113	120	124	134
A4	ISBT	114	9	102	144	108	112	115	121	143
A5	Rajpur Road	110	11	93	132	95	102	107	122	130
A6	Raipur	121	13	100	142	104	108	123	134	141
Α7	Wildlife Institute of India	91	10	78	114	81	84	90	101	112



Average, Cumulative Percentile, Maxima & Minima Sulphur-Dioxide (SO₂)

All values in $\mu g/m^3$

Site	Location	Mean	S.D	Min	Max	Percentile				
Code	Location	Mean	ر.د	Piin	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	BDL	0	BDL	BDL	1	1	1	3	4
A2	Survey Area	BDL	0	BDL	BDL	1	1	1	1	BDL
А3	ONGC/FRI	BDL	0	BDL	BDL	1	1	1	1	BDL
A4	ISBT	3	0	BDL	6	1	1	3	3	6
A5	Rajpur Road	BDL	0	BDL	BDL	1	1	1	1	BDL
A6	Raipur	BDL	0	BDL	BDL	1	1	1	I	BDL
A7	Wildlife Institute of India	BDL	0	BDL	BDL	1	1	1	1	BDL

BDL: Below Detectable Limit

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

All values in $\mu g/m^3$

										1 2
Site	Location	Mean	6.0	Min	Max			Percentile		
Code	Location	Mean	S.D	MIIN	Max				80 th	98 th
A1	Ghanta Ghar	6	0	5	6	5	5	6	6	6
A2	Survey Area	4	0	4	5	4	4	4	5	5
А3	ONGC/FRI	4	0	4	5	4	4	4	5	5
A4	ISBT	6	0	5	6	5	5	6	6	6
A5	Rajpur Road	4	0	4	5	4	4	4	5	5
A6	Raipur	4	0	4	5	4	4	4	5	5
A7	Wildlife Institute of India	4	0	4	5	4	4	4	4	5

Average, Cumulative Percentile, Maxima & Minima Ozone (\mathcal{O}_{3})

Site	Location	Mean	S.D	Min	Max			Percentile	÷	
Code	Location	Mean	را.د	MIII	Max				80 th	98 th
A1	Ghanta Ghar	19	1	16	22	18	18	20	20	22
A2	Survey Area	18	1	16	21	17	17	18	19	21
А3	ONGC/FRI	18	1	16	20	16	17	18	19	20
A4	ISBT	17	1	16	20	16	16	17	18	20
A5	Rajpur Road	18	1	16	21	17	18	18	19	21
A6	Raipur	17	1	15	20	16	16	17	18	19
Α7	Wildlife Institute of India	18	1	16	20	16	17	18	19	20



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

Site	Location	Mann	S.D	Min	Maria			Percentile	;	
Code	Location	Mean	۵.0	Pilli	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	0.2	0.0	0.0	0.3	0.2	0.2	0.2	0.3	0.3
A2	Survey Area	0.2	0.0	0.0	0.2	0.1	0.2	0.2	0.2	0.2
А3	ONGC/FRI	0.2	0.0	0.0	0.2	0.1	0.2	0.2	0.2	0.2
A4	ISBT	0.3	0.1	0.0	0.3	0.2	0.2	0.3	0.3	0.3
A5	Rajpur Road	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.2
A6	Raipur	0.2	0.0	0.0	0.2	0.1	0.2	0.2	0.2	0.2
A7	Wildlife Institute of India	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1

WINTER

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

All values in $\mu g/m^3$

Site Code	Location	Mean	S.D	Min	Max	10 th		Percentile		O O th
Code									80 th	98 th
A1	Ghanta Ghar	198	25	150	242	166	180	198	221	240
A2	Survey Area	285	29	242	343	254	262	282	306	338
А3	ONGC/FRI	197	16	179	230	189	194	205	211	228
A4	ISBT	173	14	155	219	165	171	175	185	218
A5	Rajpur Road	189	20	161	228	165	177	185	210	225
A6	Raipur	186	20	154	218	159	166	189	206	216
Α7	Wildlife Institute of India	156	16	133	194	137	144	153	170	191

Average, Cumulative Percentile, Maxima & Minima Respirable Suspended Particulate Matter (RSPM) PM_{2.5}

All values in $\mu g/m^3$

								, ,,,,	V G 10 0 0 1	
Site	Location	Mean	S.D	Min	Max			Percentile		
Code	Location	Mean	ر.د	Pilli	Max				80 th	98 th
A1	Ghanta Ghar	135	17	102	165	113	122	135	150	163
A2	Survey Area	188	19	160	226	168	173	186	202	223
А3	ONGC/FRI	126	10	114	147	121	124	131	135	146
A4	ISBT	120	9	107	151	114	118	121	127	150
A5	Rajpur Road	133	14	113	160	115	124	130	147	158
A6	Raipur	126	14	104	147	108	112	128	139	146
Α7	Wildlife Institute of India	95	10	81	118	84	88	93	103	116

Average, Cumulative Percentile, Maxima & Minima Sulphur-Dioxide (SO₂)

All values in $\mu g/m^3$

Site	Location	Mean	S.D	Min	Max	Percentile				
Code	Location	Mean	۵.0	MIIN	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	2	0	1	3	2	2	2	2	3
A2	Survey Area	BDL	0	1	BDL	1	1	2	2	2
А3	ONGC/FRI	2	0	1	BDL	1	2	2	2	2
A4	ISBT	BDL	0	1	3	2	2	2	2	3
A5	Rajpur Road	BDL	0	1	BDL	2	2	2	2	2
A6	Raipur	BDL	0	1	BDL	2	2	2	2	2
Α7	Wildlife Institute of India	BDL	0	1	BDL	1	1	2	2	2

BDL: Below Detectable Limit

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

All values in $\mu g/m^3$

Site	Location	Mann	5 D	Percentile Percentile						
Code	Location	Mean	S.D	Min	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	8	1	7	10	8	8	8	9	9
A2	Survey Area	6	0	6	7	6	6	6	7	7
А3	ONGC/FRI	7	0	6	8	6	6	6	7	8
A4	ISBT	8	1	7	10	8	8	8	9	10
A5	Rajpur Road	7	0	6	8	6	6	7	7	8
A6	Raipur	7	0	6	8	6	6	7	7	8
A7	Wildlife Institute of India	6	0	6	8	6	6	6	7	8

Average, Cumulative Percentile, Maxima & Minima Ozone ($\mathcal{O}_{_{\mathbf{3}}}$)

All values in µg/m³

										p.g,
Site	Location	Mean	S.D	Min	Max			Percentile		
Code	Location	Mean	را.د	Min	Max				80 th	98 th
A1	Ghanta Ghar	15	1	12	16	13	14	15	15	16
A2	Survey Area	14	1	12	16	13	13	14	15	16
А3	ONGC/FRI	14	1	12	15	12	13	14	14	15
A4	ISBT	13	1	12	15	12	12	13	14	15
A5	Rajpur Road	14	1	12	16	13	14	14	15	16
A6	Raipur	13	1	11	15	12	12	13	14	15
Α7	Wildlife Institute of India	13	1	12	15	12	13	14	14	15

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

Site	Location	Mean	S.D	Min	Max	Percentile				
Code	Location	Mean	۵.۷	MIIN	Max	10 th	25 th	50 th	80 th	98 th
A1	Ghanta Ghar	0.4	0.0	0.3	0.4	0.3	0.3	0.4	0.4	0.4
A2	Survey Area	0.3	0.0	0.2	0.4	0.2	0.2	0.3	0.3	0.4
А3	ONGC/FRI	0.2	0.1	0.2	0.4	0.2	0.2	0.2	0.3	0.4
A4	ISBT	0.4	0.1	0.3	0.5	0.3	0.4	0.4	0.4	0.5
A5	Rajpur Road	0.2	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2
A6	Raipur	0.3	0.0	0.2	0.3	0.2	0.2	0.3	0.3	0.3
Α7	Wildlife Institute of India	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1

SUMMER SEASON

Location	TIME	Type	Number	CO (kg/h)	HC (kg/h)	Nox (kg/h)	S02 (kg/h)	Particulate (kg/h)
Ghanta Ghar	9:00AM TO 6:00PM	2 Wheeler	4519.0	104.2	97.5	19.7	0.4	0.1
		3 Wheeler	3254.0	75.0	70.2	14.2	0.3	0.1
		Car	5132.0	118.3	110.8	22.4	0.4	0.1
		Truck	3940.0	90.8	85.0	17.2	0.3	0.1
		Bus	3522.0	81.2	76.0	15.4	0.3	0.1
		LCV	3135.0	72.3	67.7	13.7	0.3	0.1
		TOTAL	23502.0	541.8	507.2	102.5	1.9	0.6
ISBT	9:00AM TO 6:00PM	2 Wheeler	1267.0	29.2	27.3	49.7	918.6	0.3
		3 Wheeler	173.6	4.0	33.7	6.8	125.9	0.0
		Car	231.0	5.3	44.9	9.1	167.5	0.1
		Truck	499.8	11.5	97.1	19.6	362.4	0.1
		Bus	296.8	6.8	57.7	11.6	215.2	0.1
		LCV	162.4	3.7	31.5	6.4	117.7	0.0
		TOTAL	2630.6	60649.9	292.2	103.3	1907.2	0.6
ONGC/FRI	9:00AM TO 6:00PM	2 Wheeler	41.2	38.6	7.8	0.1	0.0	41.2
		3 Wheeler	28.8	27.0	5.5	0.1	0.0	28.8
		Car	43.3	40.5	8.2	0.2	0.0	43.3
		Truck	32.1	30.0	6.1	0.1	0.0	32.1
		Bus	20.2	18.9	3.8	0.1	0.0	20.2
		LCV	13.4	12.5	2.5	0.0	0.0	13.4
		TOTAL	179.0	167.6	33.9	0.6	0.2	179.0
Survey Area	9:00AM TO 6:00PM	2 Wheeler	2577.0	59.4	55.6	11.2	0.2	0.1
		3 Wheeler	1341.0	30.9	28.9	5.8	0.1	0.0
		Car	3277.0	75.6	70.7	14.3	0.3	0.1
		Truck	2064.0	47.6	44.5	9.0	0.2	0.1
		Bus	1148.0	26.5	24.8	5.0	0.1	0.0
		LCV	1078.0	24.9	23.3	4.7	0.1	0.0
		TOTAL	11486.0	264.8	247.9	50.1	0.9	0.3

POST-MONSOON SEASON

Location	TIME	Type	Number	CO (Kg/h)	HC (Kg/h)	NOx (Kg/h)	So2 (Kg/h)	Particulate (Kg/h)
Ghanta Ghar	9:00 am to 6:00 pm	2 Wheeler	3873.60	89.31	83.61	16.89	0.31	0,10
		3 Wheeler	2788.80	64.30	60,19	12.16	0.22	0.07
		Car	4399.20	101.43	94.95	19.19	0.35	0.11
		Truck	3376.80	77.85	72.88	14.73	0.27	0.08
		Bus	3019.20	69.61	65.16	13.17	0.24	0.08
		LCV	2686.80	61.95	57.99	11.72	0.22	0.07
		TOTAL	20144.40	464.44	434.78	87.85	1.62	0.50
ISBT	9:00 am to 6:00 pm	2 Wheeler	1086.00	25.04	25.04	23.44	4.74	0,09
		3 Wheeler	148.80	3.43	3.43	3.21	0.65	0.01
		Car	198.00	4.57	4.57	4.27	0.86	0,02
		Truck	428.40	9.88	9.88	9.25	1.87	0.03
		Bus	254.40	5,87	5.87	5.49	1.11	0.02
		LCV	139.20	3.21	3.21	3.00	0.61	0,01
		TOTAL	2254.80	51.99	51.99	48.67	9.83	0.18
ONGC/ FRI	9:00 am to 6:00 pm	2 Wheeler	1532.40	35.33	33,07	6.68	0.12	0,04
		3 Wheeler	1071.60	24.71	23.13	4.67	0.09	0.03
		Car	1608.00	37.07	34,71	7.01	0.13	0.04
		Truck	1191.60	27.47	25.72	5.20	0.10	0.03
		Bus	752.40	17.35	16.24	3.28	0.06	0.02
		La	498.00	1L48	10.75	2.17	0.04	0.01
		TOTAL	6654.00	153.41	143.62	29.02	0.54	0.17
Survey Area	9:00 am to 6:00 pm	2 Wheeler	2209.20	50.93	47.68	9.63	0.18	0.06
		3 Wheeler	1149.60	26.50	24,81	5.01	0.09	1.03
		Car	2809.20	64.77	60,63	12.25	0.23	0,07
		Truck	1768.80	40.78	38.18	7.71	0.14	0.04
		Bus	984.00	22.69	21.24	4.29	0.08	0,02
		LCV	924.00	21.30	19.94	4.03	0.07	0.02
		TOTAL	9844.80	226.98	212.48	42.93	0.79	0.25

WINTER SEASON

Location	TIME	Type	Number	CO (Kg/h)	HC (Kg/h)	NOx (Kg/h)	So2 (Kg/h)	Particulate (Kg/h)
Ghanta Ghar	9:00AM TO 6:00PM	2 Wheeler	3228.0	74.4	69.7	14.1	0.3	0.1
		3 Wheeler	2324.0	53.6	50.2	10.1	0.2	0.1
		Car	3666.0	84.5	79.1	16.0	0.3	0.1
		Truck	2814.0	64.9	60.7	12.3	0.2	0.1
		Bus	2516.0	58.0	54.3	11.0	0.2	0.1
		LCV	2239.0	51.6	48.3	9.8	0.2	0.1
		TOTAL	16787.0	387.0	362.3	73.2	1.4	0.4
ISBT	9:00AM TO 6:00PM	2 Wheeler	905.0	20.9	19.5	3.9	0.1	0.0
		3 Wheeler	124.0	2.9	2.7	0.5	0.0	0.0
		Car	165.0	3.8	3.6	0.7	0.0	0.0
		Truck	357.0	8.2	7.7	1.6	0.0	0.0
		Bus	212.0	4.9	4.6	0.9	0.0	0.0
		LCV	116.0	2.7	2.5	0.5	0.0	0.0
		TOTAL	1879.0	43.3	40.6	8.2	0.2	0.0
ONGC/ FRI	9:00AM TO 6:00PM	2 Wheeler	1277.0	29.4	27.6	5.6	0.1	0.0
		3 Wheeler	893.0	20.6	19.3	3.9	0.1	0.0
		Car	1340.0	30.9	28.9	5.8	0.1	0.0
		Truck	993.0	'!'*.9	21.4	4.3	0.1	0.0
		Bus	627.0	14.5	13.5	2.7	0.1	0.0
		LCV	415.0	9.6	9.0	1.8	0.0	0.0
		TOTAL	5545.0	127.8	119.7	24.2	0.4	0.1
Survey Area	9:00AM TO 6:00PM	2 Wheeler	18 41.0	0.0	0.0	0.0	0.0	0.0
		3 Wheeler	958.0	0.0	0.2	0.0	0.0	0.0
		Car	2341.0	0.1	0.5	0.0	0.0	0.0
		Truck	1474.0	0.0	0.3	0.0	0.0	0.0
		Bus	820.0	0.0	0.2	0.0	0.0	0.0
		LCV	770.0	0.0	0.1	0.0	0.0	0.0
		TOTAL	8204.0	189.1	1275.7	35.8	0.7	0.2



ANNEXURE 3

AIR QUALITY DATA FOR DEHRADUN

Ambient Air Quality (Year 2014)

Month		Clock Tower		Raipur Road			
Month		Sensitive			Sensitive		
	P.M.10	SO2	NO2	P.M.10	SO2	NO2	
January	183.05	25.86	29.61	161.52	24.95	28.7	
February	150.88	25.5	29.64	122.56	25.2	29.37	
March	115.85	25.6	29.65	152.1	26.16	30.83	
April	162.71	26.24	30	156.65	27.24	29.83	
May	150.3	26.61	29.87	154.33	26.33	29.46	
June	162.9	25.19	29.14	153.79	25.74	29.43	
July	145.62	24.48	26.35	99.28	26.29	28.41	
August	130.55	26.75	29	133.64	25.58	28.12	
September	129.64	26.12	29.22	111.6	25.99	28.76	
October	160.42	25.59	29.51	150.42	26.88	30.08	
November	154.76	25.51	29.6	157.26	27.39	30	
December	183.66	26	30.17	188.26	26.28	29.6	
Average	152.52	25.78	29.31	145.11	26.16	29.38	
Standards: Annual 24 hours	60 100	20 80	30 80	60 100	20 80	30 80	

Ambient Air Quality (Year 2015)

M II		Clock Tower		Raipur Road				
Month		Sensitive			Sensitive			
	P.M.10	SO2	NO2	P.M.10 SO2 NO2				
January	169.16	26.4	31.43	177.33	26.27	30		
February	152.39	26	30.11	166.66	26.18	29.38		
March	163.84	26.97	29.71	li	Instrument failure			
April	149.47	27.11	29.86	143.12	26.62	29.78		
May	196.71	27.23	30.34	153.92	27.14	30.49		
June	141.37	27.24	30.9	145.2	26.97	30.25		
July	125.82	26.4	29.89	126.61	27.87	30.83		
August	110.11	26.06	29.78	142.17	26.29	30.24		
September	147.84	26.69	29.39	130.76	26.02	27.66		
October	146.53	26.38	29.37	144.84	25.76	28.45		
November	189.83	25.75	29.06	199.22	25.39	29.11		
December	221.49	25.61	29.22	179.08 25.2 28.71		28.71		
Average	159.54	26.48	29.92	155.35 26.33 29.5		29.53		
Standards								
Annual	60	20	30	60	20	30		
24 hours	100	80	80	100	80	80		

Ambient Air Quality Characterstics (Year 2016)

City			Dehr	adun			
Locations		Clock Tower			Raipur Road		
Zone		Commercial		Commercial/Residential			
Month	P.M.10 (µg/m³)	SO2 (μg/m³)	NO2 (μg/m³)	P.M.10 (µg/m³)	SO2 (μg/m³)	NO2 (μg/m³)	
January	226.92	25.38	29.38	219.5	25.22	29.23	
February	187.88	25.17	29.1	235.1	26.08	29.69	
March	194.92	24.92	29.3	236.6	26.42	29.63	
April	209.79	25.06	29.96	377.76	27.65	30.73	
May	160.17	25.14	29.3	298.34	26.99	29.42	
June	141.8	24.08	27.06	483.18	26.16	28.77	
July		Rainfall		164	24.82	27.6	
August	142.18	24.3	28.47	174.3	25.22	28.13	
September	153.45	2566	27.86	189.42	25.23	28.31	
October	175.79	25.62	27.77	206.18	26.1	28.1	
November	186.22	26	28.59	190.81	26.59	29.14	
December	201.52	25.07	28.49	167.59	24.61	29.2	
Average	180.05	25.07	28.66	245.23	25.92	28.99	
Standards							
Annual	60	20	30	60	20	30	
24 hours	100	80	80	100	80	80	

Ambient Air Quality Characterstics (Year 2017)

City		Dehradun								
Locations		Clock Tower			Raipur Road					
Zone		Commercial		Commercial/Residential						
Month	P.M.10 (µg/m³)	SO2 (µg/m³)	NO2 (μg/m³)	P.M.10 (µg/m³)	SO2 (µg/m³)	NO2 (µg/m³)				
January	162.36	24.75	27.58	174.79	23.32	27.89				
February	164.99	25.27	28.25	191.82	25.52	28.18				
March	214.69	26.51	30.18	216.13	27	29.54				
April	239.69	26.84	31.11	225.85	28.16	30.67				
May	230.9	25.24	28.78	297.19	27.47	30.59				
June	244.91	25.68	28.68	255.97	26.8	28.43				
July	170.81	24.85	27.9	156.76	26.08	27.81				
August	120	23.43	28.13	150.93	24.65	28.06				
September	157	24.06	28.02	179.87	24.71	29				
October	178.92	23.11	26.4	325.65	24.68	28.32				
November										
December										
Average	188.427	24.974	28.503	217.496	25.839	28.849				

Ambient Air Quality Characteristics (Year 2018)

City		Dehradun								
Locations		Clock Tower		Raipur Road						
Zone		Commercial		Commercial/Residential						
Month	P.M.10 (µg/m³)	SO2 (μg/m³)	NO2 (μg/m³)	P.M.10 (µg/m³)	SO2 (µg/m³)	NO2 (μg/m³)				
January	198.04	IF	IF	228.18	IF	IF				
February	201.47	IF	IF	192.66	IF	IF				
March	219.31	IF	IF	188.48	IF	IF				
April	193.29	IF	IF	199.02	IF	IF				
May	206.7	IF	IF	195.57	IF	IF				
June										
July										
August										
September										
October										
November										
December										
Average										





Ambient Air Monitoring at Dehradun for Post Monsoon Season Average, Cumulative Percentile, Maxima & Minima Respirable Suspended Particulate Matter (RSPM) ${\rm PM}_{10}$

Site Code	Location	Mean	S.D	Min	Max	Percentile				
									80 th	98 th
A1	Ghanta Ghar	180	23	136	220	151	164	180	201	218
A2	Survey Area	272	27	230	327	242	249	269	291	322
А3	ONGC/FRI	177	14	161	207	170	175	185	190	206
A4	ISBT	160	13	144	202	153	158	162	171	202
A5	Rajpur Road	174	18	148	209	151	162	170	193	207
A6	Raipur	176	19	145	205	150	157	178	194	204
A7	Wildlife Institute of India	143	15	122	178	126	132	140	156	175

Clean Air Asia Center Office

Unit 3505 Robinsons Equitable Tower ADB Avenue, Pasig City, 1605 Philippines Tel +63 2 631 1042 Fax +63 2 6311390 center@cleanairasia.org

Clean Air Asia China Office

11-152, JianGuoMenWai Diplomatic Residence Compound, No.1 XiuShui Street, ChaoYang District Beijing 100600 China Tel/Fax: + 8610 8532 6172 china@cleanairasia.org

Country Networks in

China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Vietnam

www.cleanairasia.org