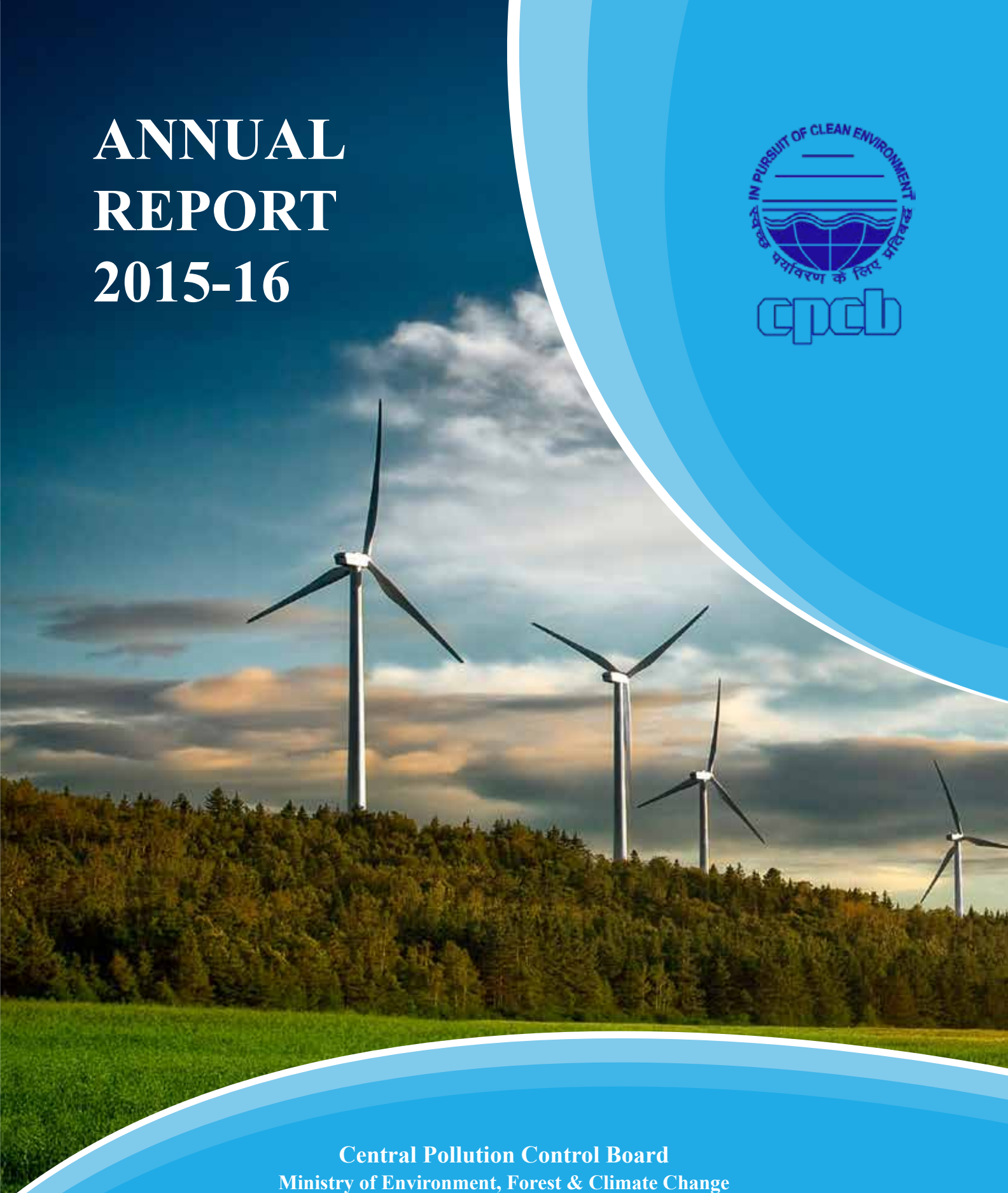
ANNUAL REPORT 2015-16



Central Pollution Control Board
Ministry of Environment, Forest & Climate Change
Website: www.cpcb.nic.in

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CHAPTER – I

INTRODUCTION

Under the provisions of The Water (Prevention & Control of Pollution) Act, 1974, the Central Government constituted the **'Central Board for the Prevention and Control of Water Pollution'** on September 23, 1974. The name of the Central Board was amended to **Central Pollution Control Board (CPCB)** under the Water (Prevention & Control of Pollution) Amendment Act, 1988 (No. 53 of 1988). The Central Pollution Control Board has been entrusted with the added responsibilities of Air Pollution Control since May, 1981 under the provisions of the Air (Prevention and Control of Pollution) Act, 1981. The enactment of the Environment (Protection) Act, 1986, which is umbrella legislation for enforcement of measures for protection of environment and several notifications of Rules under the Act widened the scope of activities of the Central Board.

The CPCB has been continuously playing a key role in abatement and control of pollution in the country by generating, compiling and collating data, providing scientific information, rendering technical inputs for formation of national policies and programmes, training and development of manpower and through activities for promoting awareness at different levels of the Government and Public at large.

1.1 FUNCTIONS OF THE CENTRAL BOARD

The main functions of CPCB, as spelt out in The Water (Prevention and Control of Pollution) Act, 1974, and The Air (Prevention and Control of Pollution) Act, 1981, are:

(i) To promote cleanliness of streams and wells in different areas of the States through prevention, control and abatement of water pollution; and,

(ii) To improve the quality of air and to prevent, control or abate air pollution in the country.

In addition to the main functions of promoting cleanliness of streams and wells, improving the quality of air and to prevent, control or abate air pollution, CPCB has been assigned following National Level functions:

- Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air;
- Plan and cause to be executed a nation wide programme for the prevention, control or abatement of water and air pollution;
- Co ordinate the activities of the State Boards and resolve disputes among them;
- Provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of water and air pollution, and for their prevention, control or abatement;
- Plan and organise training of persons engaged in programmes for prevention, control or abatement of water and air pollution;
- Organise through mass media, a comprehensive mass awareness programme on prevention, control or abatement of water and air pollution;
- Collect, compile and publish technical and statistical data relating to water and air pollution and the measures devised for their effective prevention, control or abatement;
- Prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devices, stacks and ducts;

- Disseminate information in respect of matters relating to water and air pollution and their prevention and control;
- Lay down, modify or annul, in consultation with the State Governments concerned, the standards for stream or well, and lay down standards for the quality of air;
- Establish or recognize laboratories to enable the Board to perform, and;
- Perform such other functions as and when prescribed by the Government of India.

1.2 FUNCTIONS OF THE CENTRAL BOARD AS STATE BOARD FOR THE UNION TERRITORIES

- Advise the Governments of Union Territories with respect to the suitability of any premises or location for carrying on any industry which is likely to pollute a stream or well or cause air pollution;
- Lay down standards for treatment of sewage and trade effluents and for emissions from automobiles, industrial plants, and any other polluting source;
- Evolve efficient methods for disposal of sewage and trade effluents on land;
- Develop reliable and economically viable methods for treatment of sewage, trade effluents and air pollution control equipment;
- Identify any area or areas within Union Territories as air pollution control area or areas to be notified under The Air (Prevention and Control of Pollution) Act, 1981; and
- Assess the quality of ambient air and water, and inspect wastewater treatment installations, air pollution control equipments, industrial plants or manufacturing processes to evaluate their performance and to take steps for the prevention, control and abatement of air and water pollution.

1.3 DELEGATION OF POWERS BY CENTRAL POLLUTION CONTROL BOARD

As per the policy decision of the Government of India, the Central Pollution Control Board, delegated its powers and functions from time to time under Section 4, Sub Section 4 of The Water (Prevention and Control of Pollution) Act, 1974 and Section 6 of The Air (Prevention and Control of Pollution) Act, 1981 with respect to various Union Territories to respective Pollution Control Committees under the administrative control of local Administration **(Annexure-I)**.

CHAPTER – II

CONSTITUTION OF THE CENTRAL BOARD

2.1 According to the provisions of The Water (Prevention & Control of Pollution) Act, 1974, the Central Board consists of the following members:

- A full time Chairman, being a person having special knowledge or practical experience in respect of matters relating to environmental protection or a person having knowledge and experience in administering institutions dealing with the matters aforesaid, to be nominated by the Central Government;
- such number of officials, not exceeding five, to be nominated by the Central Government to represent Government;
- such number of persons, not exceeding five, to be nominated by the Central Government, from amongst the members of the State Boards, of whom not exceeding two shall be from amongst the members of the local authorities;
- such number of non officials, not exceeding three to be nominated by the Central Government, to represent the interest of agriculture, fishery or industry or trade or any other interest which, in the opinion of the Central Government, ought to be represented;
- two persons to represent the companies or corporations owned, controlled or managed by the Central Government, to be nominated by the Government; and
- A full time Member Secretary, possessing qualifications, knowledge and experience of scientific, engineering or management aspects of pollution control, to be appointed by the Central Government.

2.2 List of Board Members during year 2015 - 2016 is provided at **Annexure-II**. The organisation structure of the Central Pollution Control Board is provided at **Annexure-III**. Staff strength as on March 31, 2016 is furnished in **Annexure-IV**.

CHAPTER – III

MEETINGS OF CENTRAL POLLUTION CONTROL BOARD

3.1. MEETINGS OF THE CENTRAL BOARD

During the reporting period (i.e. April 1, 2015 to March 31, 2016), four meetings of the Central Board were held as under:

S.No.	Meeting No.	Date	Place
1.	169TH	June 30, 2015	MoEF&CC, New Delhi
2.	170TH	September 30, 2015	MoEF&CC, New Delhi
3.	171ST	December 23, 2015	MoEF&CC, New Delhi
4.	172ND	March 23, 2016	CPCB, Delhi

3.2 MAJOR DECISIONS TAKEN BY THE BOARD

1. Agreed for the revision of Delegation of Powers particularly with reference to Administrative and Financial matters.
2. Agreed with the proposal that CPCB should direct local bodies of Ganga towns as well as others to set-up STPs and online monitoring devices. It also suggested taking actions under the law against the defaulting local bodies.
3. Agreed that CPCB should move forward for issuing directions under Section 5 of EPA to the Municipal Commissioners of Million Plus Cities, State Capitals, Authorities of important religious and tourist places and importantly to 118 towns on River Ganga. The Board also agreed that actions under the law should be taken against the defaulting municipalities.
4. Agreed the CEPI formula and referring it to MoEF&CC for further directions.
5. Agreed that the data for Water Quality index will be collected and digitized on monthly basis for publication by respective Zonal Offices for the states in their jurisdiction. CPCB will publish the index on river Yamuna and Ganga. The gaps of data will be intimated to SPCBs and Zonal Offices of CPCB for the year 2015. Zonal Offices will pursue SPCBs/PCCs for submission of data on monthly basis for WQ Index and the digitized data will be used for preparation of annual compendium and reimbursement of expenditure.
6. Agreed that CPCB may constitute a Committee of Technical Experts and disseminate information on technologies and their applicability relating to sewage and solid waste management.
7. Agreed to the proposal of setting of CAAQMS in 46 Million plus Cities and 20 state Capitals from CSR funds of CPSUs.
8. Accepted the proposal for amendment in the Central Pollution Control Board (Qualification and other Terms and Conditions of Services of Chairman), Rules, 2015 notified vide notification G.S.R. 221(E) dated the 23rd March, 2015.

3.3. REGIONAL CONFERENCE

The 59th Conference of Chairmen & Member Secretaries of Pollution Control Boards / Committees (SPCBs/ PCCs) was organised during April 08, 2015 at New Delhi.

The major issues discussed during the meeting are as follows:

- Identification of new Polluted River Stretches and Setting up of Continuous Water Quality Monitoring Stations (CWQMS),
- Management of Sewage and Enforcement of Standards,
- Review of the Primary Water Quality Criteria for bathing water (water used for organized outdoor bathing) under the Environment (Protection) Rules, 1986.
- Setting up of CAAQMS in Million Plus Cities and Connectivity of CAAQMS in CPCB,
- Air quality index for cities and air quality management plans
- Compliance to the Direction to issued by CPCB on 05.02.2014 to SPCBs/PCCs regarding self-monitoring of compliance by setting-up of online effluent and emission monitoring systems by highly polluting industries, CETPs, CHWTSDFs and CBMWTFs
- Guidelines on techno-economic feasibility of implementation of Zero Liquid Discharge (ZLD) for Water Polluting Industries and Action Plans for Pulp & Paper, Distilleries, Tanneries, sugar and Textiles
- Issues related to critically polluted areas and severally polluted areas
- Securing industrial pollution control in accordance with Water and Air Act by linking with categorization of industries, consent management and vigilance – 'In context of Red, Orange and Green categorization of industries
- Remediation of Contaminated Sites under National Clean Energy Fund (NCEF)

CHAPTER – IV

COMMITTEES CONSTITUTED BY THE BOARD & THEIR ACTIVITIES

CHAPTER – V

AIR, WATER AND NOISE MONITORING NETWORK

5.1 WATER QUALITY MONITORING

5.1.1 REAL TIME WATER QUALITY MONITORING SYSTEM (RTWQMS) ON RIVER GANGA AND YAMUNA

The Real Time Water Quality Monitoring Stations (RTWQMS) on river Ganga have been established at 8 locations to assess the water quality in the relatively clean segment in Uttarakhand at Haridwar followed by Kannauj, Kanpur, Allahabad and Varanasi in the polluted segment in Uttar Pradesh. The monitoring location at Patna and Kolkata in Bihar and West Bengal respectively are in the regenerated flow segment.

On river Yamuna RTWQMS is installed at 2 locations viz.Wazirabad and Okhla in Delhi to assess water quality of river Yamuna entering in Delhi (at water intake point of Wazirabad) and impact of wastewater load reaching through several drains of Delhi at Okhla when river Yamuna leaves Delhi.

SETTING UP OF REAL TIME WATER QUALITY MONITORING SYSTEM (RTWQMS)

In view of limitations in the manual system of monitoring pilot project has been executed to set up Real Time Water Quality Monitoring System on river Ganga and Yamuna in association with the State Pollution Control Board of Uttarakhand, Uttar Pradesh, Bihar, West Bengal. The network monitoring stations are assessing the water Quality for 10 parameters with a programmed frequency of 15 minutes and transmitting the data to Central Receiving station at CPCB server for visualisation.

The monitoring network comprises of 10 stations. Both fixed and floating type of real time system is installed.

FEATURES OF REAL TIME WATER QUALITY MONITORING SYSTEM (RTWQMS)

RTWQMS comprises of sensors for 10 parameters (pH, turbidity, conductivity, temperature, Dissolved Oxygen, Dissolved ammonia, Bio-chemical Oxygen demand (BOD), Chemical Oxygen Demand (COD), nitrate and chlorides.

All the remote stations are functional in real mode and the central station is able to access re-mote station at any time. The Remote stations are field operational, tolerant to extreme environmental conditions, rugged and do not require manual intervention except routine calibration. Power supply is assured with solar panels and batteries at each remote station.

Central Receiving station has capability to receive, analyze and archive the data received from ten unmanned

remote stations with parameter value graphs.

Water quality data received from manual monitoring for river Ganga at 8 locations and 2 locations on river Yamuna is tabulated and compared with Real time data obtained through RTWQMS is given in Table 5.1.

Table COMPARATIVE TABLE OF MANUAL AND REAL TIME WATER QUALITY DATA RANGES (2013-15)

Location Name	Type of Monitoring	B.O.D (mg/l)	DO (mg/l)	Temp (0C)	Cond *	PH
Haridwar	Manual	0 - 10	5 - 8.5	10 - 30	100 - 500	6.5 - 8.5
	Real Time	0-10	5 - 15	10 - 30	100 – 300	6.0 - 8.5
Kannauj	Manual	2 - 7	4 - 10	12 - 30	200 - 700	6.5 - 8.5
	Real Time	0 - 10	3 – 12	8.0 – 30	100 – 600	6.0 – 10.0
Kanpur	Manual	4 - 15	2 - 8	15 -30	200 - 800	6.5 – 8.5
	Real Time	0 - 30	0 - 8	10 – 35	100 – 1000	6.0 – 9.0
Allahabad	Manual	3-5	6-9	15 - 25	250 - 700	7.5 - 8.5
	Real Time	0-10	10-12	5 - 35	100 – 800	6.0 - 9.0
Varanasi U/S	Manual	3-15	8-9	15 - 25	150 - 350	7.0 - 8.5
	Real Time	0-15	0-10	15 - 35	100 – 500	7.0 - 8.5
Varanasi D/s	Manual	4-16	6-8	20 - 30	200 - 450	8 - 9
	Real Time	0-10	0 - 15	16 - 32	100 – 550	7.5 - 9
Patna	Manual	2-3	7.5 - 9.5	15 - 35	200 - 500	7.5 - 8.5
	Real Time	0-10	2.5 - 9.0	10 - 32	100 - 550	6.5 - 8.5
Kolkata	Manual	2-5	5.0 -10.0	20 - 30	200 -400	8.0 - 8.5
	Real Time	0 - 15	0.0 – 8.0	5 - 30	50 - 400	8.0 – 8.5
Wazirabad	Manual	1-5	5.5-15.5	10-30	200-1000	7.2-8.6
	Real Time	0 - 8	0.0 - 12	5 - 35	100-1000	6.5 – 8.5
Okhla	Manual	9-97	0.6-2.9	13-30	300-1500	7.0-8.0
	Real Time	0 -150	0.0 -0.5	10 – 35	50 – 1500	6.0 – 8.5

5.1.2 Interstate River Boundary monitoring

Water quality assessment includes the use of monitoring to define the condition of the water, to provide the basis for detecting trends and to provide the information enabling the establishment of cause-effect relationships. Pollution and water quality degradation interfere with vital and legitimate water uses at any scale, i.e. local, regional or international in general, pollutants can be released into the environment as gases, dissolved substances or in the particulate form. Ultimately pollutants reach the aquatic environment through a variety of pathways, including the atmosphere and the soil. In respect to this approach, Central Pollution Control Board, Delhi under the Section 16 2(b) of the Water (Prevention and Control of Pollution) Act, 1974 coordinate the activities of the State Boards and resolve disputes among them by monitoring out locations spread over rivers all over India on quarterly basis.

Main interstate water disputes in India:

1. The Cauvery water dispute between Karnataka, Kerala, and Tamil Nadu.
2. The Krishna water dispute between Maharashtra, Karnataka, and Andhra Pradesh.
3. The Tungbhadra water dispute between Andhra Pradesh and Karnataka.

4. The Godavari water dispute between Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, and Orissa.
5. The Narmada water dispute between Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan.
6. The Ravi and Beas water dispute between Punjab, Haryana, Rajasthan, Delhi, and Jammu and Kashmir.
7. The Yamuna River water dispute between Uttar Pradesh, Haryana, Himachal Pradesh, Punjab, Rajasthan, Madhya Pradesh, and Delhi

Interstate River Boundary Monitoring (IRBM) Network:

CPCB is monitoring water quality of rivers at the interstate borders since 2005. At present, the monitoring is carried out at 85 locations spread over 44 rivers. Monitoring frequency is preferably on quarterly basis though few river locations are monitored once in a year which are either small/seasonal or not carrying any interstate dispute.

ASSESSMENT OF WATER QUALITY OF LOCATIONS OF IRBM NETWORK :

Water quality of rivers monitored at various identified locations covered under IRBM Network is assessed based on the primary water quality criteria of the 04 parameters - DO, BOD, TDS and TC. Locations showing any deviation from prescribed range are considered as polluted.

Parameter	Prescribed standards
BOD	<= 3mg/l
DO	>=5 mg/l
TDS	500 mg/l
TC	500 MPN/100 ml

Source: Primary

Water Quality Criteria for Bathing Water as per the notification at serial no. 93 under Environment (Protection) Rules, 1986

Percentage Variation in Water Quality :

Percentage Variation in water quality w.r.t. DO, BOD, TDS & TC is depicted below in the Figure A -D:

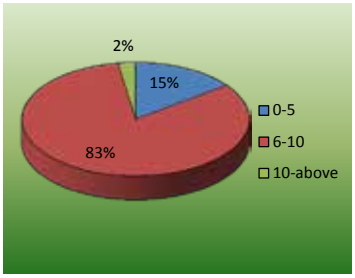


Figure A: DO

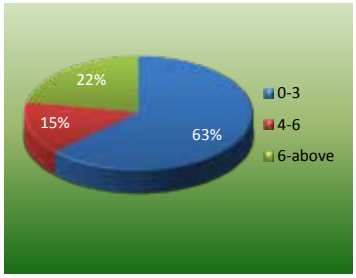


Figure B: BOD

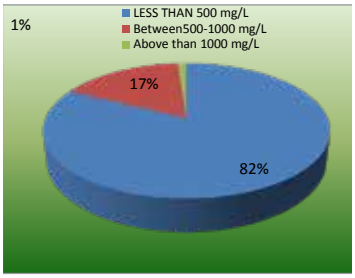


Figure C: TDS

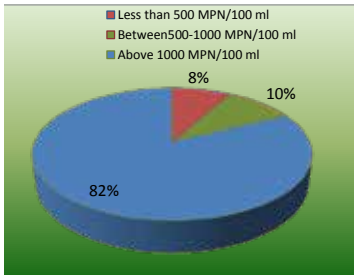


Figure D: TC

Polluted River Locations Identified on Close Observation (based on BOD Concentration):

1. Bahela at Badli Villageganga
2. Thenpennai at Mugalur Bridge (Bangalore)
3. Churni West Bengal
4. Kitcha (Pull Bhatta)
5. Markanda at Naraingarh (Haryana)
6. Ghaggar at Mubarakpur (Punjab)
7. Dhela at Adampur
8. Yamuna at Mohena Palwal road, (Haryana)
9. Yamuna at Asgarpur Village, (U.P)
10. Yamuna at Hasanpur (Haryana)
11. Ghaggar at Sirsa Hanumangarh (Rajasthan)
12. Ghaggar at Sirdulgarh(Punjab)
13. Ghaggar at Sirsa Dabwali Road, (Haryana)
14. Ghaggar at Tiwana village, (Punjab)
15. Ghaggar at Sirsa Hanumangarh Road (Rajasthan)
16. Ghaggar at Chandrapur Siphon (Punjab)
17. Damanganga at D/S of GIDC Weir, Vapi (Gujarat)
18. Damanganga at Zeri causway, (Daman)
19. Tapi at Ajnad(Maharashtra)
20. Tapi at Prakasha(Maharshtra)
21. Krishna at Kurundwad, Kolhapur, (Maharshtra)
22. Godavari at Baser (Kavalguda),Maharashtra
23. Bhima at Gangapur (Bangalore)
24. Mahi at village Bajna (M.P)
25. Sarsa at Baddi, D/S Ghanoli Village, (Punjab)
26. Kosi at Dadiyal Bridge, (Uttrakhand)

Table : Top -10 river locations having maximum BOD level

Sl. No.	River	Location	BOD (mg/l)
1	Bahela	At Badli	36
2	Ghaggar	Hunumangarh	33.89
3	Thenpennai	Mugalpur bridge	17.58
4	Yamuna	Asgarpur(U.P.)	17.11
5	River Churni	West bengal	15
6	Yamuna	Hasampur	13.86
7	Kitcha	pull Bhatta	12.44
8	Yamuna	Mohana Palwal	11.67
9	Ghaggar	Sirdulgarh	8.67
10	Markanda	Naraingarh	8.29

Recommendations for Prevention of Water Pollution:

Deterioration of the water quality of the rivers in the country may be prevented in the following ways:

1. **Sewage treatments:**

   In order to preventwater pollution, human and animal excreta should be prevented from mixing with its sources. Construction of pit latrines (or pit toilet) and proper sewage treatments can offer some solution to this problem.

2. **Prevent river water to get polluted:**

   The flowing water of the river cannot be cleaned easily by natural process. The river water thus stays polluted and may cause several diseases to the people who use it. Thus, every effort should be made to prevent the river water to get contaminated. People should not be allowed to throw wastes into the river water.

3. **Treatment of wastes before discharge:**

   Factories are expected to treat its effluent wastes. Toxic material must be treated chemically and converted into harmless materials.

4. **Strict enforcement of water laws:**

   It is necessary that the laws and legislation made by the Government in this regard are strictly observed and enforced.

5. **Treatment of drainage water:**

   It cities, a huge amount of water is put into drains every day. The water that flows through the city drainage system should be properly treated and harmful pollutants are removed, before they are introduced into reservoirs. If this water allowed going into water reservoirs without treatment, it will pollute them.

6. **Treatment plants:**

   Big cities and towns usually have effluent treatment plants. These plants filter out un-dissolved materials. Chemical treatment is also given to separate out unwanted dissolved chemicals. The treated water is either allowed to go into the water reservoirs or refused in houses. Occasionally, the treated water is used for farming if the fields to be irrigated lie in the vicinity of the water treatment plants.

7. **Keep the pond water clean and safe:**

   Washing, bathing of cattle in the pond thatis used by human should not be done. Washing of dirty clothes and bathing of cattle make the pond water dirty and unsuitable for human use. If these ponds are continually misuses, then it may lead of severe consequences.

8. **Routine cleaning:**

   Ponds, lakes and wells meant for human use should be routinely cleaned and treated, so that it remains fit for human use. It is an essential step that should not be avoided.

9. **Self hygiene:**

   Self hygiene must be maintained and drinking water must not be polluted. Drinking water should be kept undercover in a clean place. One should not put hishands into the drinking water containers. Also, the practice of cleaning the drinking water reservoirs on a regular basis needs to be strictly followed.This is also important toprevent water borne diseases.

10. **Public Awareness:**

    Common public should be aware about the effect of water pollution.Voluntary organization should go door-to-door to educate the people about environmental problems. They should perform street plays for creating awareness about the environment. They should run environmental education centers.

5.1.3 National Ganga River Basin Authority (NGRBA) Cell at CPCB

The Central Government has set up the 'National Ganga River Basin Authority' (NGRBA) vide gazette notification dated 20.2.2009 as a collaborative institution of Central and State Governments under the Environment (Protection) Act of 1986 for abatement of pollution of River Ganga.

The Apex Body of NGRBA is headed by the Prime Minister for policy decisions and the Standing Committee is headed by the Minister of Finance for periodical review of NGRBA programme implementation. The fast track mechanism for implementations of projects under NGRBA programme was constituted by the Union Cabinet in December, 2009. Creation of a Mission Directorate for Clean Mission Ganga and setting up of Empowered Steering Committee (ESC) for appraisal and approval of projects along with monitoring and coordination amongst various Central Ministries and Centre – State coordination were approved. The NGRBA including the Mission Directorate and other related matters of Ganga Rejuvenation was transferred and allotted to the Ministry of Water Resources, River Development & Ganga Rejuvenation vide 306th amendment in the Government of India (Allocation of Business) Rules, 1961 with effect from 1st August, 2014. Further, NGRBA has been reconstituted in September, 2014 with inclusion of additional four Central Ministries i.e. Union Minister of Rural Development, Union Minister for Drinking Water and Sanitation, Union Minister for Shipping and Union Minister of State, Tourism for better coordination to ensure effective abatement of pollution and rejuvenation of the River Ganga.

The objective of the authority is to ensure effective abatement of pollution and conservation of the river Ganga by adopting a holistic approach with the river basin as the unit of planning.

Key features of new approach are as follows:

- River basin will be the unit of planning and management. This is an internationally accepted strategy for integrated management of rivers.
- Accordingly, a new institutional mechanism in the form of National Ganga River Basin Authority (NGRBA) willspearhead river conservation efforts at the national level. Implementation will be by the State Agencies and Urban LocalBodies.
- The new strategy will take into account the competing demands on water and will seek to ensure minimum ecological flows. STPs minimise the pollution load up to discharge standard of BOD of

30mg/litre requiring dilution to achieveriver water quality of 3mg/ litre.

- The minimum ecological flows or the entire Ganga will be determined throughmodelling exercises.
- NGRBA will take appropriate measures to regulate water abstraction for maintaining ecological flows in the river.

Functions ofNGRBA are as follows:

- The NGRBA would be responsible for addressing the problem of pollution in Ganga in a holistic and comprehensive manner. This will include water quality, minimum ecological flows, sustainable access and other issues relevant to river ecology and management.
- The NGRBA will not only be regulatory body but will also have developmental role in terms of planning & monitoring of the river conservation activities and ensuring that necessary resources are available.
- The NRGBA would work for maintaining the water quality of the river Ganga upto acceptable standards. The pollution abetment activities will be taken through the existing implementation mechanisms in the State and also through special Purpose Vehicles (SPVs0 at the pollution hotspots.
- The NGRBA will ensure minimum ecological flow in the Ganga by regulating water abstraction and by promoting water storage projects.
- The NGRBA will plan and monitor programmes for cleaning of Ganga and its tributaries. To being with, it will concentrate on Ganga main stream.
- The NGRBA would draw upon professional expertise within and outside the Government for advice on techno-economic issues.
- The technical and administrative support to NGRBA shall be provided by the Ministry of Environment&for advice on techno-economic issues.

The technical and administrative support to NGRBA shall be provided by the Ministry of Environment & Forests.

Activities under different Projects running by NGRBA

There are three projects being carried out under the National Ganga River Basin Authority Programme are as follows:

Table – 1: Details of Projects under NGRBA Cell

S. N.	Project	Funding Agency	Project Duration	Total Budget (Rs. Crores)	Status
1.	Pollution Inventorization, Assessment and Surveillance on River Ganga (PIAS)	MoEF&CC	5 Years	34.77 (Sanctioned on 29th March, 2011)	Started from 1st April, 2011, ended on 28.03.2016 & further extended upto 28.06.2016.
2.	Water Quality Monitoring (WQM) System for River Ganga	The World Bank	7 Years	94.45	Sanctioned on 19th July, 2013
3.	Strengthening of Environmental Regulators (SER)- CPCB	The World Bank	8 Years	69.26	Sanctioned on 19th July, 2013

Pollution Inventorization, Assessment & Surveillance on River Ganga (PIAS)

The "Pollution, Inventorization, Assessment & Surveillance on River Ganga (PIAS)" project is funded by the Ministry of Environment & Forests and was sanctioned for Rs. 34.77 crores on 29th March, 2011. Under this project NGRBA Cell, CPCB has carried out different activities under monitoring, surveillance of Water

quality of River Ganga from its origin to confluence to Bay of Bengal such as in-depth monitoring of Grossly Polluting Industries (GPI), Sewage Treatment Plants (STP), Common Effluent Treatment Plant (CETP) and Polluted Stretches of River Ganga and its tributaries, besides monitoring of the drains falling into the river.

The objective of the project is to inventorize the pollution sources (both point and non-point) and to assess the pollution load being discharged into the River Ganga directly or indirectly through tributaries, namely Ramganga and Kali-East. The activities carried out under the project during the year 2015-16 are as follows:

Table – 2: Details of different activities under PIAS

S.N.	Activities	No. of Inspections	Note	Remarks
1.	Compliance verification of Grossly Polluting Industries (GPI)	**1855**		
2.	Adequacy Assessment of Common Effluent Treatment Plants (CETP)	**6**		
3.	Performance evaluation of Sewage Treatment Plants (STP)	**51**		
4.	Periodic Pollution assessment of major drains falling into the river Ganga	**192**		
5.	Comprehensive Groundwater Monitoring in adjacent districts of river Ganga	**36**		
6.	Monitoring of Polluted stretch of river Ganga	**163**		
7.	Monitoring of Ghats	**33**		

Compliance verification of Grossly Polluting Industries (GPI)

There are 764 GPIs located in the 5 Ganga states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal). Total number of 1855 GPI inspections are done by CPCB under NGRBA in this year.

Directions under section 5 of Environment (Protection) Act, 1986 & under section 18(1)(b) of Water Act, 1974 were issued to GPIs for the compliance of standards of prescribed water quality criteria during April, 2015 to March, 2016. Overall status of direction compliance of GPIs are as follows;

a) Compliance verification of Grossly Polluting Industries (GPI) as per NGT Orders

The Hon'ble National Green Tribunal vide its different orders had directed CPCB to inspect different industries jointly with UPPCB. In compliance of the orders, CPCB inspected 1279 out of 1505 of the said industries as on 31.03.2016. The NGT vide various consequent orders directed CPCB to inspect more than 1500 industries out of which approx. 879 industries were inspected during April, 2015 to March, 2016. The status of industries inspected in compliance of NGT orders is enclosed as **Annexure I**.

b) Inspection of GPIs for verification of compliance status, achievement of ZLD action plan and status of OCEMS installations:

97 GPIs were inspected by Head Office, CPCB in December 2015-January 2016 under crash program for verification of compliance status, achievement of ZLD action plan and status of OCEMS installations. The list of industries inspected under Head Office, CPCB is given in Annexure II.

C) Show cause notice to 6 Pulp and Paper and 17 Sugar industries

Out of 130 industrial units covering Head Office and ZOs (48 Pulp and Paper, 54 Sugar and 28 Distillery units) inspected from December 2015 to January 2016 in crash inspection, 17 sugar units and 6 pulp and paper units were found to be non-complying. Show cause notices under Section 5 of E (P) Act, 1986 have been issued to these 6 Pulp and Paper and 17 Sugar units for non-compliance with respect to the effluent discharge standards.

d) Directions to 433 Tanneries through 3 CETPs of Kanpur

433 Tanneries have been issued directions under Section 5 of E (P) Act, 1986 through 3 CETPs of Kanpur.

1.2 Adequacy Assessment of Common Effluent Treatment Plants (CETP)

There are 4 Common Effluent Treatment Plants (CETPs) located at the bank of River Ganga at the following locations:

1) CETP at UEM-SIDCUL, Haridwar, Uttarakhand.
2) CETP Leather Technology Park, Banthar, Unnao
3) CETP at Unnao, Uttar Pradesh.
4) CETP at Banthar Unnao at Uttar Pradesh.

All the four CETPs were monitored during the current year. Total number of 6 CETP inspections are done by CPCB under NGRBA in this year.

1.3 Performance evaluation of Sewage Treatment Plants (STP)

There are 65 STPs located in the 5 Ganga states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal). Total number of 51 STP monitoring is done by CPCB under NGRBA in this year.

Inspection of STPs from Haridwar to Kanpur Region in compliance of NGT order

A committee comprising of Member Secretary, CPCB, Member Secretary, UPPCB, Member Secretary, UEPPCB, General Manager of Jal Nigam, Advisor, CP Division, Advisor, National River Conservation Directorate, Prof Kazmi, IIT Roorkee carried out inspection of drains and STPs from Haridwar to Kanpur Region in compliance of NGT order.

6 STPs were monitored (5 STPs at Kanpur and 1 STP at Fatehgarh, Farrukhabad)

- STP (130 MLD) at Jajmau, Kanpur
- STP (5 MLD) at Jajmau, Kanpur
- STP (210 MLD) at Bingawa, Kanpur
- STP (42 MLD) at Sajari, Kanpur
- STP (15 MLD) at Baniyapurwa, Kanpur
- STP (2.7 MLD) at Fatehgarh, Farrukhabad

4 Periodic Pollution assessment of major drains falling into the river Ganga

Total 157 drains (144 in River Ganga, River Kali-East – 9 & River Ramganga - 4) is falling into river Ganga directly or through its tributaries River Kali-East & River Ramganga. Total number of 192 drain monitoring is done by CPCB under NGRBA in this year.

Inspection of drains from Haridwar to Kanpur Region in compliance of NGT order

A committee comprising of Member Secretary, CPCB, Member Secretary, UPPCB, Member Secretary, UEPPCB, General Manager of Jal Nigam, Advisor, CP Division, Advisor, National River Conservation Direcorate, Prof Kazmi, IIT Roorkee carried out inspection of drains and STPs from Haridwar to Kanpur Region in compliance of NGT order.

5 drains were monitored (3 at Kanpur and 2 at Farrukhabad) which are mentioned as follows:

- Wajidpur Drain, Jajmau, Kanpur
- Sisamau Drain, Kanpur
- Permiya Nala, Kanpur
- Bhairav Ghat Drain, Farrukhabad

- Bargadia Ghat Drain at Fatehgarh, Farrukhabad

1.5 Comprehensive Groundwater Monitoring in adjacent districts of river Ganga

Ground water monitoring is done at 33 locations by CPCB under NGRBA in this year.

1.6 Intensive Water Quality Monitoring in Polluted Stretches

163 locations were monitored and samples were collected for surface water monitoring by CPCB under NGRBA in this year.

Monitoring of Ghats

33 Ghats of River Ganga were monitored and samples were collected for surface water monitoring by CPCB under NGRBA in this year.

Water Quality Monitoring on River Ganga Basin:

Real time water quality monitoring

a) Development of RTWQMS network of 113 locations

1st Phase: Contract signed with M/s S: CAN Messtechnik GmbH, Austria and M/s Axix Nano Pvt. Ltd., India (JV).for INR 27 crores for 5 years for 36 locations.

2nd Phase: NOC received for another 16 locations from 83 finalised locations NMCG requested for data procurement for the remaining locations.

b) Engagement of Data Qualifications consultant for validation of RTWQM data

Financial Proposal of RFPs opened, R1 firm quoted Rs. 23.8 crores for 6 years

Status of NOC for Real Time Water Quality Monitoring Stations (RTWQMS) (as on 19.09.2016)

State	Station Type			Total	Site finalized	Site Verification	Site clearance obtained	NOC received after Bid submission for RTWQMS	NOC Awaited		NOC issuing authorities	
	Class I	Class II	Class III								Central Govt.	State Govt.
Uttarakhand	3	4	1	8	7	01	1	04	02		01	01
Uttar Pradesh	21	17	19	57	31	26	21	02	08		08	00
Bihar	4	1	8	13	10	03	4	-	06		00	05
West Bengal	12	14	9	35	34	01	10	10	14	9*	07	12
Total	**40**	**36**	**37**	**113**	**82**	**31**	**36**	**16**	**30#**		**16**	**18**

** Request for NOC sent to both the agencies one of Central Govt. (Indian Railways / NHAI/IWAI/ Kolkata Port Trust) and other State Govt. (PWD / Municipality/ Local Panchayat), which ever received first would be considered for placement of system.*

2.2 Biomonitoring:

1st round of Biomonitoring completed at 66 locations

2nd round is in progress, 66 locations completed

Report of Biomonitoring activities is separately submitted by Bio Lab, CPCB.

2.3 Community Monitoring

Ganga Shravan Abhiyan (GSA) Mobile Apps:

An Initiative of Central Pollution Control Board (CPCB) & National Mission of Clean Ganga (NMCG) for easy and effective participation in Clean Ganga Mission through an APP and Web based / mobile based system. Through this APP CPCB & NMCG offer a platform to receive/redress the complaints.

The platform gives all kinds of options:

– Smart Phone with Android Operating Software

– Simple Phone capable of sending SMS

Web/Internet access to the site to receive the data/opinion/suggestion/ complaint/feedback

– The APP can be downloaded the Web App from Google Play Store https://play.google.com/store/apps/details?id=com.econotes.econotes or CPCB website www.cpcb.nic.in .

The App empowers citizens:

– To check suitability of water for bathing, drinking near desired location

– To report water pollution just by visualization

– To report water pollution with specific levels of pollutants using testing kits being provided by CPCB/NMCG

– To inform exact location on maps using android devices

– To report activities resulting in water pollution

– To report any issue related to water pollution through SMS services

Water Quality status in Delhi stretch of Yamuna River in the year 2015

Central Pollution Control Board is regularly monitoring about 40 km. long Delhi stretch of Yamuna River from Palla to downstream of Okhla barrage at 4 locations i.e. Palla, Nizamuddin Bridge, Okhala at Kalindi Kunj (Okhala U/s) and Okhala D/s on monthly basis. Water quality trend of the river in this studied stretch during the year 2011-2015 in terms of Dissolved Oxygen (DO), Bio-chemical Oxygen Demand (BOD) and Total Coliform (TC) is depicted in Fig. 1 – 3. The values of DO observed during the year 2015 reflect that the level of this parameter was well above the prescribed limit 0f 4.0 mg/l at Palla and is in the range from 5.5 – 15.5 mg/l with annual mean of 9.5 mg/l. DO in the river depletes significantly after Wazirabad barrage and remain critical in remaining part of the studied river stretch. The value of this parameter from Wazirabad D/s to Okhla barrage D/s, after joining Shahdara drain was observed in the range of 0.0 – 2.6 mg/l which reflects that DO is always violating the prescribed standard of 5.0 mg/l at Okhla D/s and 4.0 mg/l at other two locations. At all the four monitoring locations the annual average value of DO are almost same as observed in the year 2014. BOD at Palla generally meets the prescribed standards of 3 mg/l and was found in the range of 1 – 8 mg/l with annual average of 3.1 mg/l. At Okhla D/s BOD values were found well above the limit of 3 mg/l and was in the range of 13-97 mg/l with annual average of 46.3 mg/l. At remaining two locations i.e. Nizamuddin bridge and Okhla U/s where BOD is not a criteria parameter, its values were found in the range of 4 – 40 mg/l and 7-28 mg/l respectively. There is almost no variation in annual average values of BOD in the first three locations of the river i. e. Palla, Nizamuddin Bridge and Okhala U/s for the year 2014 and 2015. However at Okhla D/s annual average of BOD reflects significant increase from 38 mg/l to 46mg/l. TC was found meeting the standard of 5000 MPN/100 ml at Palla on eight out of ten rounds of analysis and its values were ranged between 780 - 35000 MPN/100 ml. At Okhla D/s TC with significantly high counts i.e. 940000 – 160000000 MPN/100 ml was always found violating prescribed standard of 500 MPN/100 ml. At Nizamuddin bridge and Okhla U/s where TC is also not a criteria parameter, its vales

were in the range of 68000-170000000 MPN/100 ml. Comparison of annual average values observed in the year 2013 and 2014 indicates that at all the monitoring locations TC reflect decreasing trend. Free ammonia (NH3) which is a criteria parameter for two locations i.e. Nizamuddin bridge and Okhla U/s, was found exceeding the prescribed limit of 1.2 mg/l except twice at Nizamuddin Bridge and once at Okhla U/s. The annual average of this parameter at Nizamuddin bridge and Okhla U/s was 10.68 mg/l and 11.5 mg/l respectively. At Palla free ammonia was in the range of Below detection limit (BDL) – 0.2 mg/l, whereas, at Okhla D/s it was in the range of 1.4 - 37.2 mg/l. In comparison to 2014, annual average of Free ammonia was showing increasing trend in all locations except Palla. As observed in the year 2014, in 2015 also pH was the only parameter that meets the prescribed standards of 6.0 – 9.0 for Palla and 6.5 – 8.5 for the remaining three studied locations.

The reason of deterioration of Yamuna River water quality in Delhi stretch especially after Wazirabad barrage is due to unabated discharges of wastewater predominantly from domestic sources into the river. The other reason is the non availability of fresh water in the river after Wazirabad barrage especially during non-monsoon period, which is essential to maintain self-purification capacity of the river.

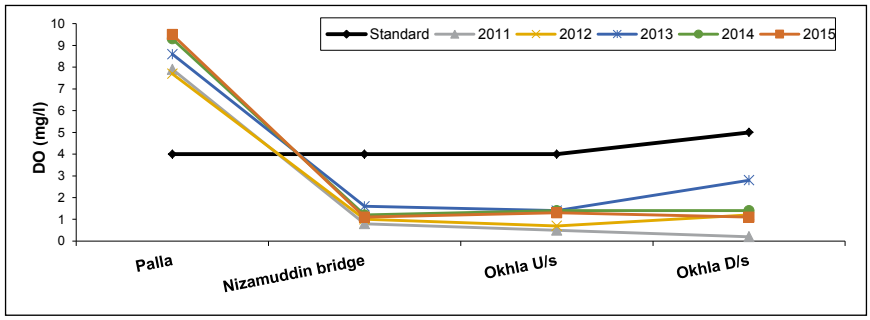


Fig. 1, Water quality trend of river Yamuna in terms of DO

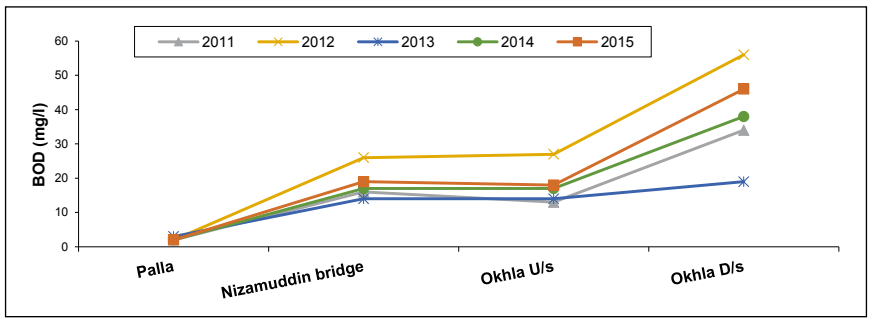


Fig. 2, Water quality trend of river Yamuna in terms of BOD

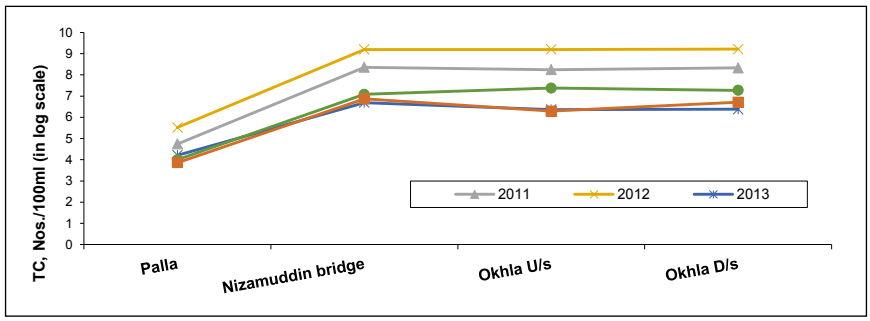


Fig. 3, Water quality trend of river Yamuna in terms of TC

Discharge and pollution load contributed by major drains in 2015 at NCT- Delhi

There are twenty one major wastewater drains in NCT-Delhi, out of which 18 drains join Yamuna River and rest joins Agra/Gurgaon canal. These drains are being monitored regularly on monthly basis. Monthly trend of total Bio-chemical Oxygen Demand load (BOD load) and discharge received by the river and canals through these drains during the year 2015 is depicted in Fig. 4 and 5. The range of total BOD Load of the monitored drains was 132 TPD (July) to 265 TPD (February) and total discharge fluctuated from 34 m^3/s (March) to 43 m^3/s (August). The collective average of these drains for the year 2015 in terms of discharge and BOD load was about 38.68 m^3/s and 193 Tons/day (TPD) respectively. Out of total BOD load and discharge of the monitored drains, Yamuna River receives about 87 percent of BOD load and about 90 percent of discharge and rest joins canals. Comparison with the year 2014 reflects decline in discharge by 3.4 % and incline by 8.4 % in total BOD Load of the studied drains. Najafgarh and Shahadara drain alone contributes about 62% of total Bod load and 73% of total discharge of the 21 major drains of Delhi

Fig. 4, Trend in BOD load of major drains of NCT-Delhi

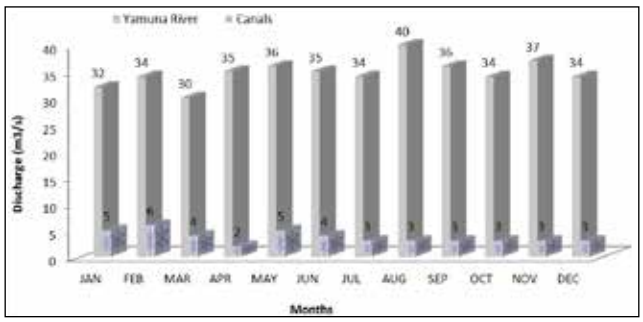


Fig. 5 Discharge trend of major drains of NCT-Delhi

ASSESSMENT OF TOXICITY LEVEL IN BAGAD RIVER AND ITS IMPACT ON GROUND WATER BODIES

Presently the impact of pollution on various water bodies is generally assessed through physico-chemical approach which is unable to provide information on the combined effects of the various abiotic factors on biotic factor of an aquatic system. Bioassay being a summary parameter is used in present study to assess the impact of physio-chemical constituents on aquatic life when released in the river.

Bagad River, a tributary of river Ganga is a seasonal river which originates from Nayapura village of Amroha district (UP), passes through Gajraula town and confluence with Ganga upstream of Kachla Ghat. During dry season, the major source of water in the river is the wastewater discharges from Gajraula industrial area. There was almost no flow in the river and it became dried after Malwali Dagrauli (U/s Babrala) except in rainy season.

Bagad River was studied at four locations of about 23 Km. long river stretch along with 4 bore wells/hand pumps on the banks of river. The study was undertaken twice to cover the variations in water quality of Bagad River led by change in the effluent quality/quantity, if any, due to fluctuations in industrial

activities. The collected samples from above mentioned locations were tested for Bioassay using Zebra fish (Brachydanio rerio) as test organism. Ten fishes were exposed in three liters of sample for 96 hours. The test samples aerated gently whenever Dissolved Oxygen was found below 4 mg/l.

First round of study reflects that the water of Bagad River was highly toxic and severity of this parameter was found reducing slightly and gradually at downstream locations on the basis of time interval for 100% mortality. This trend was not reflected in second round and toxicity level was also found low with 40% to 60% mortality of test organisms only which might be due to receipt of less toxic effluent and river water at various location represents different quality of effluent received over a period of time. Ground water samples from the bore wells on the bank of Bagad River at Gajraula only were found toxic with 40-100% mortality. Different ground water sources (bore well) with different boring depth might led this variation in toxic level. Conductivity level of ground water 722 (at Jheel, U/s of Gajraula industrial area) -1720 µmhos/cm (at industrial area) clearly reflects impact of industrial effluent on ground water which was also supported by high conductivity in Bagad river 11250-12730 µmhos/cm.

The study reflects that industrial effluent from Gajraula industrial area has significant impact not only on Bagad River but on ground water also causing water quality deterioration. Thus there is an urgent need to check the unabated discharge of industrial effluent by adopting reduce and recycle approach and ensuring proper treatment of effluent.

Performance evaluation of STPs in terms Three STPs of Delhi with physical/chemical and biological (aerobic) treatment facility were studied in the month of March, 2016 for performance evaluation in and toxicity reduction. Primary treatment in Sen Nursing home (SNH) STP is of physico-chemical type whereas, in other STPs it is of physical only.

Performance evaluation of STPs in terms of microbiological contents and toxicity reduction

Sewage received by STPs besides consisting biodegradable organic matter also consists other chemicals e.g. surfactant, disinfectant etc. Wastewater from industrial and other commercial sources also get mixed with it. Thus a study was undertaken to find out the fate of microbiological contents and toxicity of such sewage after its treatment besides physico-chemical parameters.

Six STPs of NCT, Delhi with physical/chemical and biological (aerobic) treatment facility were selected for study. Primary treatment in Sen Nursing home (SNH) STP is of physico-chemical type whereas, in other STPs it is of physical only. Each STP was studied twice to cover fluctuations in quantity or quality of sewage and also the performance of STP related with operation and maintenance. During the study Coronation Pilar, Yamuna Vihar, Rohini STP were found running under capacity whereas, remaining three were found running full or over capacity. Grab samples were collected from inlet, primary clarifier and outlet of each STP. The collected samples were analyzed for physico-chemical parameters, microbiological contents (Total coliform, Faecal coliform, E. coli, Faecal streptococci, Enterococcus) and also tested for bioassay using Zebra Fish (Brachidenio rerio).

Table 1, Reduction in microbial contents through various treatments STPS

Treatment type	Minimum reduction		Maximum reduction	
	% Reduction	Name of STP	% Reduction	Name of STP
Total coliform				
Up to Primary treatment	29.23	Coronation Pilar	99.99	SNH,STP
After Primary treatment	41.30	Coronation Pilar	100	Delhi Gate , STP
overall treatment	58.46	Coronation Pilar	100	Delhi Gate , STP
Fecal coliform				
Up to Primary treatment	42.55	Rohini STP	99.99	SNH,STP

Treatment type	Minimum reduction		Maximum reduction	
	% Reduction	Name of STP	% Reduction	Name of STP
After Primary treatment	0.00	Coronation pilar	100	Delhi Gate, STP
overall treatment	55.70	Coronation pilar	100	Delhi Gate, STP
E. coli				
Up to Primary treatment	34.62	Rohini STP	99.99	SNH,STP
After Primary treatment	0.00	Coronation Pilar	100	Delhi Gate, STP
overall treatment	69.62	Coronation Pilar	100	Delhi Gate, STP
Fecal streptococci				
Up to Primary treatment	+107.69	Coronation Pilar	99.92	SNH,STP
After Primary treatment	0.00	Coronation Pilar	100	Delhi Gate, STP
overall treatment	+107.69	Coronation Pilar	100	Delhi Gate, STP
Entereococcus				
Up to Primary treatment	+107.69	Coronation Pilar	99.92	SNH,STP
After Primary treatment	35.19	Coronation Pilar	100	Delhi Gate, STP
overall treatment	+34.62	Coronation Pilar	100	Delhi Gate, STP

+ indicates increase inplace of reduction

Findings of microbiological study is summarized in Table 1. The study reflects that out of 5 studied microbiological parameters, maximum reduction in primary treatment was observed for Total coliform, Fecal coliform & E. Coli (99.99%) at Sen Nursing Home STP and minimum was for Fecal streptococci and Enterococcus (+107.69%) at Coronation Pilar. Similarly, maximum reduction (100%) for all parameters was at Delhi Gate STP and was minimum (0%) at coronation Pilar for Fecal streptococci through secondary treatment. The overall treatment of all the studied STPs reflects maximum reduction in Delhi Gate STP (100%) for all parameters and minimum in Fecal streptococci (+107.69%) at coronation Pilar. Maximum reduction of microbial contents in primary treatment at Sen Nursing Home STP is due to adoption of chemical treatment whereas, significant reduction in Delhi Gate STP was due to Chlorine dosing to the treated sewage. The study reflects that the number of microbial contents especially TC was so high at inlet of STPs that 99.99 % reduction is not able to bring down their number significantly.

Findings of toxicity test reflects that up to primary treatment percent toxicity reduction ranged from 0% to 90% whereas, after primary treatment it ranged from -50% to100% and in overall treatment it ranged from 0% to 100%. Maximum toxicity reduction was observed up to primary treatment at Coronation Pilar (90%), after primary treatment at Delhi Gate (100%) and overall treatment again at Delhi Gate (100%) followed by SNH STP (90%). The observations reflect that performance of Delhi gate STP was excellent in term of toxicity reduction followed by SNH STP. At Yamuna Vihar STP though toxicity reduction is found but is not up to satisfactory level. At Coronation Pilar reduction was there once only but reflects significant increase in toxicity after primary treatment. Rohini and Kondli STPs were unable to reduce the toxicity as its level at inlet and out let was found unchanged. Comparison of Bioassay test values and the values of physico-chemical parameters at Delhi Gate and Sen Nursing Home reflects that reduction in toxicity is quite significant along with reduction in COD, BOD and TSS. However this similarity was not observed in Coronation Pilar, kondli and Rohini STP where reduction was observed in COD, BOD and TSS but was not supported by toxicity.

Status of River Cauvery water quality near Mekedatu, Karnataka before joining Tamil Nadu State.

A joint monitoring by CPCB Zonal Office and Karnataka State Pollution Control Board was carried out to assess the status of Cauvery river water quality after joining of storm water and treated /untreated sewage at three locations in Cauvery River.

A. One sample was collected in Cauvery River at 200 m away before Sangam

B. One sample was collected in Arkavathi River at 200 m away before Sangam

C. One sample was collected in Cauvery River at 200 m away after Sangam

From the analysis results it is noted that the parameters like pH, Dissolved Oxygen and BOD are meeting the standards of CPCB water Quality criteria for all the three samples and the Cauvery River water quality falls in Class B of water. The values of Parameter like EC, Total Coliform and Fecal Coliform in the Cauvery River water after Sangam and Arkavathi River exceeding the standards of CPCB water Quality criteria for Class C of water. It may be due to the joining of storm water drain and treated/untreated sewage and industrial waste water from part of Bengaluru city into the River Arkavathi.

The Samples collected was analyzed at CPCB Zonal Office and results are depicted below:

S. No.	Parameter (all in mg/l except pH)	River Arkavathi before Sangam	River Cauvery before Sangam	River Cauvery after Sangam
1	pH at 25^0 C	8.4	7.6	8.4
2	EC µs/cm at 25^0 C	1268	172	718
3	TDS at 180^0 C	840	156	480
4	Dissolved Oxygen	7.3	---	8.1
5	BOD at 27^0 C, 3 days	1.6	1.7	3.0
6	COD	14.7	9.9	24.0
7	Total hardness as $CaCo_3$	354	--	196
8	Calcium as Ca^{++}	92.4	--	53.4
9	Magnesium as Mg^{++}	30.1	--	15.3
10	Alkalinity as $CaCo_3$	78.3	20.6	49.4

11	Chloride	203	9.9	104
12	Sodium	130	9.1	64
13	Potassium	7.2	2.0	5.3
14	Nitrate as N	2.8	0.32	1.9
15	Nitrite as N	BDL	BDL	BDL
16	Ammonia as N	BDL	BDL	BDL
17	Phosphate as P	0.96	0.03	0.52
18	Boron	BDL	0.28	0.03
19	Sulphate	34.4	7.1	20.3
20	Total Coliform (CFU/100ml)	190000	---	120000
21	Fecal Coliform (CFU/100ml)	1000	---	1000

Pesticide pollution from agricultural runoff along Cauvery river basin

The initial phase of the project includes a survey of agriculture pattern in the river basin with the help of geoinformatics and remote sensing data. Based on the survey major agricultural zones and discharge points in the river basin were identified. Based on the agriculture pattern and hydrometric maps sample locations were decided. The river was divided into several stretches and sampling points were located on these stretches based on agricultural pattern.

The entire river including tributaries are divided into 9 stretches in Karnataka state

Stretch 1: Thalakaveri to KRS dam (Cauvery River)

Stretch 2: Hemavathy reservoir to KRS dam (Hemavathy River)

Stretch 3: Kabani reservoir to T. Narasipura (Kabani River)

Stretch 4: KRS dam to T. Narasipura (Cauvery River)

Stretch 5: T. Narasipura to Mekedatu (Cauvery River)

Stretch 6: Maddur to Mutathi (Shimsha River)

Stretch 7: Bangalore to Mekedatu (Arkavati River)

Cauvery river study stretches

The river including tributaries is divided into 11 stretches in Tamil Nadu state

Stretch 8: Mekedatu to Stanley reservoir (Cauvery River)

Stretch 9: Mettur Dam to Erode (Cauvery River)

Stretch 10: Mettupalayam to Bhavani (Bhavani River)

Stretch 11: Erode to Musiri (Cauvery River)

Stretch 12: Musiri to Grand Anicut (Cauvery River)

Stretch 13: Grand Anicut to Pitchavaram (Coleroon River)

Stretch 14: Grand Anicut to Thirumullaivasal (Uppanar & Cauvery River)

Stretch 15: Grand Anicut to Poompuhar (Cauvery River)

Stretch 16: Grand Anicut to Karaikal (Arasalar River)

Stretch 17: Grand Anicut to Nagappattinam (Puttar & Vettar Rivers)

Stretch 18: Grand Anicut to Thopputhurai (Vennar River)

Stretch 19: Grand Anicut to Muttupet (Panmani & Koraiyar Rivers)

At the same time efforts were taken to setup instrumentation facility for the analysis of organochlorine and organophosphorus pesticides. However, facility for analysis of carbamate pesticides has to be developed. Presently, it is envisaged to take the help of CPCB, Delhi to complete the work. Extensive sampling and analysis covering all season will be carried out during the next financial year (2016-17).

Investigation of Causes of Pollution in Polluted River Stretches of Major Rivers in Central Zone

Central Pollution Control Board has developed water quality monitoring network in the country under National Water Quality Monitoring Programme (NWMP) and executes it with the help of State Pollution Control Board (SPCB). The data received from SPCB are compiled by CPCB annually and based on the trend of data water quality status of the river is being identified. In the recent year CPCB has declared Polluted River stretches in the country on priority basis in which 34 river stretches have been identified in Central Zone. In terms of priority declared by CPCB, water quality study of River Betwa from its origin to downstream of Vidisha was conducted during this financial year.

River Betwa at D/s Vidisha

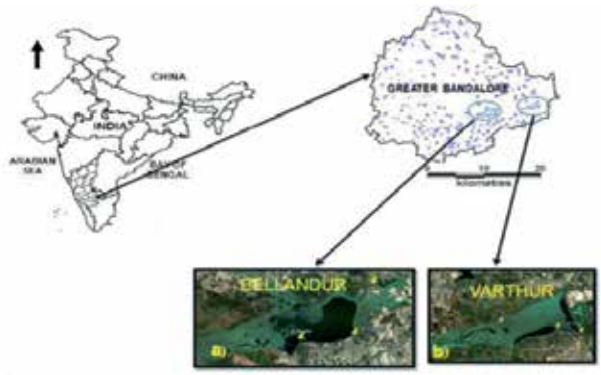
River Betwa originates from Kumra (Jhirri) village in Raisen district of Madhya Pradesh and joins River Yamuna before its confluence to River Ganga hence it is a tributary of River Ganga. River Betwa receives water form River Gohar, Kaliasot and Bias during its travel of 70 km distance from Kumra to Vidisha. The major sources of pollution in River Betwa are industrial discharge of Mandideep Industrial area, sewage discharge of Mandideep, Part of Bhopal City and also from Vidisha city.

River Betwa at Mandideep

The water quality of River Betwa was found severally polluted (BOD more than 50 mg/l) in Mandideep area up to D/S Bhopal and moderately polluted from Bhopal downstream to Vidisha upstream (BOD between less than 30 mg/l). The river maintains normal water quality from its origin to upstream Mandideep as no discharge joins in this sector and Vidisha up stream to Vidisha downstream due to presence of dilution water from other tributaries. Presence of Total and fecal coliform in higher concentration indicates the discharge of partially/untreated sewage in River Betwa. MPPCB is in process of formulation of remedial action plan for up gradation of water quality of river.

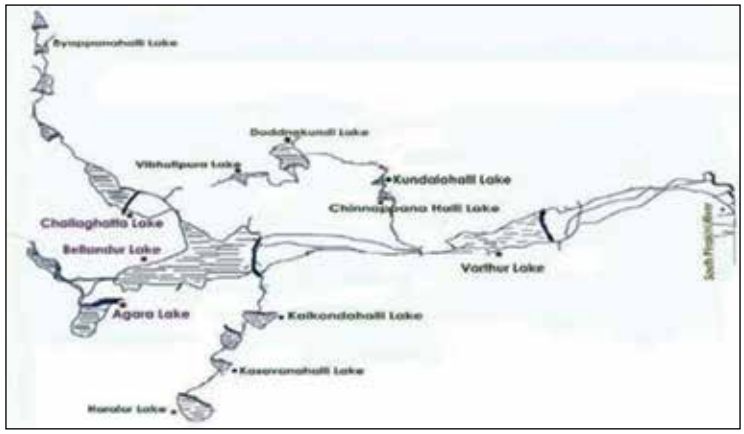
Status of Lakes in Bengaluru, Karnataka

Bellandur Lake is an old and major tank located in eastern part of Bengaluru city at latitude of 12°58" N and longitude of 77°35" E & altitude of 921 m above mean sea level. It is the largest lake spread across an area around 892 acres with water storing capacity of around 17.66 million cubic feet. The total catchment area of the lake is 287.33 Sq. KM and independent catchment area of 14 - 48 Sq. KM and the annual rainfall in the catchment area is around 32 inches. The natural topography of the catchment slopes towards Bellandur Lake, thus any storm water runoff eventually makes its way into the lake. The length, width and mean depth of the lake is around 3.6 KM, 1.4KM and 2.1 M respectively.



This tank is a receptor from three chains of tanks. One chain, originates in the north, from Jayamahal, covers the eastern portion and has been referred to as the eastern stream. Another chain originates from the central part of the city, from the K.R.Market area and covers the central portion and is called the central stream. The other chain, that reaches the tank is through the south-western region and is called the western stream. Water from Bellandur tank flows to Varthur tank which is situated at 7 KM in the downstream and eventually joins the Dakshina Pinakini river basin, which flows towards Tamil Nadu. The water in downstream is used for drinking purposes in Hosur and Krishnagiri districts after treatment.

Varthur Lake (12°57'24.98" - 12°56'31.24" N, 77°43'03.02" - 77°44'51.1"E) is an shallow artificial lake, or tank, located in the South taluk of Bengaluru district which was built by the Ganga Kings few thousand years ago for domestic and agricultural uses. The lake occupies around 147.8 hectares with a mean depth of 1 meter. The lake is surrounded by villages and small farms and is estimated to irrigate around 625 hectares. Varthur Lake is interconnected to Bellandur and other tanks present in Bengaluru South region and finally joins the Dakshina Pinakini River (Thenpennai River) which is drinking water source in Hosur, Tamilnadu. It has a catchment area of 1.8 KM2 but due to rapid urbanization the entire catchment area of Varthur Lake contains substantially huge population and full of huge residential & office complexes.



Interconnection of Lakes showing the linkage of Varthur with other lakes

Bellandur lake outlet, Yemalur (Inlet to Varthur lake)

Varthur lake outlet channel: Varthur Kodi

Ulsoor Lake is one of the biggestlakes spread over 123.6 acers, located on the eastern side at Ulsoor, Bangalore city. This lake is developed and maintained by Bruhut Bengaluru Mahanagara Palike (BBMP). This lake was receiving rain water through two storm water drains during rainy season. This Ulsoor lake water quality is monitored every month under the National Water Quality Monitoring Programme (NWMP) by the Karnataka State Pollution Control Board (KSPCB). As per the report of KSPCB, the water quality of Ulsoor lake conforms to designated-best-use classification Class "D" i.e. Water is fit for propagation of wildlife and fisheries. The fisheries Department has awarded the fishing activity to Bangalore District Fisheries Product Processing Society in Ulsoor Lake.

Map showing the view of Ulsoor Lake

The Bangalore has total number of 210 lakes, which are under the custody of various departments (BBMP, BDA, KFD, LDA, MI) handed over for protection and taking up of development activities. CPCB has issued directions on the following two issues under Section 18 (1) (b) of the Water Act to Karnataka State Pollution Control Board (KSPCB) to the effect that the sewage generated in the catchment area is required to be treated and utilized.

1. **Varthur and Bellandur Lake Pollution:** Directions issued under 18(1) (b) of the Water (Prevention and control of Pollution) Act 1974 in the mater of contamination of Bellandur and Varthur Lakes on 22.05.2015

2. **Ulsoor Lake Pollution (Mortality of Fishes):** Directions issued under 18(1) (b) of the Water (Prevention and control of Pollution) Act 1974 in the mater of contamination of Ulsoor Lake on 04.04.2016

In the Bangalore city about 1,280 MLD of sewage is generated while the city's infrastructure has capacity to handle only 721 MLD of sewage in which only 600 MLD is treated due defunct of STP. Since many years, severalBengalurulakes were getting polluted because of the untreated sewage flowing into them. The issue is serious and last year there was an incident of fire in the Bellandur Lake.

On these issues to improve the water quality and conserve the water bodies in Bangalore, the central government proposed to extend Rs.800 crore assistance to rejuvenate lakes in Bengaluru, especially the Bellandur Lake, the largest and most polluted water body in the Karnatakacapital. Of the allotted funds, Rs. 500 crore is for laying down a 74-km trunk sewage pipeline, and Rs. 162 crore is to set up four sewage treatment plants (STPs) in Bellandur Lake. The remaining is for the Urban Development Ministry for local water conservation activities.

Study of Mass Bath during Mahamaham Festival '2016 (South Kumbhamela) Kumbakonam

Mahamaham is a South Kumbha Mela Hindu festival celebrated in Southern India at Holy town Kumbakonam in Thanjavur District, Tamil Nadu once in twelve years. Normally Kumbhamela celebrated on the banks of the river. Whereas, this festival is celebrated in a tank called Mahamaham tank, spread over six-acre area. During that time lot of Hindu Saints, Sacred personality and devotees prefers to come to this temple town to take a holy dip in Mahamaham tank, Pottramarai tank and River Cauvery with a belief that their sin will be washed away and consider it as sacred.

Masimaham is an annual event takes place on the Maham star in Tamil month namely Maasi (February-March). On that day, Festival deities (Urtchavar) from all temples in Kumbakonam will come to Mahamaham tank at Noon and the event of Mass bathe will take place along with the devotees. This event is called Theerthavari. Once in twelve years, Mahamaham festival occurs.

This time Mahamaham festival was celebrated from 13th February to 22nd February 16 as announced earlier by GoT and the same has been extended till the month end after seeing the response from the general public.

In this regard, water samples were collected from Mahamaham tank and Pottramarai tank and from river Cauvery at Upstream of Kumbakonam town, Main Bathing Ghat and Downstream of Kumbakonam Town from 20th to 22nd February, 2016. Post festival sampling was carried out on 24th February. All MINARS parameters were analysed.

From the Analytical results, it is observed that the organic and inorganic load have been increased almost by two times.

STATUS OF LAKE WATER IN AND AROUND KOLKATA (WEST BENGAL)

The lake ecosystem is playing a key role in maintaining the oxygen balance and is also being used for sports, recreational and cultural activities, This lake ecosystem also act as a natural sink through the removal of pollutants from the surrounding environment.

Recently, the pressure of human activities on the lakes surrounding Kolkata has increased. Solid wastes including plastic wastes are also being dumped beside the lake water. All these anthropogenic activities have led to the deterioration of the environmental components specially the lake water quality. The environmental degradation consequently threatens the sustainable development of aquatic and terrestrial ecosystem of the area. Considering the above situation CPCB, ZO, Kolkata has decided to assess the quality of lake water around Kolkata. Five lakes of Kolkata city are chosen for monitoring namely Subhas Sarobar, Beliahata, Eco Park, Rajarhat, Nalban, Saltlake, Eco-Garden, Chingrighata, and Ravindra Sarovar,Golpark. Studies were carried out in four seasons Monsoon, Post monsoon, Winter and Summer. All the Physico-chemical and Microbiological parameters have been analysed to assess quality of lake.

The study was carried out in the month of August 2015, December 2015, February 2016 and May 2016 corresponding to the Monsoon, Post Monsoon, winter and Summer in all the Five locations pertaining to the year 2015-16.

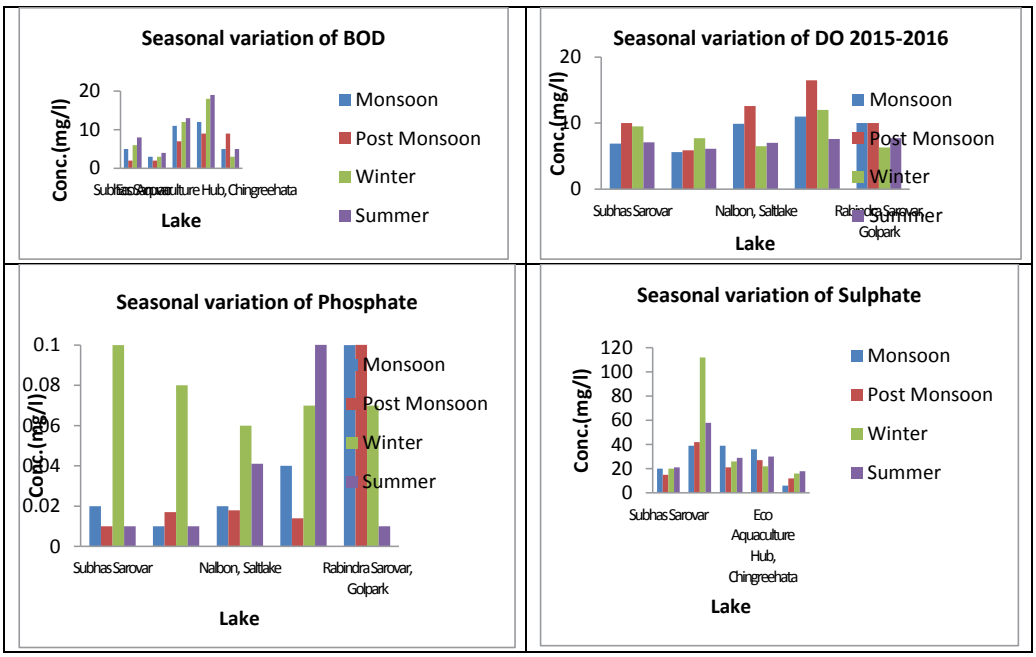
The BOD is one of the most important parameter in Lake Water. BOD values were observed in the range of 3 - 12 mg/l in Monsoon, 2 -9 mg/l in Post Monsoon, 3-18 mg/l in Winter and 4-19 mg/l in Summer.

DO values were observed in the range of 6 - 11 mg/l in Monsoon, 6 -17 mg/l in Post Monsoon, 6-12 mg/l in Winter and 6-7 mg/l in Summer.

The Total and Faecal Coliform count were found more and always above the criteria under used based water quality The reason may be primarily, mass bathing, open defecation, Surface runoff . Cattle bathing etc.

Nutrients such as Phosphate is observed in the range of 0.01 - 0.1 mg/l in Monson and 0.01-0.1 mg/l in Post Monsoon,0.06-0.1 mg/l in Winter and 0.01-0.37 mg/l in Summer.

Nutrients such as Sulphate is observed in the range of 6.0 -39 mg/l in Monson , 12-42 mg/l in Post Monsoon,.16-112 mg/l in Winter and 18- 58 mg/l in Summer.



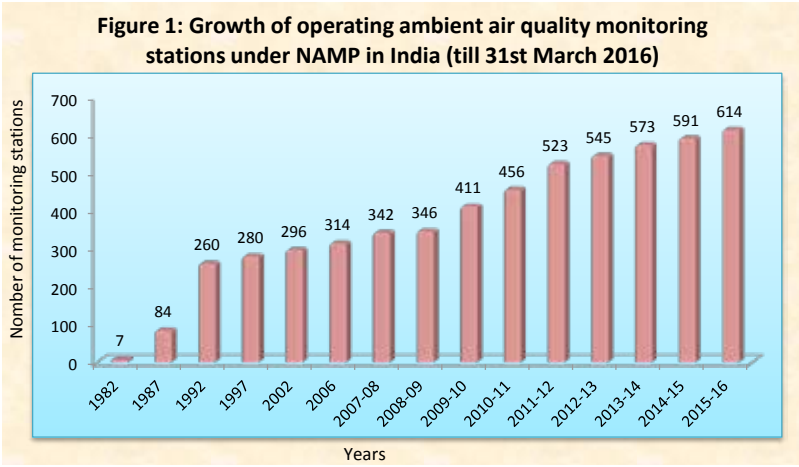
5.2 Ambient air quality status under National Air Quality Monitoring Programme (NAMP): 2015-16

In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981. According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 'Air pollution' has been defined as 'the presence in the atmosphere of any air pollutant.' As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 'Air Pollutant' has been defined as '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'. Therefore ambient air quality standard is developed as a policy guideline that regulates the effect of human activity upon the environment so that pollutant emission into the air can be regulated. Standards may specify a desired state or limit alterations.

National Ambient Air Quality Monitoring Programme

Central Pollution Control Board is executing a nation-wide National Air Quality Monitoring Programme (NAMP). NAMP was started in 1984 with 7 stations in Agra and Anpara. The growth of operating Ambient Air Quality Monitoring Stations in the country is given in figure below (Figure 1). The ambient air quality monitoring network has 614 operating stations covering 254 cities/towns in 28 States and 5 Union Territories as on 31st March 2016.

Figure 1: Growth of operating ambient air quality monitoring stations under NAMP in India (till 31st March 2016)



Parameters monitored under NAMP

Under NAMP three criteria pollutants viz. PM_{10} (Particulate Matter having an aerodynamic diameter less than or equal to 10 µm), Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2) were identified for regular monitoring at all locations. Other notified parameters like Carbon monoxide (CO), Ammonia (NH3), Ozone (O_3), $PM_{2.5}$ (Particulate Matter having an aerodynamic diameter less than or equal to 2.5 µm), Benzo(a) pyrene {B(a)P}, Lead (Pb) and Nickel (Ni) are being monitored at selected locations. The monitoring of meteorological parameters such as wind speed, wind direction, relative humidity and temperature has been also integrated with the monitoring of air quality.

Objectives of NAMP

i) To determine the status and trends of ambient air quality;

ii) To ascertain whether the prescribed ambient air quality standards are violated;

iii) To identify non-attainment cities with respect to national standards and;

iv) To obtain the knowledge and understanding necessary for developing preventive and corrective measures.

Agencies involved in the Network (NAMP)

The monitoring under the NAMP is being carried out with the help of Central Pollution Control Board; State Pollution Control Boards; Pollution Control Committees and National Environmental Engineering Research Institute (NEERI), Nagpur. CPCB co-ordinates with these agencies to ensure uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring station.

Status of Ambient Air Quality in million plus cities during 2015

Urbanization in India is more rapid around the major cities in India. The population growth has been mainly centered on cities due to large scale migration of rural population accelerated by high population growth rates. Increase in industrial activities, population both endemic and floating and vehicular population etc. have led to a rapid increase in environmental problems, one of them being air pollution. 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. Keeping all these factors in mind, an attempt is made to address the problem of air pollution in seventeen cities in India identified by Honorable Supreme Court as polluted cities. These cities include the metropolitan cities of India which has been classified by Census of India 2011 as million plus cities. 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. In the 46 million plus cities (population ≥ 10 lacs; Census 2011), mainly three criteria air pollutants such as SO_2, NO_2 and PM_{10} are discussed and presented.

Air quality categories in cities of India

CPCB depicts ambient air quality in terms of low, moderate, high and critical levels by calculating an exceedence factor as follows:

The Exceedence Factor (EF) is calculated as follows:

$$\text{Exceedence Factor} = \frac{\text{Observed annual mean concentration of criteria pollutant}}{\text{Annual standard for the respective pollutant and area class}}$$

The four air quality categories are:

- Critical pollution (C) : when EF is more than 1.5;
- High pollution (H) : when the EF is between 1.0 - 1.5;
- Moderate pollution (M) : when the EF between 0.5 - 1.0; and
- Low pollution (L): when the EF is less than 0.5.

Pollution level classification is given in Table 1.

Table 1: Pollution Level Classification

Pollution level	Annual Mean Concentration Range (µg/m^3)					
	Industrial, Residential, Rural & others areas			Ecologically Sensitive Area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low (L)	0-25	0-20	0-30	0-10	0-15	0-30
Moderate (M)	26-50	21-40	31-60	11-20	16-30	31-60
High (H)	51-75	41-60	61-90	21-30	31-45	61-90
Critical (C)	>75	>60	>90	>30	>45	>90

Table 2: Number of million plus cities with low, moderate, high & critical air quality 2015 (residential/industrial/commercial/rural and sensitive)

Category	Number of million plus cities (population > 10 lacs)					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Low (L)	39	8	0	1	0	0
Moderate (M)	1	24	2	1	1	0
High (H)	0	6	10	0	0	0
Critical (C)	0	2	28	0	1	2
Inadequate data/No data	2	2	2	0	0	0
Non operational monitoring station	1	1	1	0	0	0
No monitoring station	1	1	1	0	0	0
Total million plus cities (as per Census 2011)	**44**	**44**	**44**	**2**	**2**	**2**

NB. Low, moderate, high, critical classification based on Pollution Level Classification Table-1.

Table 3: Number of million plus cities exceeding the NAAQS 2015 (Based on annual average data)

Category	Number of million plus cities (population > 10 lacs)					
	Residential / industrial / rural / commercial areas			Ecologically sensitive area		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
Not exceeding NAAQS (NE)	40	32	2	2	1	0
Exceeding NAAQS (E)	0	8	38	0	1	2
Inadequate data/No data	2	2	2	0	0	0
No operational monitoring station	1	1	1	0	0	0
No monitoring station	1	1	1	0	0	0
Total metro cities (as per Census 2011)	44	44	44	2	2	2

Out of the 46 million plus cities, 8 cities (18%) and 38 cities (86%) exceed the NAAQS with respect to NO_2 and PM_{10} respectively in the residential / industrial / rural / commercial areas. None of the cities exceed the standard limit with respect to SO_2. Number of cities exceeding the NAAQS (Based on annual average data) is given in Table 4.

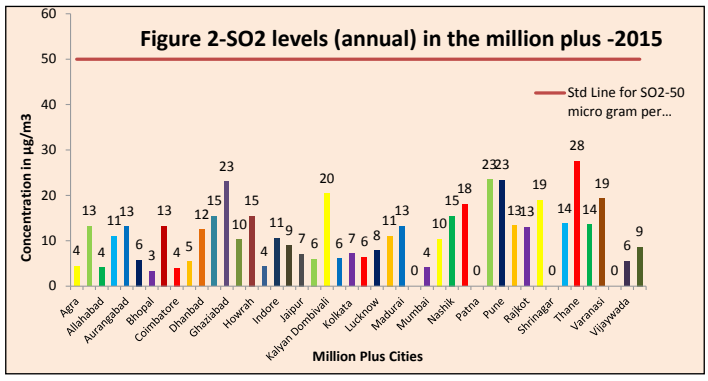
Table 4: Air Quality in Million Plus Cities of India – 2015

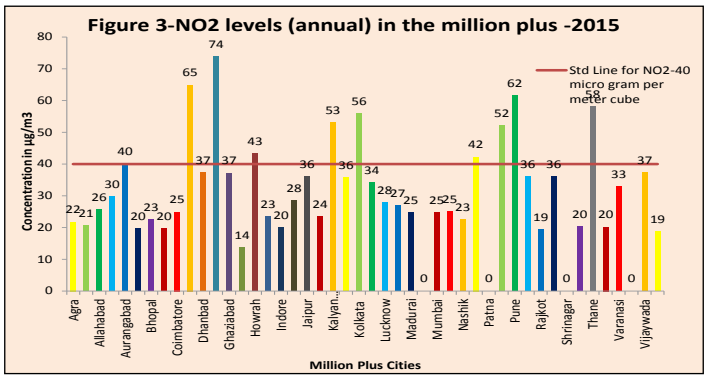
State	Cities	Type & category of city	No. of Stations	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air Quality	Annual average ($\mu g/m^3$)	Air Quality	Annual average ($\mu g/m^3$)	Air Quality
Andhra Pradesh	Hydrabad	RIRuO	10	4	L	23	M	93	C
Andhra Pradesh	Vijaywada	RIRuO	3	6	L	37	M	110	C
Andhra Pradesh	Vishakhapatnam	RIRuO	8	9	L	19	L	61	H
Bihar	Patna	RIRuO	2	-	-	-	-	-	-
Chattisgarh	Raipur	RIRuO	3	13	L	36	M	188	C
Delhi	Delhi	RIRuO	11	5	L	65	C	220	C
Gujarat	Ahmedabad	RIRuO	8	13	L	21	M	89	H
Gujarat	Rajkot	RIRuO	2	13	L	19	L	83	H
Gujarat	Surat	RIRuO	3	14	L	20	L	89	H
Gujarat	Vadodara	RIRuO	5	14	L	20	L	87	H
Haryana	Faridabad	Taj-trapezium	2	15	M	74	C	105	C
Jammu &Kashmir	Shrinagar	RIRuO	0	@	@	@	@	@	@
Jharkhand	Dhanbad	RIRuO	3	12	L	37	M	168	C
Jharkhand	Ranchi	RIRuO	1	19	L	36	M	220	C
Karnataka	Bangalore	RIRuO	9	6	L	20	L	119	C
Madhya Pradesh	Bhopal	RIRuO	6	3	L	23	M	158	C
Madhya Pradesh	Gwalior	RIRuO	2	10	L	14	L	125	C
Madhya Pradesh	Indore	RIRuO	3	11	L	20	L	97	C
Madhya Pradesh	Jabalpur	RIRuO	2	9	L	28	M	90	H
Maharashtra	Aurangabad	RIRuO	4	13	L	40	M	83	H
Maharashtra	Kalyan Dombivali	RIRuO	2	20	L	53	H	104	C
Maharashtra	Mumbai	RIRuO	3	4	L	25	M	107	C
Maharashtra	Nagpur	RIRuO	7	10	L	25	M	90	H
Maharashtra	Nashik	RIRuO	4	15	L	23	M	78	H
Maharashtra	Navi Mumbai	RIRuO	6	18	L	42	H	125	C
Maharashtra	Pimpri Chinchwad	RIRuO	1	23	L	52	H	102	C
Maharashtra	Pune	RIRuO	3	23	L	62	C	99	C
Maharashtra	Thane	RIRuO	3	28	M	58	H	117	C
Maharashtra	Vasai-virar	RIRuO	0	NA	NA	NA	NA	NA	NA
Punjab	Amritsar	RIRuO	3	11	L	30	M	148	C
Punjab	Ludhiana	RIRuO	4	11	L	27	M	139	C

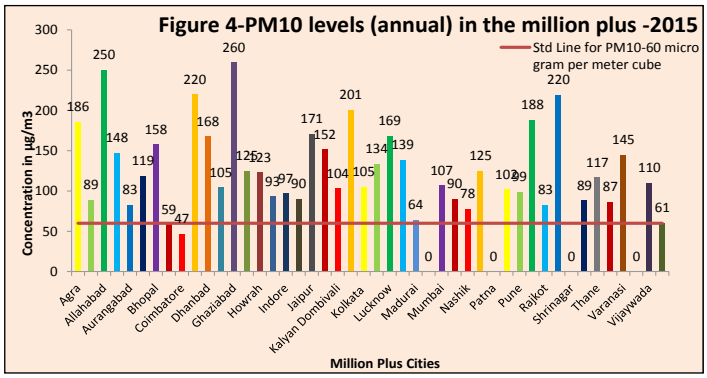
State	Cities	Type & category of city	No. of Stations	SO_2		NO_2		PM_{10}	
				Annual average ($\mu g/m^3$)	Air Quality	Annual average ($\mu g/m^3$)	Air Quality	Annual average ($\mu g/m^3$)	Air Quality
Rajasthan	Jaipur	RIRuO	6	7	L	36	M	171	C
Rajasthan	Jodhpur	RIRuO	6	6	L	24	M	152	C
Rajasthan	Kota	RIRuO	3	6	L	34	M	134	C
Tamilnadu	Chennai	RIRuO	11	13	L	20	L	59	M
Tamilnadu	Coimbatore	RIRuO	3	4	L	25	M	47	M
Tamilnadu	Madurai	RIRuO	3	13	L	25	M	64	H
Uttar Pradesh	Agra	Taj-trapezium	6	4	L	22	M	186	C
Uttar Pradesh	Allahabad	RIRuO	5	4	L	26	M	250	C
Uttar Pradesh	Ghaziabad	RIRuO	2	23	L	37	M	260	C
Uttar Pradesh	Kanpur	RIRuO	9	6	L	36	M	201	C
Uttar Pradesh	Lucknow	RIRuO	8	8	L	28	M	169	C
Uttar Pradesh	Meerut	RIRuO	2	-	-	-	-	-	-
Uttar Pradesh	Varanasi	RIRuO	5	19	L	33	M	145	C
West Bengal	Howrah	RIRuO	4	15	L	43	H	123	C
West Bengal	Kolkata	RIRuO	10	7	L	56	H	105	C
16 states 1UT	**46 cities**		**206**						

*NB. Figures within parentheses represent total number of operating monitoring stations in the state # no monitoring station in the city @ monitoring station sanctioned but not yet operational; RIRuO – Residential/industrial/rural/other area, ES – Ecologically sensitive area; L: Low, M: Moderate, H: High, C: Critical *Concentration exceeding NAAQS of 50 $\mu g/m^3$ for SO_2, 40 $\mu g/m^3$ for NO_2, and 60 $\mu g/m^3$ for PM_{10} for Residential/ industrial / other area & 20 $\mu g/m^3$ for SO_2, 30 $\mu g/m^3$ for NO_2, and 60 $\mu g/m^3$ for Ecologically sensitive area; Low, moderate, high, critical classification based on Pollution Level Classification, Table 1, '-' inadequate data; Data of monitoring stations with monitoring days ≥50 has only been considered*

The air quality scenario with respect to SO_2, NO_2 and PM_{10} in million plus cities is represented in figure 2, 3 and 4



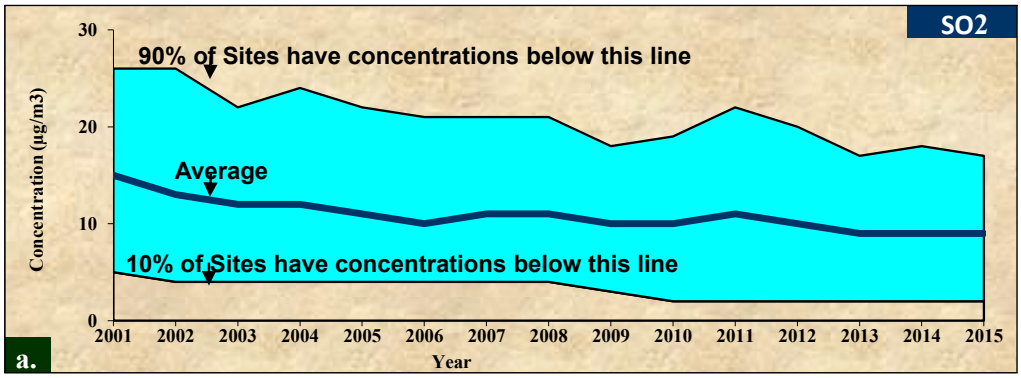


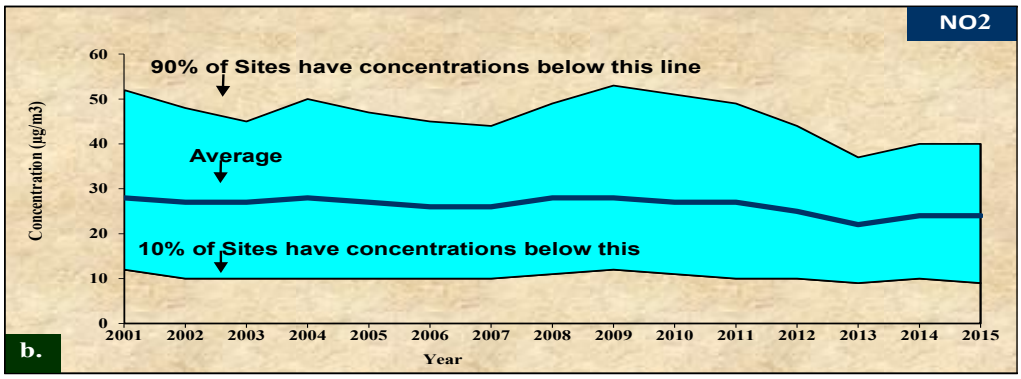


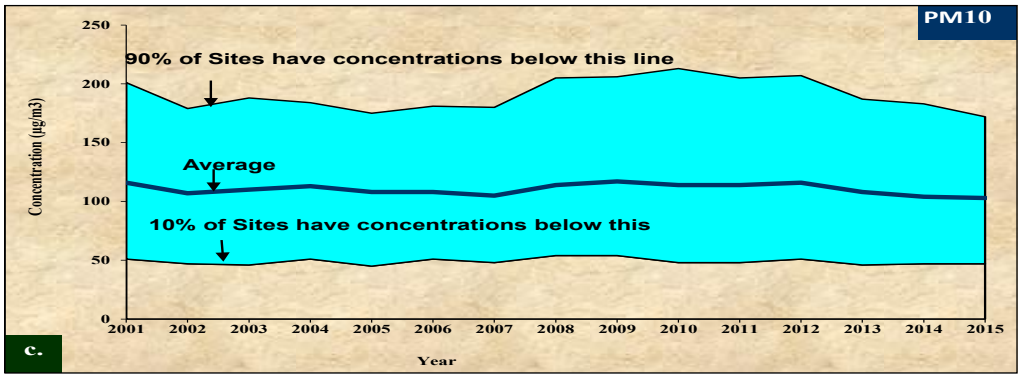
National Mean Concentration of three regularly monitored pollutants

National mean concentration with 90th percentile and 10th percentile for SO_2, NO_2 and PM_{10} is depicted in Figure 5. National mean of SO_2 concentration has decreased over the years indicating that there has been a decline in SO_2 levels (Figure 5.a). Decreasing trend may be due to various interventions that have taken place in recent years such as reduction in Sulphur in diesel, use of cleaner fuel such as CNG in metro cities, change in domestic fuel from coal to LPG etc. National mean of NO_2 concentration has remained stable over the years with a slight decrease in last three years despite increase in sources like vehicles (Figure 5.b). The reason for this may be various intervention measures that have taken place such as improvement in vehicle technology and other vehicular pollution control measures like alternate fuel etc. National mean of PM_{10} concentration shows fluctuating trend exceeding the NAAQS (Figure 5.c). The reasons being emission from gensets, small scale industries, biomass incineration, suspension of traffic dust, natural dust, commercial and domestic use of fuel and vehicular emission etc. Furthermore, the increasing trend for PM_{10} may be attributed to the increasing number of vehicles and re-suspension of natural dust.

Figure 5. National mean concentration of different locations that fall under 10th and 90th Percentile for SO_2, NO_2 and PM_{10}







5.3 National Ambient Noise Monitoring Network (NANMN) Programme

Noiserefers to the disturbing sound that may cause harm to human and animal life. It may affect the mind, health and behaviour. It may cause physically discomfort and temporary or permanent damage to hearing.

The indoor sources of Noise Pollution are loudly played music stereos, radio, televisions, grinding machines, etc. The outdoor sources of Noise Pollution commonly referred to as environmental noise comes from airplane, machines, trains, vehicles, industries, fire-crackers etc.

The following measures can be taken to prevent noise pollution:

- ✓ To prevent and control noisepollution it is necessary to create public awareness. Only law is not sufficient. People must be made aware of the harmful consequences of noise pollution.
- ✓ People should be made aware that excessive noisebeyond certain limitsmay cause deafness.
- ✓ They should know that injuries caused by sound pollutionare often irreversible.
- ✓ There should be minimum use of sound producing instruments. There should be proper regulations for the use of loudspeakers and other devices that producenoisebeyond that are beyond the toleration limits of human-beings.
- ✓ The Pollution Control Board and the High Court have already taken effective measures to bring sound pollution under control. Adequate measures should be taken to ensure that noise related restrictions are not violated.
- ✓ Anti-pollution laws should be enacted and enforced.
- ✓ Ban of fire crackers should be imposed and electric horns should be replaced by bulb horns.
- ✓ The use of microphones should be controlled and regulated.

Under the Environment (Protection) Act, 1986 Noise Pollution (Regulation and Control) Rules, 2000 notified by MoEF was last amended in January 2010. Database on noise level is required for policy formulation, setting standards and ensuring compliance of the existing rules. As per section 5.2.8 (IV) of National Environment Policy (NEP)-2006, Ambient Noise is included as environmental quality parameter and to monitor in specified urban areas regularly.

Road map declared during 2010 by Hon'ble Minister of Environment & Forests regarding setting up a systematic national noise monitoring network covering 25 cities to make Indian cities less noisy. CPCB decided to install Automatic Real time Noise Monitoring System as large number of stations can be handled easily using this technology

Existing Network:

Central Pollution Control Board in association with State Pollution Control Board has laid down National Ambient Noise Monitoring Network in 07 metropolitan cities and installed 35 no. of Noise Monitoring System in Mumbai, Delhi, Kolkata, Chennai, Bangalore, Lucknow and Hyderabad (five stations in each) under Phase-I of the programme. The Strengthening of Network has been carried out by adding 35 more stations in the same 07 metropolitan during 2014-15.Thus the monitoring network has been extended to 70 Nos. of stations.

CPCB in association with State Pollution Control Boards has laid down National Ambient Noise Monitoring Network in 07 metropolitan cities and installed 35 Nos. of Noise Monitoring System in Mumbai, Delhi, Kolkata, Chennai, Bangalore, Lucknow and Hyderabad (05 Nos. of stations in each city) under Phase-I. The sound level data fetched from Real time Noise Monitoring Station was compared with Ambient Noise Standards. The extent of violation with respect to prescribed standards was assessed. The Noise Level Data for 04 years (2011-2014) is being published and same reveals that:

- In Delhi noise level is exceeding to the prescribed standards at all stations except CPCB, H.Q.
- In Lucknow noise level is exceeding to the prescribed standards at all stations except at Talkatora for both day time and night time and at Indira Nagar for day time.
- In Kolkata noise level is exceeding at SSKM Hospital, New Market for both day & night time and at Patauli for night time. Noise levels are within prescribed limits at remaining station.
- In Mumbai noise levels are exceeding to the prescribed standards except Thane MCO (at day time).
- In Hyderabad noise levels are exceeding to the prescribed standards except Jeedimetla.
- In Chennai noise levels are exceeding to the prescribed standards except at Guindy for night time .
- In Bangalore noise levels are exceeding to the prescribed standards at BTM and Nisarga Bhawan for both day and night time and at Parisar Bhawan at night time.

Ambient noise level data (yearly basis) for 04 years is attached at Annexure-I. Further, CPCB established more 35 Nos. of Noise Monitoring System in same cities (05Nos. of stations in each city) during 2014. Noise data generated for 70 Nos. of Stations of 07 Cities during the year 2015 is attached at Annexure 'II'. Close examination of data placed at Annexure 'II' reveals following observations:

- ✓ In Bangalore city, only 02 stations installed at Peeniya and Marathali are meeting the prescribed norms w.r.t day time whereas during night time stations installed at Whitefield and Peeniya are within prescribed norms.
- ✓ Stations installed at Chennai and Delhi is above the prescribed limits.
- ✓ Out of 10 stations installed at Hyderabad, only 01 station installed at Gaddapothram meeting the prescribed standards.

- ✓ 02 stations installed at Head Quarter - West Bengal SPCB, Tartala are meeting the standards with respect to day time. During Night time, only 01 station installed at Tartala meeting the prescribed limit.
- ✓ Only 01 Station installed at Talkatora, Lucknow are meeting the prescribed limits of day and night time. Remaining 09 stations installed at Lucknow above the prescribed limits.
- ✓ Stations installed at L& T Powai, Andheri, M & M Kandivali are meeting day time and night limits and remaining 07 stations are above the prescribed standards.

Table 1: Category wise details of Existing Noise Monitoring

Area/ Category/ Zone	No. of Stations	Cities covered
Silence	17	Chennai (2), Hyderabad(2), Kolkata(2), Delhi(4), Mumbai (2), Bangaluru(2)&Lucknow(3)
Residential	16	Bangaluru(3), Chennai (3),Delhi(2), Hyderabad(2), Kolkata(3), Mumbai (1), &Lucknow(2)
Commercial	25	Bangaluru(3), Chennai (4), Hyderabad(4), Kolkata(3), Delhi(4), Mumbai (4) &Lucknow(3)
Industrial	12	Bangaluru(2), Chennai (1), Hyderabad(2), Kolkata(2), Mumbai (3) &Lucknow(2)
Total	**70**	

Note: Figures in brackets indicate the no. of locations

Frequency of monitoring:

Ambient Noise Monitoring is carried out in Real Time mode continuously and data is captured at central receiving station at CPCB, Delhi and is made available on public domain as well as CPCB's website.

Action Taken by CPCB:

1. Ambient Noise Level data monitored by CPCB through automatic real time Ambient Noise Monitoring Network spread over 09 million plus cities have been evaluated against the prescribed standards/ limits, notified under Noise Rules, 2000. Report on "National Ambient Noise Monitoring Network: NANMN/02/2015-16 " provides city wise status of ambient noise level. The report also includes information on instrumentation involved in its implementation relating to noise measurement. The sound level data fetched from Real time Noise Monitoring Station was compared with Ambient Noise Standards. The extent of violation with respect to prescribed standards was also assessed.
2. All the concerned SPCBs and States have been provided data and requested to take necessary action for and remedial measures to control Noise Pollution as per Noise Rules, 2000.
3. Press Release on Noise Pollution Level is issued every year on the occasion of Deepawali (available on website of CPCB).
4. Data is made available on public demand as well as website of CPCB.
5. Based on findings of the noise levels observed, following Directions vide letter dated 26/04/2016 were issued to concerned SPCBs/PCCs under Section 18 (1) b of Air (Prevention and Control of Pollution) Act:
   - ✓ The State Pollution Control Boards/Pollution Control Committees shall issue directions under section 31 (a) of the Air (Prevention & Control of Pollution) Act, 1981 and under section 5

of Environment (Protection) Act, 1986 to designated authorities as notified in Noise Pollution (Regulation & Control) Rules, 2000 to take corrective measures so as to control noise pollution.

- ✓ SPCBs/PCCs shall ensure that noise generating sources like public address systems, music at occasion of marriage, D.G. Sets shall be operated within prescribed limit and shall not used during night hours (after 10 P.M.).
- ✓ SPCBs/PCCs shall eliminate the noise emitting sources like flourmills and other industrial activity from residential area.
- ✓ A Control Room will be set up to receive public grievance on Noise Pollution and these will be readdressed within reasonable time frame.

Status of Noise Levels of 07 Metropolitan Cities in Year 2011, 2012, 2013 and 2014

S. No.	Stations Name with Zone		Limit in dB(A) Leq		2011		2012		2013		2014	
	City	Location	Day 06 AM to 10 PM	Night 10 PM to 06 AM	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)
1	Bangalore	Banglore, Parisar Bhawan (C)	65	55	66	58	65	57	65	57	65	57
2		Banglore, Peeniya (I)	75	70	56	53	56	49	58	53	58	55
3		Banglore, NisargaBhawan (R)	55	45	56	47	56	47	56	48	56	49
4		Banglore, Marathali (C)	65	55	56	53	54	52	57	54	59	56
5		Banglore, BTM (R)	55	45	66	56	66	56	66	56	66	57
6	Chennai	Chennai, Eye Hospital (S)	50	40	64	51	62	52	64	53	61	53
7		Chennai, T.Nagar(c)	65	55	73	62	73	62	74	64	75	67
8		Chennai Perambur (C)	65	55	68	58	69	58	68	57	69	58
9		Chennai, Guindy (I)	75	70	76	71	75	71	75	71	76	72
10		Chennai, Triplicane (R)	55	45	68	55	68	56	68	56	68	57
11	Delhi	Delhi, Dilshad Garden (S)	50	40	52	50	52	49	51	49	52	48
12		Delhi, CPCB (C)	65	55	64	53	62	53	63	53	65	54
13		Delhi, DCE (S)	50	40	52	48	51	49	52	49	52	48
14		Delhi, ITO (C)	65	55	73	71	72	69	74	73	74	73
15		Delhi, NSIT (S)	50	40	56	54	56	54	56	53	56	53

S. No.	Stations Name with Zone		Limit in dB(A) Leq		2011		2012		2013		2014	
	City	Location	Day 06 AM to 10 PM	Night 10 PM to 06 AM	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)	Day Leq. dB(A)	Night Leq. dB(A)
16	Hyderabad	Hyderabad, Abits (C)	65	55	72	63	72	63	72	64	74	65
17		Hyderabad, Punjagutta (C)	65	55	76	71	75	70	76	71	79	73
18		Hyderabad, Jeedimetla (I)	75	70	62	56	63	56	63	56	65	58
19		Hyderabad, Zoo (S)	50	40	53	48	54	48	54	49	56	50
20		Hyderabad, Jublee Hills (R)	55	45	58	50	56	49	56	49	57	49
21	Kolkata	Kolkata, SSKM Hospital (S)	50	40	61	54	62	56	62	57	62	56
22		Kolkata, Gole Park (I)	75	70	64	59	65	61	68	64	70	67
23		Kolkata, Head Quarter (C)	65	55	62	56	61	54	62	55	64	58
24		Kolkata, Patauli (R)	55	45	55	49	55	49	55	48	55	49
25		Kolkata, New Market (C)	65	55	67	60	67	59	68	60	70	65
26	Lucknow	Lucknow, Talkatora (I)	75	70	63	55	64	56	63	56	64	57
27		Lucknow, Hajrat Gunj (C)	65	55	67	58	72	61	72	62	72	61
28		Lucknow, P.G.I. (S)	50	40	55	49	58	52	60	53	62	55
29		Lucknow, Indira Nagar (R)	55	45	54	47	53	47	54	48	57	49
30		Lucknow, Gomti Nagar (S)	50	40	71	61	63	55	66	57	69	61
31	Mumbai	Mumbai, Thane (C)	65	55	62	53	62	55	62	55	64	56
32		Navi Mumbai, Vashi Hospital (S)	50	40	68	58	69	57	69	57	69	59
33		Mumbai, Ashp (S)	50	40	66	59	65	59	65	60	66	60
34		Mumbai, Bandra (C)	65	55	70	68	69	67	69	67	70	67
35		Mumbai, MPCB, Head Qarter (C)	65	55	67	63	66	63	68	65	71	68
Note: I = Industrial, C = Commercial, R = Residential, S = Silence Zone												

AMBINET NOISE LEVEL DATA OF SEVEN CITIES FOR THE YEAR 2015

S. No.	Stations Name with Zone		Limit in dB(A) Leq		Day Leq. dB(A)	Night Leq. dB(A)
	City	Location	Day 06 AM to 10PM	Night 10 PM to 06 AM		
1	Banglore	Banglore, Parisar Bhawan(C)	65	55	67	59
2		Banglore, Peeniya(I)	75	70	61	59
3		Banglore,Nisarga Bhawan(R)	55	45	58	53
4		Banglore, Marathali(C)	65	55	59	57
5		Banglore, BTM(R)	55	45	66	58
6		Banglore,Yeshwantpur(C)	65	55	72	63
7		Banglore,R.V.C.E.(S)	50	40	60	54
8		Banglore,Whitefield(I)	75	70	67	61
9		Banglore, Dolmur(R)	55	45	66	61
10		Banglore, Nihmans(S)	50	40	63	60
11	Chennai	Chennai, Eye Hospital(S)	50	40	66	60
12		Chennai, T.Nagar(C)	65	55	77	69
13		Chennai Perambur(C)	65	55	72	64
14		Chennai, Guindy(I)	75	70	80	76
15		Chennai, Triplicane(R)	55	45	73	68
16		Chennai, Pallikarnai(C)	65	55	74	67
17		Chennai, Velachery(R)	55	45	67	63
18		Chennai, Washermanpet(C)	65	55	70	67
19		Chennai, Anna Nagar(S)	40	40	67	63
20		Chennai, Sowcarpet(R)	55	45	67	61
21	Delhi	Delhi, Dilshad Garden(S)	50	40	57	55
22		Delhi, CPCB HQ.(C)	65	55	69	59
23		Delhi, DCE(S)	50	40	60	56
24		Delhi, ITO(C)	65	55	74	70
25		Delhi, NSIT(S)	50	40	60	56
26		Delhi, Civil Lines(C)	65	55	72	73
27		Delhi, RK Puram(R)	55	45	62	57
28		Delhi, Anand Vihar(C)	65	55	70	66
29		Delhi, Mandir Marg(S)	40	40	76	74
30		Delhi, Punjabi Bagh(R)	55	45	86	82
31	Hyderabad	Hyderabad, Abids(C)	65	55	78	70
32		Hyderabad, Punjagutta(C)	65	55	80	75
33		Hyderabad, Jeedimetla(I)	75	70	69	63
34		Hyderabad, Zoo(S)	50	40	57	51
35		Hyderabad, Jublee Hills(R)	55	45	60	53
36		Hyderabad, Tarnaka(R)	55	45	60	54
37		Hyderabad, Gaddapothram(I)	75	70	65	59
38		Hyderabad, Gachibowli(S)	50	40	61	55
39		Hyderabad, Paradise(C)	55	55	79	75
40		Hyderabad, Kukatpalli(C)	65	55	70	66

S. No.	Stations Name with Zone		Limit in dB(A) Leq		Day Leq. dB(A)	Night Leq. dB(A)
	City	Location	Day 06 AM to 10PM	Night 10 PM to 06 AM		
41	Kolkata	Kolkata, SSKM Hospital(S)	50	40	64	59
42		Kolkata, Gole Park(I)	75	70	81	81
43		Kolkata, Head Quarter(C)	65	55	64	58
44		Kolkata, Patauli(R)	55	45	69	68
45		Kolkata, New Market(C)	65	55	78	77
46		Kolkata, Birati N.(R)	55	45	63	57
47		Kolkata, RG Kar (S)	50	40	64	63
48		Kolkata, Tollygunge(C)	65	55	67	63
49		Kolkata, Bag Bazar(R)	45	45	78	69
50		Kolkata, Tartala(I)	75	70	65	61
51	Lucknow	Lucknow, Talkatora(I)	75	70	67	62
52		Lucknow, Hazrat Gunj(C)	65	55	73	64
53		Lucknow, P.G.I.(S)	50	40	64	58
54		Lucknow, Indira Nagar(R)	55	45	62	57
55		Lucknow, Gomti Nagar(S)	50	40	93	91
56		Lucknow, Chinhat(I)	75	70	68	60
57		Lucknow, IT College(S)	50	40	66	57
58		Lucknow, CSS Airport(C)	65	55	75	66
59		Lucknow, RSC Aligabj(C)	55	55	63	58
60		Lucknow, Vibhuti Khand(R)	55	45	63	58
61	Mumbai	Mumbai, Thane(C)	65	55	65	57
62		Navi Mumbai, Vashi Hospital(S)	50	40	69	59
63		Mumbai, Ashp(S)	50	40	77	75
64		Mumbai, Bandra(C)	65	55	68	64
65		Mumbai, MPCB, Head Qarter(C)	65	55	71	70
66		Mumbai, M&M Kandivali(I)	75	70	62	56
67		Mumbai, Ambassador Hotel(C)	65	55	73	69
68		Mumbai, L&T Powai(I)	75	70	60	57
69		Mumbai, Pepsico Chembur(R)	45	45	67	64
70		Mumbai, Andheri(I)	75	70	71	68

AMBIENT NOISE LEVEL ASSESSMENT AT 70 LOCATIONS IN 07 METRO CITIES DURING DEEPAWALI 2011, 2012, 2013, 2014 AND 2015

Ambient Noise Level assessment has been conducted at 70 locations in seven cities (Delhi, Mumbai, Chennai, Kolkata, Lucknow, Bangalore and Hyderabad) reveals following observations:

1. Out of 70 locations, only 07 locations at Peeniya (Industrial) and Whitefield (Industrial) in Bangalore; Jeedimetla (Industrial) and Addapotharam (Industrial) in Hyderabad; Tartala (Industrial) in Kolkata; Talkatora (Industrial) in Lucknow and Andheri (Industrial) in Mumbai are meeting both the day time and night time standards. All these 07 locations lying in Industrial zone.

2. All the locations are above the prescribed limits for day and night time in Delhi and Chennai.

3. Among the 70 locations, 16 are meeting the prescribed limits for day time standards (06 AM to10PM) and 09 are meeting the prescribed norms for night time (10 PM to 06 AM). Ambient noise monitoring data of 70 noise monitoring stations depicting Leq day time and Leq night time is shown in Annexure-I.

4. Leq (24hr) ranges between 57 dB (A) at Lucknow, Chinhat (Industrial) to 92 dB (A) at Kolkata, New Market (Commercial). The maximum sound level observed at Kolkata, New Market (Commercial) followed by Dolmur (Residential) in Bangalore and Gomti Nagar (Silence) in Lucknow.

5. The minimum sound level observed at Chinhat (Industrial) in Lucknow followed by Mumbai, Powai (Industrial), Hyderabad, Zoo (Silence) and Delhi, Mandir Marg (Silence).

6. Overall Ambient Noise Level Trend in these seven cities on the occasion of Deepawali 11/11/2015, 23/10/2014, 03/11/2013, 13/11/2012 and 26/10/2011 along with data are presented in Annexure-II.

7. Trend analysis with respect to previous year data reveals that 08 locations have decreasing trend or no change especially in Bangalore and Mumbai.

8. Increasing trend with marginal variation is observed at 26 locations in Delhi, Kolkata, Hyderabad, Chennai and Lucknow, over the last five years on the occasion of Deepawali.

AMBIENT NOISE MONITORING DATA OF 70 NOISE MONITORING STATION ON THE OCCASION OF DEEPAWALI

Sr. No.	City	Limit in dB(A) Leq		Station Name	Leq (24 hrs.) Value dB(A)	Day Leq. dB(A)	Night Leq. dB(A)
		Day 06 AM to 10PM	Night 10 PM to 06 AM				
1	Bangalore	65	55	Bangalore, Parisar Bhawan (C)	66	68	59
2		75	70	Bangalore, Peeniya(I)	60	61	58
3		55	45	Bangalore, Nisarga Bhawan(R)	67	70	55
4		65	55	Bangalore, Marathali(C)	61	62	58
5		55	45	Bangalore, BTM(R)	67	69	61
6		65	55	Bangalore, Yeshwanthpur(C)	72	74	64
7		55	45	Bangalore, R.V.C.E.(S)	60	61	56
8		75	70	Bangalore, Whitefield(I)	65	67	60
9		55	45	Bangalore, Dolmur(R)	88	89	86
10		50	40	Bangalore, NIMHANS(S)	82	81	88
11	Chennai	50	40	Chennai, Eye Hosp.(S)	69	69	68
12		65	55	Chennai, T. Nagar(C)	75	77	68
13		65	55	Chennai, Perambur(C)	N/A	N/A	N/A
14		75	70	Chennai, Guindy(I)	78	80	74
15		55	45	Chennai, Triplicane(R)	69	71	62
16		65	55	Chennai, Pallikaranai(C)	72	74	66
17		55	45	Chennai, Velachery(R)	74	73	77
18		65	55	Chennai, Warhermanpet(C)	75	76	75
19		50	40	Chennai, Anna Nagar(S)	65	66	62
20		55	45	Chennai, Sowcarpet(R)	71	72	69

Sr. No.	City	Limit in dB(A) Leq		Station Name	Leq (24 hrs.) Value dB(A)	Day Leq. dB(A)	Night Leq. dB(A)
		Day 06 AM to 10PM	Night 10 PM to 06 AM				
21	Delhi	50	40	Delhi, Dilshad Garden(S)	65	65	67
22		65	55	Delhi, CPCB(C)	68	67	68
23		50	40	Delhi, DCE(S)	68	66	71
24		65	55	Delhi, ITO(C)	72	73	70
25		50	40	Delhi, NSIT(S)	63	63	62
26		65	55	Delhi, Civil Lines(C)	64	64	66
27		50	40	Delhi, R K Puram(S)	66	67	65
28		65	55	Delhi, I.S.B.T.(C)	69	69	70
29		50	40	Delhi, Mandir Marg(S)	60	60	60
30		55	45	Delhi, Punjabi Bagh(R)	68	66	71
31	Hyderabad	65	55	Hyderabad, Abids(C)	80	82	72
32		65	55	Hyderabad, Punjagutta(C)	79	81	76
33		75	70	Hyderabad, Jeedimetla(I)	66	68	61
34		50	40	Hyderabad, Zoo(S)	59	60	58
35		55	45	Hyderabad, Jublee Hills(R)	66	67	62
36		55	45	Hyderabad, Tarnka(R)	68	70	60
37		75	70	Hyderabad, Gaddapotharam(I)	66	69	53
38		55	45	Hyderabad, Gachibowli(S)	64	67	54
39		65	55	Hyderabad, Paradise(C)	77	77	74
40		65	55	Hyderabad, JNTU(C)	71	73	68
41	Kolkata	50	40	Kolkata, SSKM Hosp.(S)	63	63	62
42		75	70	Kolkata, Gole Park(I)	66	65	66
43		65	55	Kolkata, WBPCB HQ.(C)	60	61	60
44		55	45	Kolkata, Patauli(R)	81	81	80
45		65	55	Kolkata, New Market(C)	92	92	92
46		55	45	Kolkata, Birati Neelanchal(R)	63	64	59
47		50	40	Kolkata, R G Kar(S)	63	63	64
48		65	55	Kolkata, Tollygunge(C)	71	73	68
49		55	45	Kolkata, Bag Bazar(R)	77	76	78
50		75	70	Kolkata, Tartala(I)	63	64	60

Sr. No.	City	Limit in dB(A) Leq		Station Name	Leq (24 hrs.) Value dB(A)	Day Leq. dB(A)	Night Leq. dB(A)
		Day 06 AM to 10PM	Night 10 PM to 06 AM				
51	Lucknow	75	70	Lucknow, Talkatora(I)	67	68	64
52		65	55	Lucknow, Hazrat Ganj(C)	71	72	66
53		50	40	Lucknow, P.G.I.(S)	65	66	63
54		55	45	Lucknow, Indira Nagar(R)	77	79	69
55		50	40	Lucknow, Gomti Nagar(S)	86	83	90
56		75	70	Lucknow, Chinhat(I)	57	60	44
57		50	40	Lucknow, IT College(S)	64	65	63
58		65	55	Lucknow, RSC Aliganj(C)	74	75	71
59		55	45	Lucknow, Vibhuti Khand(R)	63	65	57
60		65	55	Lucknow, CSS Airport(C)	63	65	58
61	Mumbai	65	55	Mumbai, Thane(C)	63	65	60
62		50	40	Navi Mumbai, Vashi Hsp.(S)	67	68	63
63		50	40	Mumbai, Ashp(S)	72	72	72
64		65	55	Mumbai, Bandra(C)	67	68	66
65		65	55	Mumbai, MPCB HQ.(C)	67	67	66
66		75	70	Mumbai, Kandivali(I)	62	63	61
67		75	70	Mumbai, Powai(I)	59	58	60
68		55	45	Mumbai,Chembur (R)	66	67	62
69		75	70	Mumbai, Andheri(I)	71	72	70
70		65	55	Mumbai, Ambassador Hotel(C)	72	73	71

TREND ANALYSIS OF SOUND LEVEL DATA FOR 35 NOISE MONITIORING STATIONS

S.N.	City	Stations	2011 Leq (24 hrs)	2012 Leq (24hrs)	2013 Leq (24hrs)	2014 Leq (24hrs)	2015 Leq (24hrs)	Increasing Trend	Decreasing Trend/ No change
1	Bangalore	Nisarga Bhawan	60	51	59	58	67	↑	
2		Parisar Bhawan	64	62	61	63	66	↑	
3		BTM	65	63	62	64	67	↑	
4		Marathalli	57	55	61	61	61		- (No Change)
5		Pineeya	59	57	56	61	60		↓
6	Chennai	Triplicane	69	63	65	66	69	↑	
7		T. Nagar	69	70	69	72	75	↑	
8		Guindy	75	74	69	76	78	↑	
9		Perambur	75	86	65	69	N.A		
10		Eye Hospital	65	60	66	66	69	↑	

S.N.	City	Stations	2011 Leq (24 hrs)	2012 Leq (24hrs)	2013 Leq (24hrs)	2014 Leq (24hrs)	2015 Leq (24hrs)	Increasing Trend	Decreasing Trend/ No change
11	Delhi	NSIT	64	56	58	60	63	↑	
12		CPCB	61	58	62	66	68	↑	
13		DCE	53	50	52	54	68	↑	
14		Dilshad Garden	57	49	56	58	65	↑	
15		ITO (Pragati Maidan)	74	74	73	77	72		↓
16	Hyderabad	Abits	71	70	70	75	80	↑	
17		Jeedimetla	61	61	60	62	66	↑	
18		Jubliee Hills	-	54	55	57	66	↑	
19		Punjagutta	75	76	76	76	79	↑	
20		Zoo	-	52	55	55	59	↑	
21	Kolkata	Head Quarter (WBPCB)	60	59	63	61	60		↓
22		New Market (Municipal Corporation)	64	64	65	72	92	↑	
23		Patauli	57	54	53	56	81	↑	
24		SSKM Hospital	59	59	61	60	63	↑	
25		Golpark	64	64	75	74	66		↓
26	Lucknow	Indira Nagar	54	51	58	57	77	↑	
27		PGI Hospital	-	54	60	60	65	↑	
28		Gomti Nagar	-	60	66	65	86	↑	
29		Hajrat Ganj	68	69	68	70	71	↑	
30		Talkatora Industrial Area	59	61	60	63	67	↑	
31	Mumbai	Acworth Hospital (ASHP)	64	64	64	64	72	↑	
32		Bandra	69	69	68	69	67		↓
33		Thane (TMCO)	62	59	64	63	63		No change
34		Vashi Hospital	66	65	65	65	67	↑	
35		MPCB, HQ	64	66	66	69	67		↓
Note:-All values are measured in Leq [dB(A)]								**26**	**6 (No change-2)**

RECOMMENDATIONS:

1. Noise pollution can be controlled when the sense of understanding of the effects of noise on the other end is percepted. Awareness programme shall be organized as most of the noise is generated because of improper and inefficient usage of resources.
2. Mass awareness programs shall be organized in school so that use of fire crackers shall be eliminated.

3. The manufactures of fire crackers shall comply with Noise Standards for fire crackers. Local/Concerned authorities shall ensure that fire crackers of only authorized manufactures complying with the standards brought into reach of users.
4. Residential colonies should be constructed with such an architectural design as to reduce the level of noise reverberation.
5. Vegetation buffer zone and road side plantation should be developed in different parts of the city.
6. Fire crackers shall be used in control manner and fire cracker burning shall be stopped after 10 P.M.
7. Publishing the legislation reflecting possible consequences of the legal action by Prevention, Prohibition, Payment and Punishment to the public.
8. Fire crackers shall not used near silence zone like hospitals, institutional area and schools.
9. Burning of fire crackers also generates solid waste and responsibility shall be imposed by concerned authority for generation of solid waste in public place.

Vehicular Noise:

India produced around 2, 22, 66,246 vehicles during 2014-15 and there are around 159 million registered vehicles (2012-13) plying on the road. Vehicular noise increases with increasing on-road vehicles and is influenced by vehicle engine, horns/sirens, design parameters of the vehicle, age, driving pattern, etc. Horn is called as 'Audible Warning Device' (AWD) internationally in automotive regulatory terms. AWD is basically a safety device providing warning to other road users to avoid accidents and for signaling overtaking while driving on highways. However, cities/towns are experiencing higher ambient noise levels at thickly traffic areas which further gets aggravated by other sources also.

Vehicular 'noise' pollution is mainly caused due to automobiles and horns. The major sources of noise in automobiles are exhaust, air intake, engine, fan and tires at high speed. The noise output of all components increases with speed. The increase in noise emission from vehicles depends mainly on condition and speed of the vehicles, improper usage of horns and sirens.

The existing system of measuring Noise at Manufacturing Stage and for moving vehicle has been studied. There is difference between the two methods as, one (for manufacturing stage/ New Vehicle), there is emission / ignorance of ambient noise and whereas, moving vehicle noise measurement is in ambient condition which is main concern for assessing noise being created by individual moving vehicle and mix of vehicles on road. The IS method for in-use / moving vehicle already exist as IS 3028/1998 which now can be further revisited taking noise component.

Hence, CPCB interacted with resource Institutions and Expert having Knowledge in this field and making efforts to develop demonstration plans for Noise monitoring from individual vehicles in moving traffic in Indian Cities.

CHAPTER – VI

PRESENT STATE OF ENVIRONMENT, ENVIRONMENTAL PROBLEMS AND COUNTER MEASURES

6.1 Ambient Air Quality of Delhi:

The CPCB has established network of ambient air quality way back in 1985-86 and the data being generated from these network are being used by various developmental activities including for mega projects like metro. The data generated during 2013, 2014 and 2015 and presented as under:

Sulphur dioxide (SO_2):

The annual mean concentration of Sulphur dioxide during the year 2013, 2014 & 2015 is shown in Fig.1. The concentration of sulphur dioxide recorded at all the six locations was same with previous year and well within the national standard.

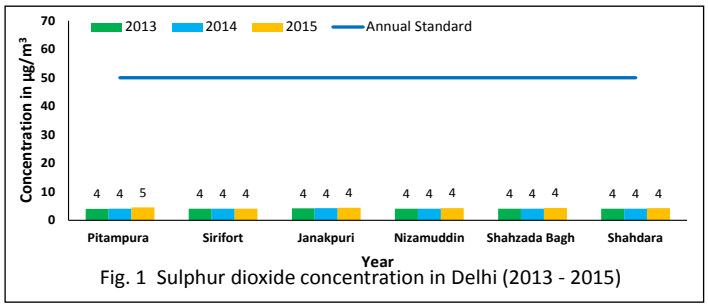


Fig. 1 Sulphur dioxide concentration in Delhi (2013 - 2015)

Nitrogen dioxide (NO_2):

The annual mean concentration of Nitrogen dioxide during the year 2013, 2014 and 2015 is shown in Fig.2. The concentration of nitrogen dioxide recorded at three locations shows a decreasing trend and three locations an increasing trend with respect to previous years. The concentration of NO_2 ranged between 37 µg/m^3 (Pitampura) to 56 µg/m^3 (Shahzada Bagh) during the year 2015. The concentration of NO_2 exceeded the national standards at all locations except one (Pitampura) during the year 2015.

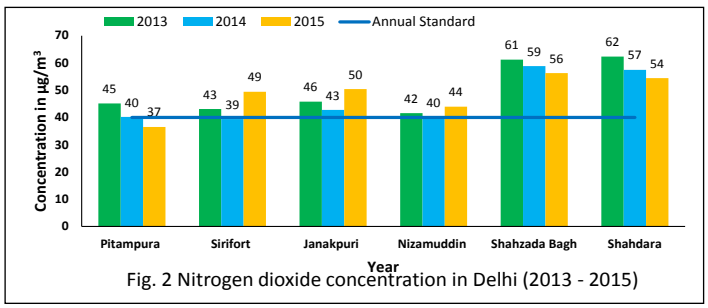


Fig. 2 Nitrogen dioxide concentration in Delhi (2013 - 2015)

Particulate Matter (PM_{10})

The concentration of PM_{10} monitored at four locations (Pitampura, Janakpuri, Nizamuddin & Shahzada Bagh) shows an increasing trend while other two locations (Sirifort & Shahdara) shows a decreasing trend (Fig.3). The concentration of PM_{10} ranged between 189 µg/m^3 (Sirifort) to 261 µg/m^3 (Shahzada Bagh) during the year 2015. The concentration of PM_{10} at all locations exceeded the annual national standard.

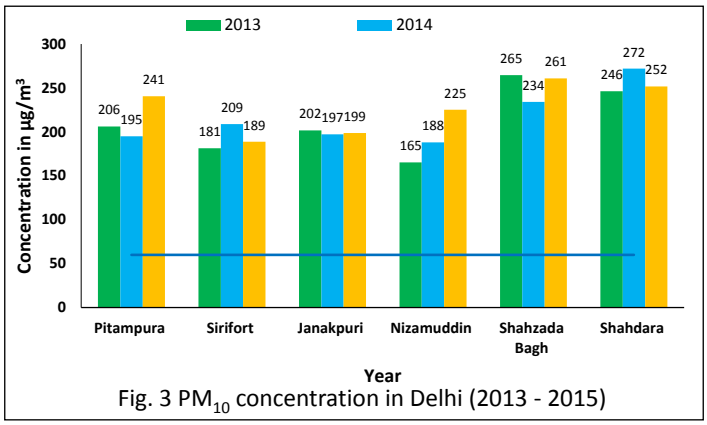


Fig. 3 PM_{10} concentration in Delhi (2013 - 2015)

Particulate Matter ($PM_{2.5}$)

The annual mean concentration of $PM_{2.5}$ shows an increasing trend at all locations during the year 2015 in comparison to year 2013 & 2014 (Fig.4). The annual mean concentration of $PM_{2.5}$ ranged between 83 µg/m^3 (Nizamuddin) and 119 µg/m^3 (Pitampura) during the year 2015. The concentration of $PM_{2.5}$ exceeded the prescribed national annual standard at all the locations.

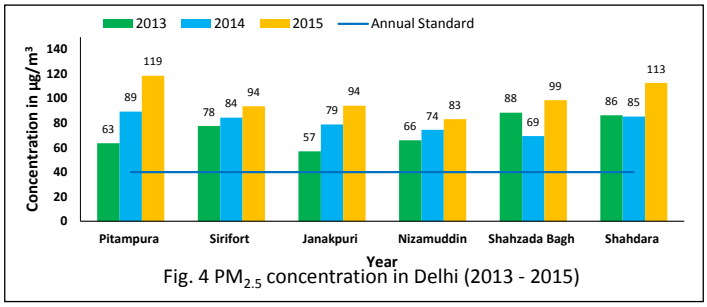


Fig. 4 $PM_{2.5}$ concentration in Delhi (2013 - 2015)

Particulate Heavy Metals (Pb & Ni) and Semi-metal (As) in the Ambient Air of Delhi (2013 - 2015):

Central Pollution Control Board is monitoring lead, nickel and arsenic in particulate matter PM_{10} at Six locations (Pitampura, Sirifort, Nizamudin, Janakpuri, Shahdara and Shahzadabagh) in Delhi. In ambient air, Lead arises from natural as well as anthropogenic sources. Human's exposure to lead can result in a wide range of biological effects depending on the level and duration of exposure. It affects synthesis of hemoglobin in blood and cause damage to kidneys. Nickel in ambient air mainly comes from combustion of fuel oil, coke in power plants, refineries and other industries. Excessive amount of Nickel can be mildly toxic. Long-term exposure can cause heart and liver ailments. Aresenic has both natural and anthropogenic sources. Rock pyrite leaches Arsenic in soil through aberration and fossil fuel burning (coal) also add Arsenic in Environment. This toxic metal has wide range of health effects in organisms and human being. Skin rashes, Lung ailments and finally kidney failure are common effects of Arsenic on human health. Major health an effect of Arsenic is through water route (contaminated ground water). The concentration of metals (Pb & Ni) and semimetal (As) is described as follows:

Particulate Lead in PM_{10} :

The annual mean concentration of particulate lead in the ambient air of Delhi is shown in Fig.-1.

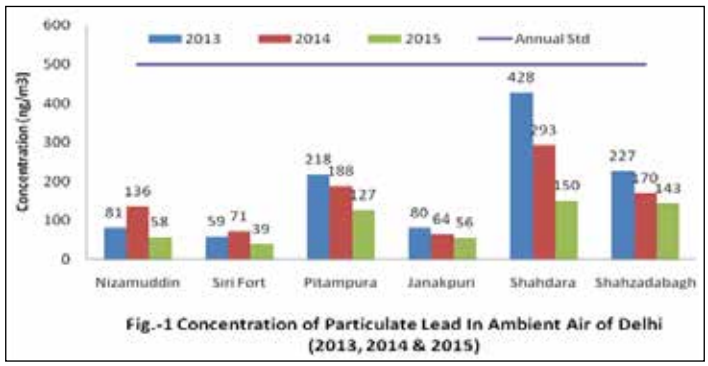


Fig.-1 Concentration of Particulate Lead In Ambient Air of Delhi (2013, 2014 & 2015)

The annual mean concentration of particulate lead in the year 2013, 2014 and 2015 were observed in the range of 59.0 ng/m^3 to 428.0 ng/m^3, 64.0 ng/m^3 to 293.0 ng/m^3 and 39.0 ng/m^3 to 150.0 ng/m^3 respectively in the ambient air of Delhi. The maximum concentrations of particulate lead was observed at Shahdara (428.0 ng/m^3) in 2013, (293.0 ng/m^3) in 2014 and 150 ng/m^3 in 2015.The minimum concentration of lead found at Sirifort (59.0 ng/m^3) in 2013, Janakpuri (64.0 ng/m^3) in 2014 and Sirifort (39.0 ng/m^3) in 2015. Lead concentration has not violated the permissible limit (500 ng/m^3) across Delhi.

Particulate Nickel in PM_{10} :

The annual mean concentration of particulate nickel in the ambient air of Delhi is shown in Fig.-2.

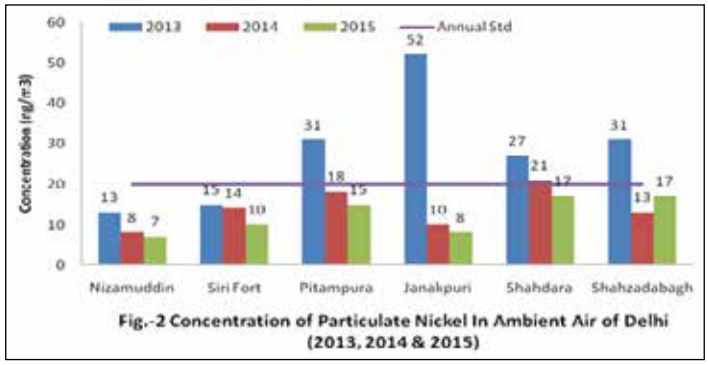


Fig.-2 Concentration of Particulate Nickel In Ambient Air of Delhi (2013, 2014 & 2015)

The annual mean concentrations of particulate nickel were observed in the range of 13.0 ng/m^3 to 52.0 ng/m^3 (2013), 08.0 ng/m^3 to 21.0 ng/m^3 (2014) and 07.0 ng/m^3 to 17.0 ng/m^3 (2015) in the ambient air of Delhi. The observed concentration value of Nickel is exceeded the permissible limits of 20.0 ng/m^3 at four out of six locations (Pitampura, Janakpuri, Shahzadabagh and Shahdara) in the year 2013 and one location at Shahdara in the year 2014. In 2015 concentration of Nickel observed within permissible limit across Delhi.

Particulate Arsenic in PM_{10} :

The annual mean concentration of particulate semimetal (arsenic) in the ambient air of Delhi is shown in Fig.-3.

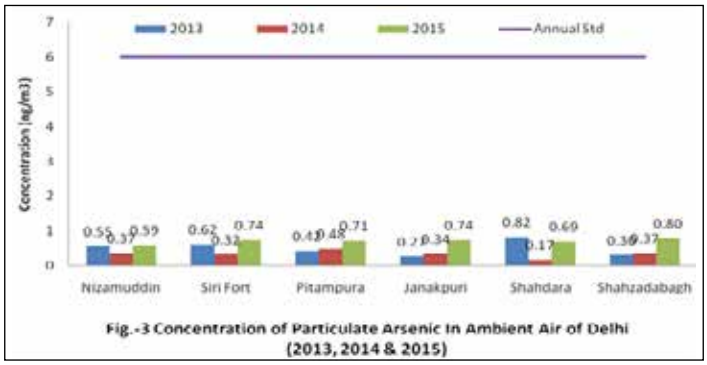


Fig.-3 Concentration of Particulate Arsenic in Ambient Air of Delhi (2013, 2014 & 2015)

The mean values ranges from 0.27ng/m^3 to 0.82 ng/m^3. (2013), 0.17 ng/m^3 to 0.48 ng/m^3. (2014 and 0.59 ng/m^3 to 0.80 ng/m^3. (2015). The annual mean Concentrations of Arsenic were observed within the prescribed standard limits (6.0ng/m^3) across Delhi.

Model Ambient Air Quality Monitoring Station at ITO (BSZ Marg), New Delhi:

The ambient air quality monitoring station located at ITO (BSZ Marg) was temporary shifted to Pragati Maidan (Near Metro Station along Mathura Road) due to metro construction activities. After completion of construction activities at ITO, DMRC has constructed a new monitoring stations building in place of our old demolished station building. The Model ambient air quality monitoring station has been developed in new building at BSZ Marg, ITO

Intersection. The instrument, equipment and other monitoring related items were shifted to ITO station and started the monitoring activities in the month of March, 2016. The view of station, sampling system and inside laboratory is shown in figure as below.

Figure a: Ambient air quality monitoring station, ITO (BSZ Marg), New Delhi

Figure b: Sampling system, ITO (BSZ Marg), New Delhi

Figure c: Inside laboratory (On-line & Manual measurement), ITO (BSZ Marg), New Delhi

Station is being visited regularly by number of Dignitaries, Environmentalist, officials of SPCBs & PCCs, students, the personnel working in the field of environment etc.. Being an integrated station for both manual and automatic measurement, attempts are on to run the station as model station for all.

Assessment of Air Quality in Delhi (2001-2015):

The ambient air quality data for the period from 2001 to 2015 has been assessed on the basis of exceedance factor (EF), i.e. Observed annual mean concentration of pollutant divided by annual standard for the respective pollutant based on NAAQS, 2009 for all available parameters (SO_2, NO_2, PM_{10}, $PM_{2.5}$, Lead,

Ammonia, Benzene, Arsenic & Nickel) and coded as low(L), moderate(M), high(H) and critical pollution(H). The surmised assessment report is presented in Table.

Overall Assessment of Air Quality Trend 2002 - 2015

Location / Year		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Pitampura	SO_2	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Sirifort		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Janakpuri		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Nizamuddin		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Shahzada Bagh		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Shahdara		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Pitampura	NO_2	M	M	M	M	H	M	M	M	M	M	H	H	H	M	H
Sirifort		M	M	M	M	M	M	M	H	H	H	H	H	H	M	H
Janakpuri		M	M	H	H	H	H	H	H	H	H	H	H	H	H	H
Nizamuddin		M	M	H	H	H	H	H	H	H	H	H	H	H	M	H
Shahzada Bagh		M	M	M	H	H	H	M	H	H	H	H	H	C	H	H
Shahdara		M	M	M	M	M	H	H	H	H	H	H	H	C	H	H
Pitampura	PM_{10}	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sirifort		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Janakpuri		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Nizamuddin		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Shahzada Bagh		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Shahdara		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Pitampura	$PM_{2.5}$	Notified in NAAQS 2009								C	C	C	C	C	C	C
Sirifort										C	C	H	H	C	C	C
Janakpuri										H	C	C	H	H	C	C
Nizamuddin										C	C	H	H	C	C	C
Shahzada Bagh										C	C	C	C	C	C	C
Shahdara										C	C	C	C	C	C	C
Pitampura	Pb	L	L	L	L	L	L	L	L	L	L	L	M	L	L	L
Sirifort		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Janakpuri		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Nizamuddin		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Shahzada Bagh		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Shahdara		L	L	L	L	L	L	L	L	L	M	M	M	M	M	L
Dilshad Garden	NH_3											L	L	L	L	L
Shadipur	C_6H_6	Notified in NAAQS 2009										C	C	C	M	M
Dwarka												C	C	C	M	M
Pitampura	As	Notified in NAAQS 2009										M	L	L	L	L
Sirifort												L	L	L	L	L
Janakpuri												H	L	L	L	L
Nizamuddin												M	L	L	L	L
Shahzada Bagh												H	L	L	L	L
Shahdara												H	L	L	L	L
Pitampura	Ni	Notified in NAAQS 2009								C	C	C	C	C	M	M
Sirifort										C	C	H	H	M	M	L
Janakpuri										C	C	M	H	C	L	L
Nizamuddin										C	C	M	M	M	L	L
Shahzada Bagh										C	C	H	M	C	M	M
Shahdara										C	C	H	H	H	H	M

L Low Pollution | M Moderate Pollution | H High Pollution | C Critical Pollution | No Data

It is observed from the assessment of air quality data (2001-2015) that there is continuous exceedance with respect to particulate matter, both PM_{10} & $PM_{2.5}$. This concludes that Delhi is dusty besides having local anthropogenic air pollutants like NO_2 attributed to increased number of CNG fleet introduced in 2001 onwards. The metals were found having lower concentration as compared to notified standards. The concentration of Benzene has lowered from 2014 because of improved fuel quality and better management of gasoline driven vehicles.

Ambient Air Quality at Agra (2002-2015):

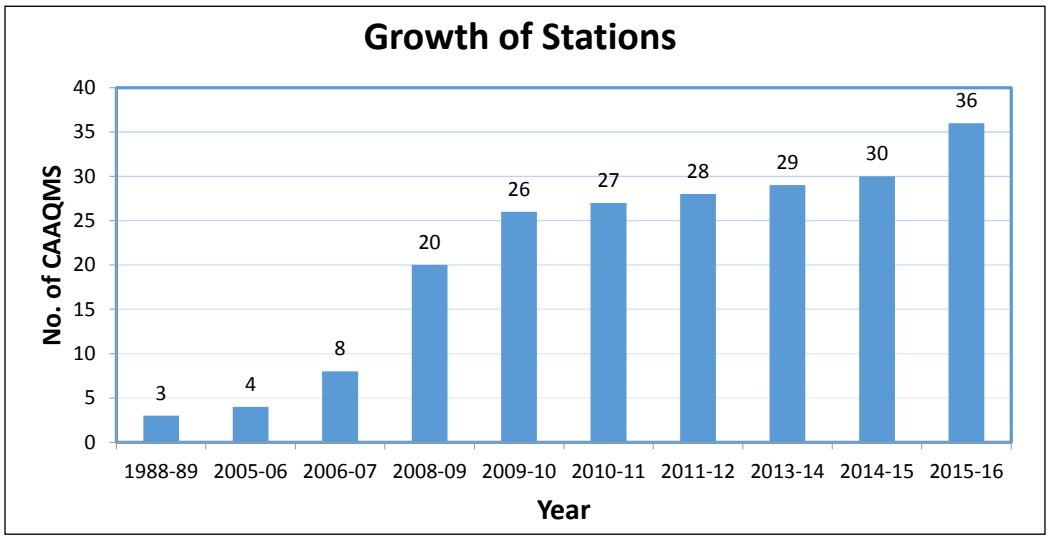
The Hon'ble Supreme Court of India [WP (civil) 13381/1984] has entrusted CPCB to submit the air quality status for the Agra, established by CPCB in 2002. In this direction, data generated by Agra Office CPCB are being complied on regular basis. An assessment of data for the period from 2002 till 2015 with respect to

EF [Annual mean Concentration / Prescribed standard] has been tabulated with color code. The calculated values of exceedance factors over the years for the notified parameters are tabulated above. The values of Exceedance Factors for SO_2 shows the concentration level of well below permissible limits at all locations in Agra. After the year 2009 there is a clear reduction in the atmospheric Presence of SO_2. It may also be seen that the NO_2 was high at Tajmahal till 2009 and critical at other three locations in Agra city. The values of Exceedance Factor show that from 2010 onwards there is improvement and the pollutant level of NO_2 at three locations except Nunhai. The NO_2 remains high at Nunhai and concentration at other three locations falls below permissible limits as per the revised national ambient air quality standards notified in November 2009.

In reference to the concentration of particulate matter in Agra the pollution level may be termed as critical. The Exceedance Factor of PM_{10} in the city remains always higher than the permissible limits at all the location from 2002 to 2015. Comparatively the Exceedance Factor of PM_{10} at Tajmahal is always lower than EF of PM_{10} at other locations being monitored by CPCB.

Growth of Continuous Ambient Air Quality Monitoring Station (CAAQMS) by CPCB & SPCBs in India

Central Pollution Control Board and SPCBs are continuously working to setup Continuous Ambient Air Quality Monitoring Stations on 50:50 sharing basis. The priority is given to set up stations at 46 identified million-plus cities in phase – I. On completion of this target, setting up of stations would start for 21 state capitals and UTs (except Delhi). In this direction, the growth of these stations is given in the graph below. The parameters monitored at most of the locations are SO_2, NO_2, NH_3, O, CO, Benzene, PM_{10} & $PM_{2.5}$ besides meteorological parameters. The AQI (Air Quality Index) of all these stations are being prepared on daily basis and available at CPCB website for information to public in general.



CPCB – Continuous Ambient Air Quality Monitoring Station Network in India

Sl. No.	CAAQMS Installed (16 cities)	Under installation (10 cities during years, 2014-16)	Proposed under CPSUs Project (13 cities during year, 2016-17)	Left over cities (3 cities) (Proposed under GOI Fund)	Coverage in 21 State Capitals including UTs – Phase II (Proposed under GOI Fund)
01.	Mumbai (01)	Nagpur (01) Vishakhapatnam (01)		Vasai - Virar	Amravati
			Dhanbad (01)	Kalyan-Dombivali	
02.	Pune (01)	Nashik (01)	Ranchi (03)	**(2 Nos.)**	Bhubaneswar (01)
03.	Jodhpur (01)	Aurangabad * (01)	Allahabad (03)		Gandhi Nagar
04.	Jaipur (01)	Ludhiana * (01)	Meerut (03)		Dehradun (01)
05.	Lucknow (03)	Howrah (01)	Bhopal (03)		Panaji
06.	Agra (01)	Coimbatore * (01)	Indore (03)		Shimla
07.	Kanpur (01)	Ghaziabad * (01)	Gwalior (03)		Thiruvananthapuram
08.	Varanasi (01)	Srinagar (01)	Jabalpur (03)		Guwahati
09.	Kolkata (01)	Amritsar (01)	Pimpri-Chinchwad (02)		Itanagar
10.	Patna (01)	Vijayawada (01)	Raipur (03)		Agartala (01)
11.	Ahmedabad (01)	*** Common with CPAs**	Madurai (02)		Shillong (01)
12.	Faridabad (01)		Surat (01)		Gangtok
13.	Bengaluru (03)	**(10 Nos.)**	Rajkot (02)		Imphal
14.	Chennai (03)		Vadodara (02)		Aizawl
15.	Hyderabad (01)		Thane (02)		Kohima
16.	Delhi (6)**		Navi Mumbai (01)		Chandigarh
** All CPCB stations (4 are in operation & 2 stations are under renovation)			Kota (02)		Puducherry
			(18 Nos.)		Daman
					Port Blair
					Silvassa
					Kavaratti
	(16 Nos.)				**(Out of 21 Nos. 04 are proposed next year)**
	← **Total 46 Million –plus Cities** →				← **State Capitals** →

Continuous Ambient Air Quality Monitoring Station being set up in Critically Polluted Areas (CPAs)							
S. No.	**Name of CPA**	**S. No.**	**Name of CPA**	**S. No.**	**Name of CPA**	**S. No.**	**Name of CPA**
01.	Ludhiana *	05.	Bhiwadi	09.	Aurangabad *	13.	Coimbatore *
02.	Mandi Gobind Garh	06.	Ankleshwar	10.	Chandra Pur	14.	Angul Talcher
03.	Ghaziabad *	07.	Vapi	11.	Dombivalli	15.	Jharsuguda (Ib Valley)
04.	Noida	08.	Vatva	12.	Manali	16.	Asansol **

** Air Severe

Stations are likely to be installed by June 2016

Continuous Ambient Air Quality Monitoring stations (CAAQMS) in Delhi

Delhi being capital city, the CPCB pays attention to monitoring ambient air quality since 2010 by automatic stations situated across the city. These stations are located at DMS-Shadipur, IHBAS-Dilshad Garden and NSIT Dwarka. The parameters monitored in these stations are: NO_2, CO, SO_2, O_3, PM_{10}, NH_3, Benzene, THC, along with meteorological parameters viz. Temperature, Humidity, wind speed, wind direction, vertical wind speed, solar radiation and barometric pressure. The daily data connected from these stations are available on CPCB website on real time basis.

This data is also being displayed on real-time basis and used for online NAQI dissemination for public in general as well as release of NAQI bulletin for media on regular basis. The surmised data over the years for 3 stations are shown with respect to parameters.

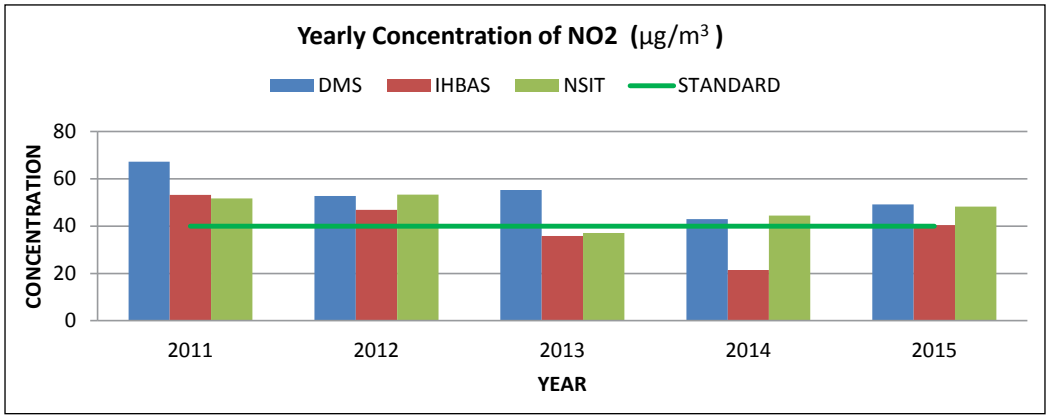
Location Map of CAAQMS in Delhi

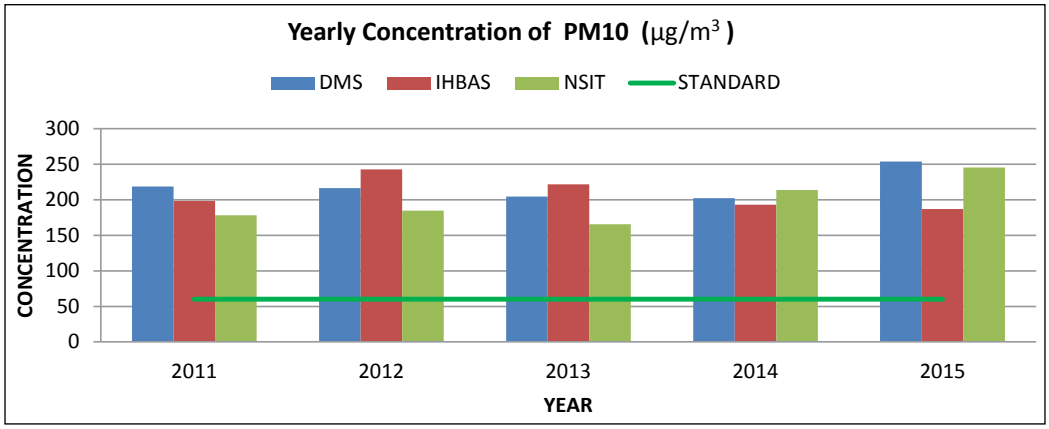
Continuous Ambient Air Quality Monitoring Data (Mean Concentration for last 05 years (2011-2015):

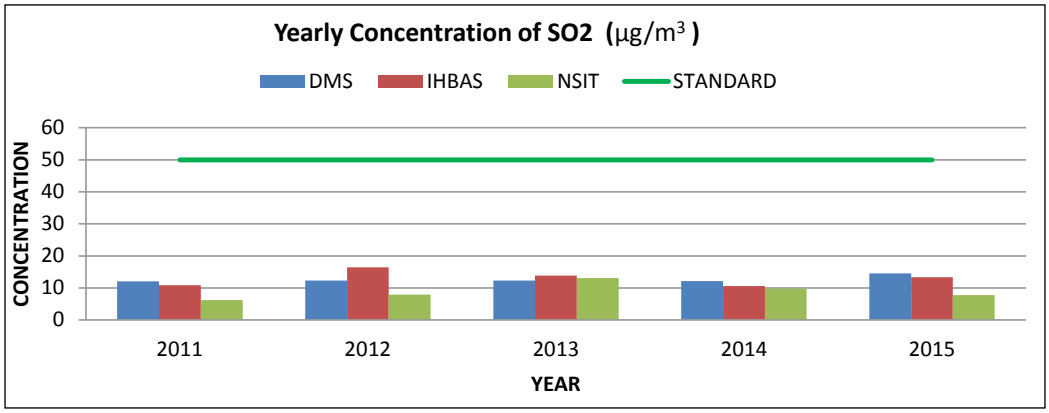
Station	Parameter	Unit	Standard	2011	2012	2013	2014	2015
DMS, Shadipur	**NO_2**	**µg/m^3**	40	67.25	52.74	55.32	42.99	57.26
	SO_2	**µg/m^3**	50	12.05	12.33	12.31	12.15	10.43
	CO	**µg/m^3**	#	1666.61	1316.87	1265.18	750.36	772.15
	O_3	**µg/m^3**	#	37.39	31.70	27.37	30.74	37.87
	PM_{10}	**µg/m^3**	60	218.83	216.39	204.65	202.46	253.81
	$PM_{2.5}$	**µg/m^3**	40	*	*	*	*	87.78
	Benzene	**µg/m^3**	5	11.49	11.98	9.04	4.53	2.69
IHBAS, Dilshad Garden	**NO_2**	**µg/m^3**	40	53.24	46.88	35.80	21.48	41.11
	NH_3	**µg/m^3**	100	13.28	27.59	36.46	29.69	46.37
	SO_2	**µg/m^3**	50	10.84	16.41	13.85	10.58	10.18
	CO	**µg/m^3**	#	1163.73	1060.24	901.24	672.83	545.55
	PM_{10}	**µg/m^3**	60	198.57	242.93	221.68	193.27	186.89
	$PM_{2.5}$	**µg/m^3**	40	*	*	*	*	93.23

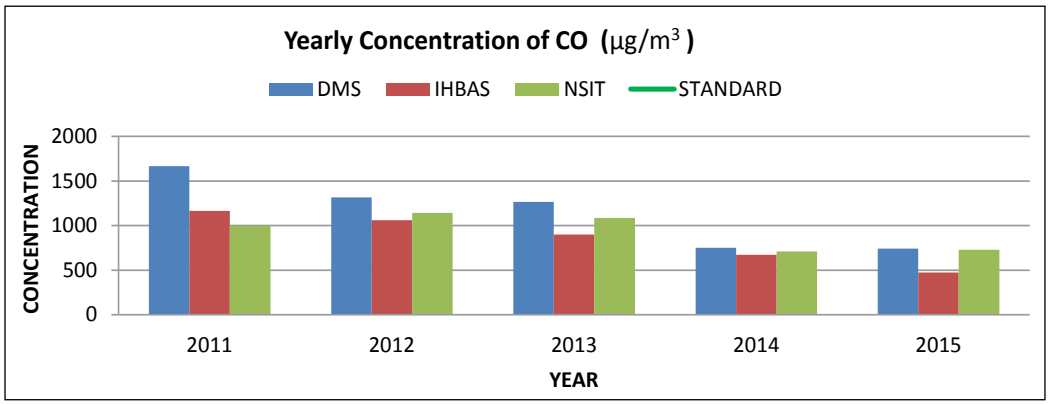
Station	Parameter	Unit	Standard	2011	2012	2013	2014	2015
NSIT, Dwarka	NO_2	$\mu g/m^3$	40	51.71	53.31	37.10	44.48	42.26
	SO_2	$\mu g/m^3$	50	6.24	7.91	13.09	9.83	9.06
	CO	$\mu g/m^3$	#	996.59	1141.61	1085.87	709.07	785.74
	O_3	$\mu g/m^3$	#	26.30	27.90	32.13	32.52	38.84
	PM_{10}	$\mu g/m^3$	60	178.15	184.64	165.59	213.80	245.30
	$PM_{2.5}$	$\mu g/m^3$	40	*	*	*	*	89.86
	Benzene	$\mu g/m^3$	5	9.78	10.08	8.38	4.44	2.66

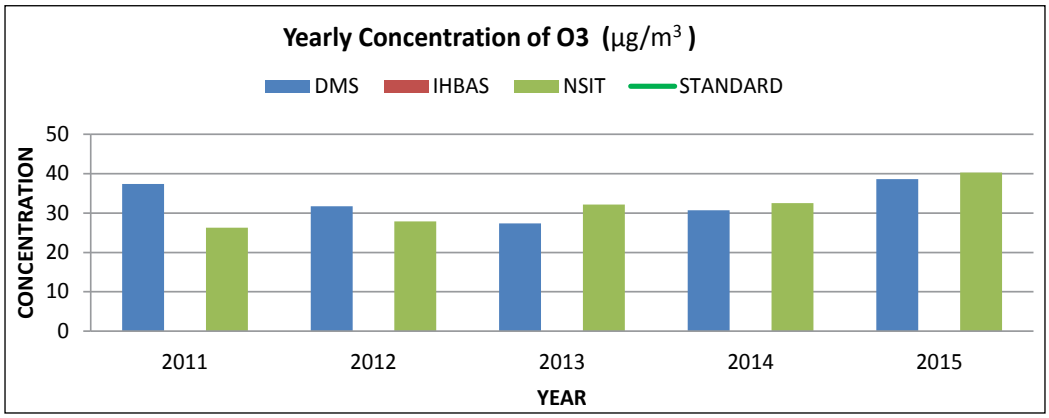
NOTE: i) $PM_{2.5}$ values from March 2015 to Dec 2015;
ii) # Notified standard for CO & O_3 is hourly (8 hr or 1- hr)

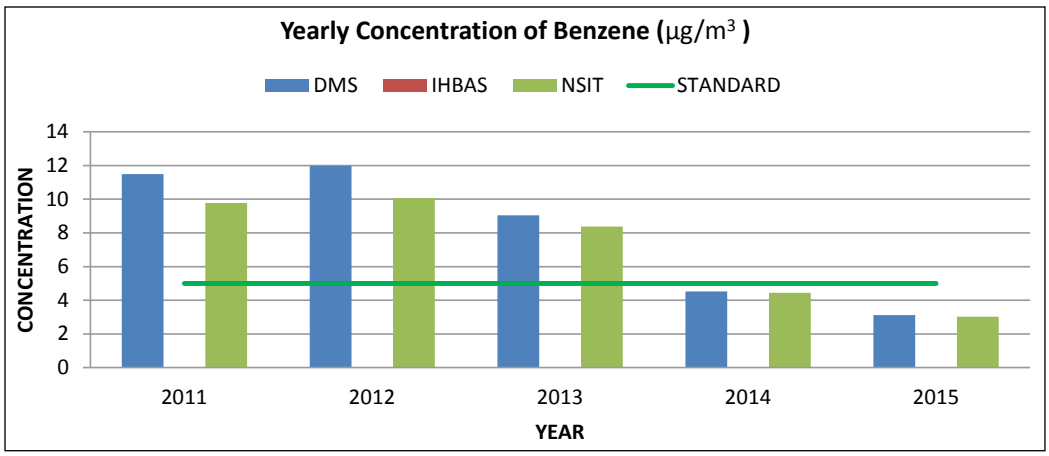












At DMS Shadipur, the Annual Average concentration of NO_2 was observed between 2011-2015, 42.99 µg/m³ (Min.) and 67.25 µg/m³ (Max.) respectively. The SO_2 concentration was 10.43 µg/m³ (Min) & 12.33 µg/m³ (Max). The concentration of CO was measured as 750.36 µg/m³ (Min) & 1666.61 µg/m³ (Max). The concentration of O_3 was observed as 27.37 µg/m³ (Min) & 37.87 µg/m³ (Max.) The concentration of PM_{10} was observed as 202.46 µg/m³ (Min) & 218.83 µg/m³ (Max.). The Benzene concentration was observed 2.53 µg/m³ (Min) & 11.98 µg/m³ (Max).

At IHBAS Dilshad Garden, the Annual Average concentration of NO_2 was observed between 2011-2015, 21.48µg/m³ (Min) and 53.24 µg/m³ (Max.) respectively. The SO_2 concentration was 10.18 µg/m³ (Min) & 16.84 µg/m³ (Max). The concentration of CO was measured as 545.55 µg/m³ (Min) & 1163.75 µg/m³ (Max). The concentration of PM_{10} was observed as 186.89 µg/m³ (Min) 242.93 µg/m³ (Max). The NH_3 concentration was observed 13.28 µg/m³ (Min) and 46.37 µg/m³ (Max).

At NSIT Dwarka, the Annual Average concentration of NO_2 was observed between 2011-2015, 37.10 µg/m^3 (Min) and 53.31 µg/m^3 (Max) respectively. The SO_2 concentration was 6.24 µg/m^3 (Min) & 13.09 µg/m^3 (Max). The concentration of CO was measured as 709.07 µg/m^3 (Min) & 1141.61 µg/m^3 (Max). The concentration of O_3 was observed as 26.30 µg/m^3 (Min) & 38.84 µg/m^3 (Max). The concentration of PM_{10} was observed as 165.59 µg/m^3 (Min) & 245.30 µg/m^3 (Max). The Benzene concentration was observed 2.66 µg/m^3 (Min) and 10.08 µg/m^3 (Max).

Measurement of Mixing Height:

A SODAR system is in continuous operation at Parivesh Bhawan, CPCB to probe the lower atmosphere. The data obtained from the SODAR system is analysed to get mixing height. Mixing height in different months and periods of high/low convective activity are given in the following tables.

Mixing height in Delhi

Month	Monthly Mean (m)			Maximum* (m)			Minimum* (m)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
January	465	464	402	1600	1749	1833	95	90	115
February	548	559	645	1579	1685	1833	90	85	110
March	-	588	742	1494	1579	2066	110	95	130
April	614	620	895	1749	1579	2469	110	110	110
May	576	635	842	1621	1706	2385	105	90	125
June	-	661	870	1621	1621	2469	105	100	120
July	-	702	-	-	1664	2087	-	105	145
August	629	-	621	1706	-	2003	100	-	100
September	639	717	869	1791	1770	2087	110	90	160
October	593	658	696	1706	1749	2045	95	85	80
November	495	511	513	1621	1749	1939	100	70	60
December	497	466	522	1600	1791	1812	90	100	70
**Hourly averages*									

In 2013, the monthly mean mixing height was minimum in January ie. 465 meters. Minimum mixing height measured was in February and December ie. 90 meters, while in 2014 the monthly mean mixing height was minimum in January ie. 464 meters. Minimum mixing height measured was in February and October ie. 85 meters. In 2015, the monthly mean mixing height was minimum in January ie. 402metres. Minimum mixing height measured was in November ie. 60 meters.

Mean mixing height in periods of high/low convective activity

Month	Mean mixing height in period of high convective activity (m)			Mean mixing height in period of low convective activity (m)		
	2013	2014	2015	2013	2014	2015
January	1142	1164	1432	263	269	326
February	1265	1234	1496	283	236	373
March	1216	1177	1595	267	294	346
April	1237	1216	1890	270	289	358
May	1206	1194	1777	200	261	327

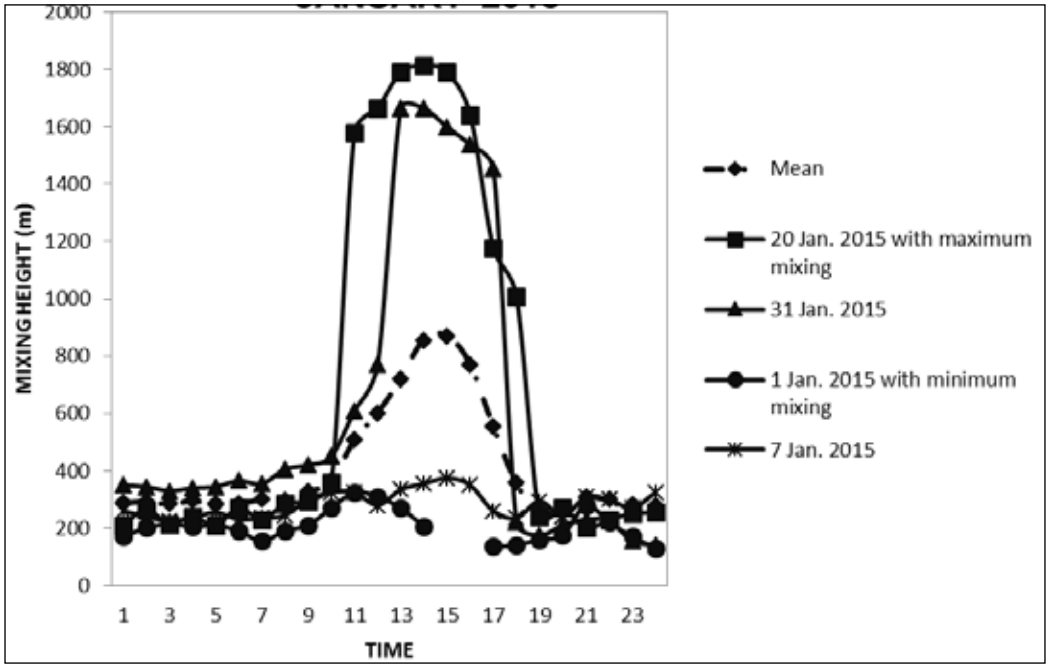
June	1298	1206	1880	185	259	380
July	-	1288	1617	-	205	333
August	1262	-	1468	260	-	273
September	1325	1363	2087	234	273	372
October	1231	1369	1540	242	263	268
November	1199	1274	1359	248	228	223
December	1239	1451	1447	276	311	260

In 2013 mean mixing height in the period of low convective activity was minimum in June i.e. 185 meters followed by May i.e. 200 meters. Duration of high convective activity was minimum in January and December. In 2014 mean mixing height in the period of low convective activity was minimum in July i.e. 205 meters followed by November i.e. 228 meters. Duration of high convective activity was minimum in January and December. In 2015 mean mixing height in the period low convective activity was minimum in November i.e. 223 meters followed by December i.e. 260 meters. Duration of high convective activity was minimum in January since thermal plumes were observed in SODAR echogram only in 9 days even though for considerable period layers with more than usual height.

Mostly occurring period of high convective activity

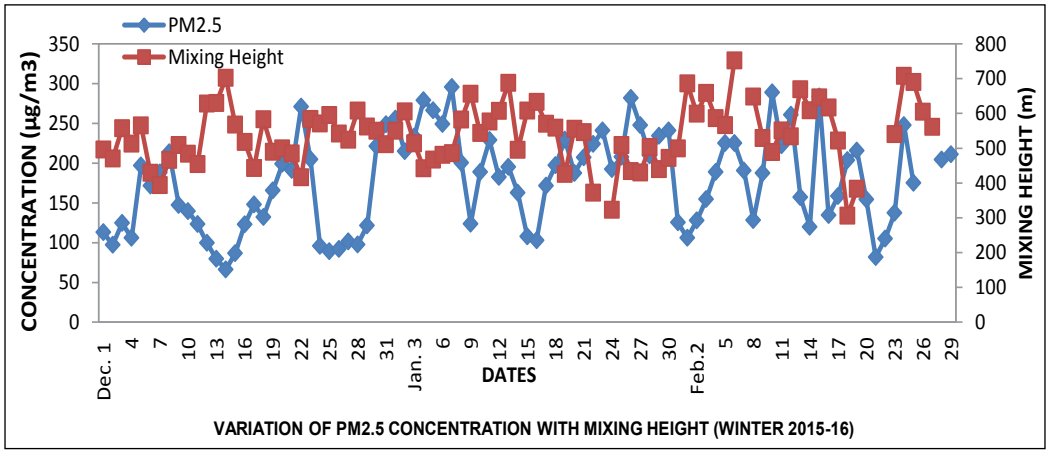
Month	2013	2014	2015
January	11 am to 4 pm or 5 pm	Between 10 am & 12 pm to 5 pm	Between 10 am & 01 pm to 4 pm or 6 pm
February	10 am or 11 am to 5pm or 6 pm	Between 9 am & 11 am to 5 pm or 6 pm	11 am or 12 pm to 5 pm or 6 pm
March	9 am or 10 am to 5 pm or 6 pm	9 am or 10 am to 6 pm	10 am or 11 am to 5 pm, 6 pm or 7 pm
April	10 am to 6 pm	9 am or 10 am to 6 pm	9 am or 10 am to 6 pm
May	Between 8 am & 10 am to 6 pm	8 am or 9 am to 6 pm	9 am or 10 am to 6 pm or 7 pm
June	10 am to 6 pm	Between 7 am & 9 am to 6 pm or 7 pm	Between 8 am & 10 am to 6 pm
July	-	7 am or 8am to 6 pm or 7 pm	9 am or 10 am to 6 pm or 7 pm
August	8 am or 9 am to 6 pm or 7 pm	-	9 am or 10 am to 6 pm or 7 pm
September	Between 8 am & 10 am to 6 pm	8 am or 9 am to 6 pm	9 am to 6 pm
October	9 am to 5 pm or 6 pm	Between 8 am & 10 am to 5 pm or 6 pm	9 am or 10 am to 5 pm or 6 pm
November	10 am or 11 am to 4 pm or 5 pm	Between 9am & 11 am to 4pm or 5 pm	10 am or 11 am to 4 pm or 5 pm
December	Between 10 am & 12 pm to 4 pm or 5 pm	11 am to 5 pm	11 am or 12 pm to 4 pm or 5 pm

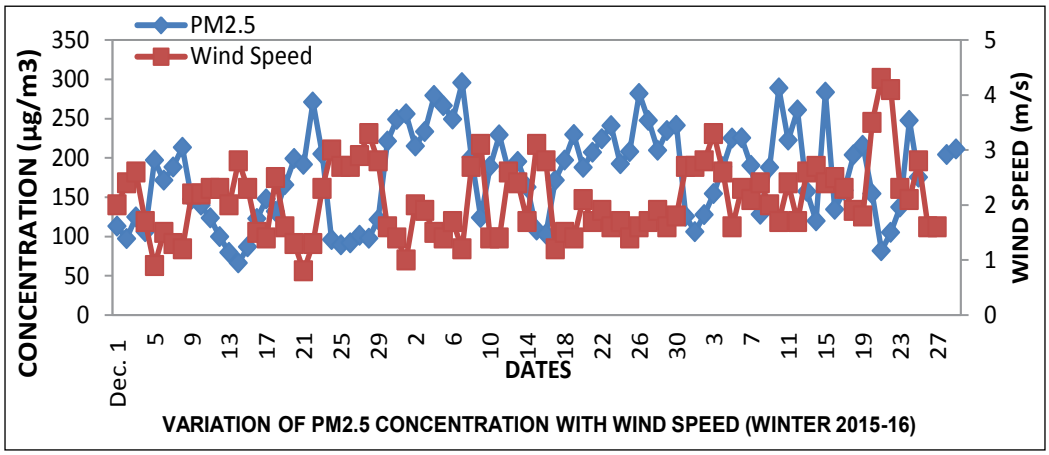
Diurnal variation of mixing height for the month of January 2015 with minimum monthly mean mixing height in 2015 is shown in figure.



Variation of $PM_{2.5}$ concentration with mixing height and wind speed:

The variation of $PM_{2.5}$ concentration measured at IHBAS, Dilshad Garden and mixing height at Parivesh Bhawan is shown in the figure. It is observed that at most of the time the concentration of the $PM_{2.5}$ has decreased when mixing height increased. A similar trend was also observed in the plot with $PM_{2.5}$ concentration and wind speed of the same locations as shown in the figure.





National Air Quality Index

Air pollution has been a matter of environmental and health concerns, particularly in urban areas. Central Pollution Control Board along with State Pollution Control Boards has been operating National Air Monitoring Program (NAMP) covering 240 cities of the country. In addition, continuous monitoring systems that provide data on real-time basis are also installed in few cities.

The Hon'ble Prime Minister launched National **Air Quality Index(AQI)** on 6th April, 2015 tomonitor air quality in major urban citiesacross the country on a real-time basis and to enhance public awareness. Air Quality Index (AQI) is one such tool for effective dissemination of air quality information to people. As a part of this, Union Environment Ministry proposed to extend the measurement of air quality on real time basis in 22 state capitals and 76 other cities with a population of more than one million. This index will help the people know about the level of pollution in the ambient air on daily basis. The AQI Display has been increased from the initial 10 cities to currently 24 cities in 10 states of India. At present, total 43 Continuous Ambient Air Quality Monitoring Stations all over the country are connected with NAQI. Attempts are on to add more stations under the purview of NAQI.

Under the current measurement of air quality, 8 parameters are kept for calculating AQI. The proposed AQI will consider eight pollutants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3, NH_3, and Pb) in which one of PM_{10} or PM2.5parameter is mandatory. There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. The AQI values and corresponding ambient concentrations (health breakpoints) as well as associated likely health impacts for the identified eight pollutants are as follows.

AQI Category, Pollutants and Health Breakpoints

AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5 –1.0
Moderately polluted (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+

**One hourly monitoring (for mathematical calculations only)*

AQI	Associated Health Impacts
Good (0–50)	Minimal Impact
Satisfactory (51–100)	May cause minor breathing discomfort to sensitive people.
Moderately polluted (101–200)	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
Poor (201–300)	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease
Very Poor (301–400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.
Severe (401-500)	May cause respiratory effects even on healthy people and serious health impacts on peoplewith lung/heart diseases. The health impacts may be experienced even during light physicalactivity

Month wise Air Quality Index of Delhi City

Month-wise AQI Index Values											
MONTHS	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Dates	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values	AQI Index Values
1	221	200	153	130	99	251	405	356	391	270	352
2	238	253	219	122	250	282	377	332	384	268	334
3	259	152	179	128	246	194	373	331	381	284	315
4	289	195	176	153	296	201	421	321	429	274	280
5	311	No Data	303	134	152	211	323	364	434	337	155
6	305	95	225	149	175	276	272	271	356	362	209
7	254	188	145	148	171	267	435	156	402	337	236
8	229	310	160	155	189	337	389	383	399	301	189
9	234	No Data	153	167	222	254	323	382	337	313	No Data
10	290	151	112	142	200	81	353	350	312	362	222
11	262	148	56	246	222	221	343	352	348	313	No Data
12	228	No Data	67	101	217	224	360	323	339	361	108
13	183	208	63	179	218	236	388	281	332	306	No Data
14	No Data	123	82	175	302	207	377	206	345	230	No Data
15	208	251	195	130	274	272	356	208	292	245	220
16	288	280	247	96	248	310	337	254	285	269	228
17	261	281	180	105	293	168	263	300	305	265	225
18	269	286	187	147	166	304	322	293	344	285	197
19	227	262	151	62	133	323	371	257	346	372	250
20	212	159	155	144	110	331	411	330	397	322	264
21	147	88	132	174	144	318	402	281	356	186	189
22	192	146	124	128	97	No Data	410	316	334	230	206
23	188	171	178	106	98	292	420	374	398	217	212
24	193	234	99	99	85	376	348	178	430	305	308
25	214	96	104	143	189	310	314	166	380	285	300
26	305	167	82	190	193	211	331	140	417	277	179
27	323	172	53	173	227	270	317	327	379	317	179
28	335	182	70	No Data	206	267	342	271	384	306	251
29	314	No Data	73	212	237	254	303	269	399	301	285
30	217	No Data	60	185	175	No Data	408	330	417		260
31	74		99	190		394		386	407		269
MAX	335	310	303	246	302	394	435	386	434	372	352
MIN	147	88	53	62	85	81	263	140	285	186	108
AVG	248	192	138	147	194	264	360	293	370	293	238

Good	Satisfactory	Moderate	Poor	Very Poor	Severe
(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)

NAQI Status of India in 2015-16:

Cities	Months	Good	Satisfactory	Moderate	Poor	Very Poor	Severe
		(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)
Agra	May-15	*	17	8	2	*	*
	Jun-15	5	13	9	*	*	*
	Jul-15	14	11	3	1	*	*
	Aug-15	18	8	1	3	*	*
	Sep-15	5	17	3	*	*	1
	Oct-15	*	*	9	15	*	*
	Nov-15	*	*	1	11	15	3
	Dec-15	*	*	*	7	15	6
	Jan-16	*	*	*	3	17	9
	Feb-16	*	1	4	12	1	*
	Mar-16	*	5	13	2	*	*
Ahmedabad	May-15	*	9	13	4	1	*
	Jun-15	3	15	8	*	*	*
	Jul-15	4	18	5	1	*	*
	Aug-15	*	17	2	*	*	*
	Sep-15	4	11	9	*	*	*
	Oct-15	*	1	7	10	2	1
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	*	*	*	*
	Jan-16	*	*	*	*	*	*
	Feb-16	*	*	*	*	*	*
	Mar-16	*	*	*	*	*	*
Bengaluru	May-15	8	17	2	2	*	*
	Jun-15	17	9	1	*	*	*
	Jul-15	25	5	*	*	1	*
	Aug-15	15	11	3	*	*	*
	Sep-15	10	10	6	*	*	*
	Oct-15	2	13	13	*	*	*
	Nov-15	8	18	1	*	*	*
	Dec-15	2	20	9	*	*	*
	Jan-16	*	5	24	2	*	*
	Feb-16	*	3	23	3	*	*
	Mar-16	*	*	27	3	*	*

Cities	Months	Good	Satisfactory	Moderate	Poor	Very Poor	Severe
		(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)
Chandrapur	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	3	12	3	2	*	1
	Oct-15	9	3	16	3	*	*
	Nov-15	*	6	13	5	*	*
	Dec-15	*	10	12	2	*	1
	Jan-16	*	2	13	1	*	*
	Feb-16	*	6	13	1	*	*
	Mar-16	1	8	7	3	1	*
Chennai	May-15	*	*	*	*	*	*
	Jun-15	*	1	23	2	*	*
	Jul-15	*	8	22	*	*	*
	Aug-15	*	16	14	*	*	*
	Sep-15	*	27	3	*	*	*
	Oct-15	9	20	8	*	*	*
	Nov-15	1	13	14	*	*	*
	Dec-15	*	5	14	4	1	*
	Jan-16	*	6	20	2	1	*
	Feb-16	*	6	18	1	1	*
	Mar-16	*	3	14	2	*	*
Delhi	May-15	*	1	5	18	6	*
	Jun-15	*	3	13	8	1	*
	Jul-15	*	11	17	2	1	*
	Aug-15	*	3	25	2	*	*
	Sep-15	*	4	12	13	1	*
	Oct-15	*	1	2	17	9	*
	Nov-15	*	*	*	2	20	8
	Dec-15	*	*	3	11	16	*
	Jan-16	*	*	*	2	23	6
	Feb-16	*	*	*	13	15	1
	Mar-16	*	*	7	16	4	*

Cities	Months	Good	Satisfactory	Moderate	Poor	Very Poor	Severe
		(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)
Faridabad	May-15	*	2	9	8	6	3
	Jun-15	1	9	13	4	*	*
	Jul-15	10	12	5	3	1	*
	Aug-15	4	19	3	4	*	*
	Sep-15	1	13	10	*	*	*
	Oct-15	*	*	12	13	5	*
	Nov-15	*	*	1	6	17	6
	Dec-15	*	*	*	5	19	4
	Jan-16	*	*	*	*	4	15
	Feb-16	*	*	1	16	7	*
	Mar-16	*	2	5	6	*	*
Gaya	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	*	3	1	*
	Jan-16	*	*	2	13	9	*
	Feb-16	*	6	12	6	1	*
	Mar-16	*	13	12	*	1	*
Gurgoan	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	6	*	*	*
	Jan-16	*	*	1	*	*	*
	Feb-16	*	*	1	2	4	*
	Mar-16	*	*	1	1	4	*

Cities	Months	Good (0–50)	Satisfactory (51–100)	Moderate (101–200)	Poor (201–300)	Very Poor (301–400)	Severe (>401)
Haldia	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	1	2	*	*	*
	Jan-16	*	12	6	*	*	*
	Feb-16	*	9	6	*	*	*
	Mar-16	*	12	9	*	*	*
Hyderabad	May-15	*	23	6	1	*	*
	Jun-15	11	12	*	1	*	*
	Jul-15	24	7	*	*	*	*
	Aug-15	15	10	5	*	*	*
	Sep-15	*	5	18	5	*	*
	Oct-15	*	4	17	8	1	*
	Nov-15	*	15	14	1	*	*
	Dec-15	*	18	11	*	*	*
	Jan-16	*	5	24	2	*	*
	Feb-16	*	14	13	2	*	*
	Mar-16	*	12	18	*	*	*
Jaipur	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	1	*	*	7	9	*
	Jan-16	*	*	*	8	6	*
	Feb-16	*	*	7	14	1	*
	Mar-16	*	*	13	10	*	*

Cities	Months	Good	Satisfactory	Moderate	Poor	Very Poor	Severe
		(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)
Jhodpur	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	*	15	11	*
	Jan-16	*	*	4	10	10	*
	Feb-16	*	*	20	7	1	*
	Mar-16	*	1	20	8	*	*
Kanpur	May-15	1	9	15	6	*	*
	Jun-15	1	11	14	*	*	*
	Jul-15	5	24	2	*	*	*
	Aug-15	1	28	*	*	*	*
	Sep-15	*	15	12	1	*	*
	Oct-15	*	1	10	11	8	*
	Nov-15	*	*	*	10	18	*
	Dec-15	*	1	*	4	18	6
	Jan-16	*	1	*	*	20	5
	Feb-16	*	*	3	12	6	*
	Mar-16	*	1	15	4	5	*
Lucknow	May-15	*	15	13	1	*	*
	Jun-15	*	9	15	2	1	*
	Jul-15	1	10	18	*	*	*
	Aug-15	*	18	10	*	*	*
	Sep-15	*	5	17	1	*	*
	Oct-15	*	4	4	8	4	*
	Nov-15	*	*	*	3	10	10
	Dec-15	*	*	*	5	15	6
	Jan-16	*	*	1	3	18	3
	Feb-16	*	*	1	6	14	*
	Mar-16	*	*	14	3	*	*

Cities	Months	Good (0–50)	Satisfactory (51–100)	Moderate (101–200)	Poor (201–300)	Very Poor (301–400)	Severe (>401)
Mumbai	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	10	*	*	*	
	Sep-15	*	27	2	*	*	*
	Oct-15	*	11	15	4	*	*
	Nov-15	*	7	14	*	*	*
	Dec-15	*	1	25	1	*	*
	Jan-16	*	2	18	8	*	*
	Feb-16	2	12	11	*	*	*
	Mar-16	*	13	12	1	*	*
Muzaffarpur	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	2	*	*	*
	Oct-15	*	3	12	3	*	*
	Nov-15	*	1	*	5	19	4
	Dec-15	*	*	*	*	10	13
	Jan-16	*	*	*	1	7	17
	Feb-16	*	*	1	9	11	3
	Mar-16	*	*	8	9	3	*
Navi Mumbai	May-15	*	14	15	*	*	*
	Jun-15	*	15	11	*	*	*
	Jul-15	*	*	31	*	*	*
	Aug-15	2	27	*	*	*	*
	Sep-15	*	20	7	*	*	*
	Oct-15	*	16	12	1	*	*
	Nov-15	*	9	20	*	*	*
	Dec-15	*	9	19	*	*	*
	Jan-16	*	9	19	*	*	*
	Feb-16	*	3	24	*	*	*
	Mar-16	*	1	27	*	*	*

Cities	Months	Good	Satisfactory	Moderate	Poor	Very Poor	Severe
		(0–50)	(51–100)	(101–200)	(201–300)	(301–400)	(>401)
Panchakula	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	4	5	*	*	*
	Jan-16	2	6	6	4	*	*
	Feb-16	3	13	6	*	*	*
	Mar-16	6	10	1	*	*	*
Patna	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	1	6	1	*	*
	Oct-15	*	*	4	6	1	*
	Nov-15	*	*	*	2	8	5
	Dec-15	*	*	*	1	8	7
	Jan-16	*	*	1	1	8	12
	Feb-16	*	*	1	8	2	1
	Mar-16	*	1	7	2	2	
Pune	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	9	2	*	*	*
	Sep-15	*	14	11	1	*	*
	Oct-15	*	6	20	3	*	*
	Nov-15	*	2	5	18	1	*
	Dec-15	*	1	10	13	2	*
	Jan-16	*	3	11	14	*	*
	Feb-16	*	2	19	8	*	*
	Mar-16	*	*	9	2	*	*

Cities	Months	Good (0–50)	Satisfactory (51–100)	Moderate (101–200)	Poor (201–300)	Very Poor (301–400)	Severe (>401)
Rhotak	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	*	*	*	*
	Jan-16	*	2	2	5	*	*
	Feb-16	*	4	*	*	*	*
	Mar-16	12	3	*	*	*	*
Sholapur	May-15	*	*	*	*	*	*
	Jun-15	*	*	*	*	*	*
	Jul-15	*	*	*	*	*	*
	Aug-15	*	*	*	*	*	*
	Sep-15	*	*	*	*	*	*
	Oct-15	*	*	*	*	*	*
	Nov-15	*	*	*	*	*	*
	Dec-15	*	*	*	*	*	*
	Jan-16	*	2	15	*	*	*
	Feb-16	*	4	25	*	*	*
	Mar-16	*	7	18	*	*	*
Varanasi	May-15	*	*	11	14	3	*
	Jun-15	*	6	10	6	4	*
	Jul-15	2	20	8	*	*	*
	Aug-15	6	12	6	*	1	*
	Sep-15	*	7	17	2	*	*
	Oct-15	*	2	10	11	3	*
	Nov-15	*	*	1	10	18	*
	Dec-15	*	1	*	*	14	6
	Jan-16	*	*	*	*	9	18
	Feb-16	*	*	2	10	10	*
	Mar-16	*	1	3	2	7	*

Note: '' Indicates Data not available or Data not fall in the category*

Ambient Air Quality of Delhi during Odd-Even Scheme

The Government of NCT of Delhi had implemented odd-even scheme from 1st to 15th January, 2016 which was applied to four wheeler Passenger/Private Cars. The public transport buses, two wheelers, trucks, CNG operated passenger/private cars, three wheeler were exempted from the scheme. In addition, cars driven by women were also exempted apart from a select number of VIP and emergency vehicles.

The air quality in Delhi is monitored through a set of 08 Continuous Ambient Air Quality Monitoring System (CAAQMS) and 07 manual stations (NAMP), which operate on alternate days.

The pollutants for which data have been considered for the above said assessment include PM_{10}, $PM_{2.5}$, SO_2, Benzene, O_3, NO_2 and CO which is presented in Tables-I, II and III. It may be seen that during January 1-15, 2016, the pollutants viz., PM_{10} ranged between (161-629 µg/m³); $PM_{2.5}$(79 –507 µg/m³); SO_2(4-42 µg/m³); Benzene (1-11µg/m³); O_3(2-66µg/m³); NO_2(9-159µg/m³) and CO (280 – 1990µg/m³).

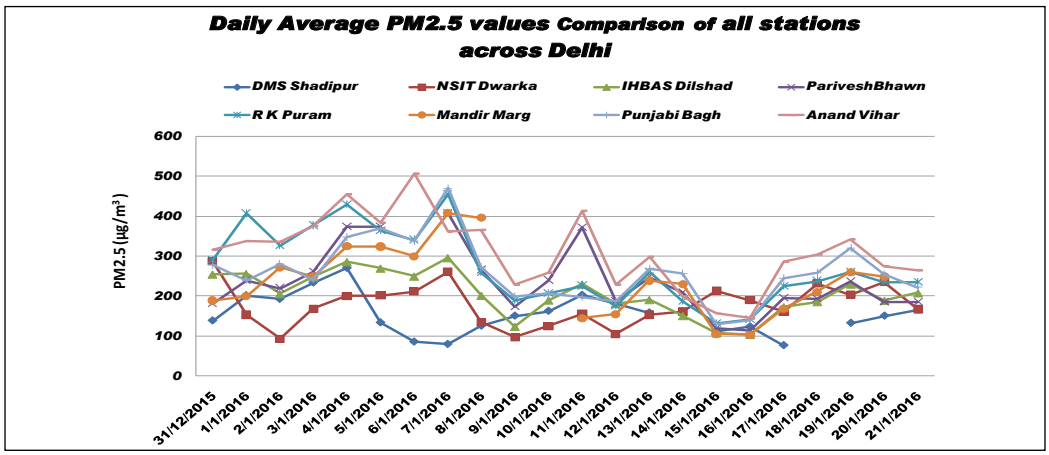
The data analyses for days preceding (period from 25th to 31st December, 2015) and post (period from 16th to 21st January, 2016) to the odd-even scheme, shows that during pre-odd-even scheme December 25-31, 2015; the pollutants viz., PM10ranged between (142-454 µg/m³); $PM_{2.5}$ (52-298 µg/m³); SO_2 (4-31 µg/m³); Benzene (1-7 µg/m³); O_3 (18-48 µg/m³); NO_2 (5-116 µg/m³) and CO (114 – 1244 µg/m³); while during post odd-even scheme, January 16-21, 2016; the pollutants viz., $PM_{2.5}$ ranged between(76-342 µg/m³); SO_2 (4-13 µg/m³); Benzene (1-7 µg/m³); O_3 (13-34 µg/m³); NO_2 (17-47 µg/m³) and CO (278 – 1316 µg/m³).

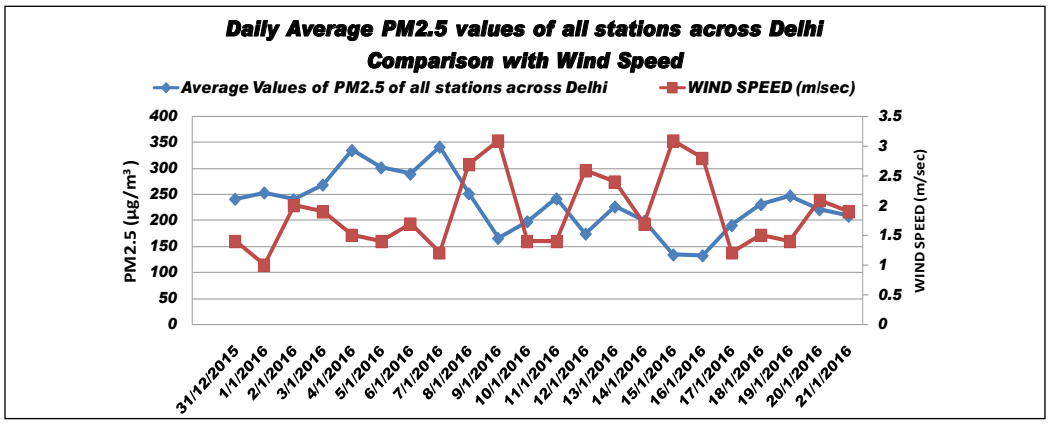
With no clear trend and wide fluctuations observed in the concentrations, it is evident that the meteorology and emissions from other polluting sources have been major factors impacting air quality of Delhi during the period. Higher wind speeds and mixing height in general result in better dispersion and lower pollution levels (Figure-I).

Overall, it can be stated that while some reduction in air pollution is likely to have happened due to odd-even scheme, this single factor or action cannot be said to have substantially reduced air pollution levels in Delhi. Therefore, a comprehensive set of actions following an integrated approach is required to make substantial improvement in air quality.

Figure – I

SHOWING $PM_{2.5}$ PROFILE, CO-RELATION OF $PM_{2.5}$ WITH MIXING HEIGHT AND WIND SPEED.





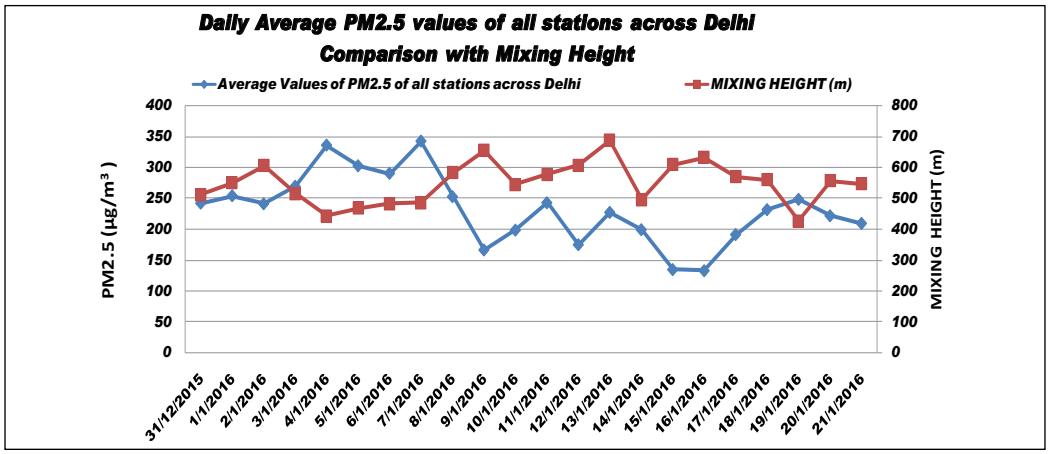


Table: I

Central Pollution Control Board
Air Quality Profile (Daily average in µg/m^3)
(CAAQM Stations of CPCB in Delhi)

Stations (CPCB Stations)	Parameters	Pre Odd Even (25-31 December, 2015						During Odd-Even (1-15 January, 2016)						Post Odd-Even 16-21 January, 2016)					
		$PM_{2.5}$	CO	NO_2	O_3	Benzene	SO_2	$PM_{2.5}$	CO	NO_2	O_3	Benzene	SO_2	$PM_{2.5}$	CO	NO_2	O_3	Benzene	SO_2
DMS Shadipur	Max	141	1244	72	48	3	31	270	1990	126	45	8	26	165	604	47	34	4	13
	Min	65	114	35	34	1	22	79	280	14	2	1	7	76	278	20	13	1	7
NSIt Dwarka	Max	298	698	12	40	7	28	261	1061	33	66	11	8	235	675	28	32	7	7
	Min	52	484	5	18	3	8	93	438	9	4	2	5	160	502	17	13	3	4
IHBAS Dilshad Garden	Max	221	1006	71	NA	NA	19	295	1610	148	NA	NA	12	229	1316	44	NA	NA	8
	Min	85	321	51			7	107	371	29			6	103	363	27			7
Parivesh Bhawan	Max	NA	NA	NA	NA	NA	NA	408	NA	NA	NA	NA	NA	237	NA	NA	NA	NA	NA
	Min							119						114					

Table: II

Central Pollution Control Board
Air Quality Profile (Daily average values in µg/m^3)
(Manual Monitoring Stations in Delhi)

Manual Stations (CPCB Stations)	Parameters & data range	Pre Odd Even (25-31 December, 2015				During Odd-Even (1-15 January, 2016)			
		PM_{10}	$PM_{2.5}$	NO_2	SO_2	PM_{10}	$PM_{2.5}$	NO_2	SO_2
Pitampura	Max	420	NA	44	9	541	429	98	17
	Min	142	NA	43	5	207	116	15	4
Sirifort	Max	Data inadequate				548	286	98	39
	Min					301	168	33	4
Janakpuri	Max					614	259	97	34
	Min					367	102	24	4
Nizamuddin	Max	270	NA	71	13	294	185	81	11
	Min	253	NA	51	13	161	84	31	4
ShazadaBagh	Max	309	233	93	17	607	166	93	15
	Min	301	193	52	5	172	81	50	4
Shahdara	Max	Data inadequate				629	231	106	42
	Min					217	82	26	4
BSZ-Marg	Max	454		116	4	516		159	17
	Min	254		77	4	169		64	4

Table:III

Central Pollution Control Board
$PM_{2.5}$ Profile
(Daily average values in µg/m^3)

CAAQMS Stations (DPCC stations)	Data Range	During Odd-Even (1-15 January, 2016)	Post Odd-Even (16-21 January, 2016)
R.K. Puram	Max	429	261
	Min	132	142
Mandir Marg	Max	407	259
	Min	105	103
Punjabi Bagh	Max	470	320
	Min	130	140
Anand Vihar	Max	507	342
	Min	156	145

Emissions Trading Scheme for Particulate Matter in Stationary Sources (Stack):

MOEFCC, Central Pollution Control Board and the State Pollution Control Boards of Gujarat, Maharashtra and Tamil Nadu have been working since 2011 on an innovative project to design, pilot and evaluate an emissions trading system for particulate matter, India's most acute air pollution problem. The project objectives involve the rollout of Continuous Monitoring for particulates followed by the use of this high quality data to implement market based regulation of pollutants. The key benefit of emissions trading as a regulator tool would be to reduce the cost of emissions reduction from industries in the selected pilot clusters and to incentivize plants by rewarding those who make the largest emissions reductions. In addition, the use of Continuous Emissions Monitoring Systems (CEMS) to monitor PM emissions can enable the use of better-targeted regulatory restrictions (cumulative load standards instead of point concentration standards) and also greatly improve the information and ability of regulators to monitor industry.

ETS was taken up for 1,000 industries in Gujarat, Maharashtra, and Tamil Nadu. In each state, the SPCB has selected regions with high industrial particulate matter emissions and/or high ambient PM concentrations. Within each region, participating industries were chosen based on a number of criteria to target the most highly polluting industries where installation of CEMS was deemed feasible.

The project has been designed as a phased randomized control trial enabling rigorous experimental evaluation of the benefits of the regulatory innovations implemented. Jameel Poverty Action Lab South Asia (M/s J-PAL) was engaged as Design Phase consultant to MoEF and as a Research Consultant to CPCB for the Baseline Phase.

Key milestones achieved in Phase 1 (November 2011- March 2014)

- **Development of CEMS standards**

  A technical committee has developed comprehensive technical standards for the measurement of industrial PM emissions, which have been published by the CPCB in November 2013 as well as shorter guidelines for laboratories and industry.

- **Capacity building for SPCB staff and industries**

  SPCBs have conducted detailed trainings on CEMS and ETS for their own staff and for industry associations, CEMS vendors, environmental labs and participating industry with positive response.

- **Data Acquisition and Handling System (DAHS) Centres**

  The technical committee oversaw the design of the full monitoring architecture for ETS and finalized hardware requirements for Centres at CPCB and each SPCB.

Key milestones achieved in Phase 2 (April 2014- March 2016)

- **Baseline Survey completed**
  - Detailed baseline questionnaire was developed and piloted. Survey includes environmental performance (stack PM emissions levels) and technical survey of installed air pollution control equipment.
  - Selection and tendering process with appointments completed for Research Consultant for baseline survey and environmental labs to undertake technical survey and stack sampling.
  - Baseline surveys and Stack Monitoring completed in Gujarat, Maharashtra and Tamil Nadu in around 800 industries.
  - Baseline deliverables and analytical outputs completed and final report submitted to MoEF&CC. This includes model of abatement cost of plants and market design document for Phase 3.

- **CEMS installations in industries**
  - Over 100 industries in Gujarat and Maharashtra have issued purchase orders for CEMS and data access enabled at SPCBs following detailed protocols developed in Design Phase.
  - Successful evidence in field of viability and feasibility of specified standards.
  - CEMS devices, particularly DC tribo-electric devices, have witnessed reduction in prices, due to competition among vendors and negotiations by industry associations.
  - Data acquisition and handling server hardware installed in all three states by CPCB appointed vendor.
  - Protocol for calibration of CEMS. Development of protocol & training module for calibration of CEMS including organization of Training programs for certified laboratories. The calibrated Stack Monitoring kits have already procured and supplied to all three SPCBs and CPCB.

Next Phase of Activities for launching of ETS program in India

1. **Mandate for ETS / Gazette notification for ETS in India:** To implement the trading program, a gazette notification on the ETS program to be issued under the Air Act by CPCB or SPCBs under Section 17(g). Prior to issuance of notification, MoEF & CC to finalize market design based on baseline survey and MoEF & CC to identify legal changes required if any especially amendments to the Air Act, 1981 necessary to empower SPCB to levy civil fines. [To be taken up MoEF & CC].
2. **Determination of Cap and Load Allocation:** Technical committee to determine the methods to assign initial load permits to plants following draft methods note. This may be incorporated in gazette notification.
3. **Finalization of the market design:** To review and finalize the market design, the technical committee needs to be expanded to bring in experts on market design to complement the technical experts. The committee will review the draft market design document and finalize the design
4. **Creation of Trading platform and state level registry:** To facilitate permit exchange, an appropriate trading platform needs to be identified. This could be housed within an existing exchange or a custom-built web-based platform. To support back-end processes, a special cell will be required, housed within the SPCBs, to maintain a registry on permit transactions and actual compliance.
5. **Completion of CEMS Rollout:** SPCBs to complete CEMS installations for all pilot plants on urgent basis and complete data validation and analysis as per CEMS specifications and in consultation with CPCB technical committee.
   - Reply to the parliament assurance un-starred Q.No. 4969 related to the air pollution caused by illegal glass industries in Firozabad, TTZ area.
   - Prepared and translated in Hindi a Background note on Environmental Status of Taj Trapezium Area for Department related Parliamentary Standing Committee on Science and Technology visit to Agra in April 2015
   - Handling of the all the matter related to the TTZ including complaints/references received from PMO and MoEF&CC.

Source Monitoring

The laboratory services are provided to all divisions to examine the compliance of emission norms. Extensive supports are provided to comply the monitoring as and when entrusted by the Hon'ble Supreme Court of

India, Hon'ble National Green Tribunal, Delhi Principle Bench etc. In this effect, some special monitoring is highlighted, as under:

(1) Source emission monitoring at MP Waste Management Pvt Ltd, Pitampur to examine successful incineration of UCIL waste.

(2) Source emission monitoring at Thermal power plant at Dadari.

Dadari Thermal Power Plant Stack Monitoring

(3) Source emission monitoring at Rajghat thermal power plant.

Rajghat Thermal Power Plant

(4) Source emission monitoring at M/s Bhushan Steel (P) Ltd. Ghaziabad (U.P.).

M/s Bhushan Steel (P) Ltd.

Hon'ble National Green Tribunal (NGT) Matters for Pollution from vehicles:

In compliance of orders of Hon'ble National Green Tribunal (NGT) in respect of emission measurement of vehicles as well as checking the functioning of Pollution Checking Centres (PCC), authorised by Department of Transport (DoT), on random basis in Delhi.

Parliamentary Standing Committee for Science & Technology

- Made all preparations including background materials (Bilingual) on Environmental Status of Taj Trapezium Area for Department related Parliamentary Standing Committee on Science and Technology visit to Agra in April 2015
- Made all preparations including background materials (Bilingual) on Environmental Status note on Environmental Status of Delhi related Parliamentary Standing Committee on Science and Technology meeting organized in the Parliament in Delhi

Technical Proposal prepared by CPCB for Green Crematorium

According to a report, all the year round, around 50 to 60 million trees are cut for cremations in India. While burning the wood, few million tonnes of carbon dioxide is added to the environment. The two main drawbacks of the traditional method of cremation are air pollution and deforestation. Also, cremation in open grounds generates large amounts of ashes, which are later thrown into rivers and water bodies, thereby polluting the water. Wood based combustion is an accepted age old practice and any new or paradigm shift requires a huge change in the mindset and public favor. An environmental friendly and energy efficient, wood based cremation system is the need of the day.

The issue to have more eco-friendly crematorium CPCB has already submitted the recommendations to Hon'ble Supreme Court for consideration. The recommendations are as under:

1. Public may have options to choose type of cremation.
2. Each city shall have CNG or electrical based crematorium as an option along with traditional wood based crematoriums with modified pyre.
3. Traditional wood based crematoriums shall be modified with an environmental friendly pyre system to achieve energy efficiency and facilities for collection and treatment of pyre emissions. The wood based pyre may be modified as per the designs prepared Mokshada PEVSS, a Delhi based NGO. CPCB proposes further modification for the same by incorporating air pollution control devices as shown in schematic diagram given at figure-1.
    (i) The salient features of the modified wood based pyre are given below:
    (ii) Expected to reduce consumption of wood by 50%
    (iii) The pyre is to be set on a steel tray
    (iv) Control in air supply by providing flaps along the length of the pyre.
    (v) Provision of ash tray underneath the pyre to collect the after combustion ash.
    (vi) Provision of stainless steel fume-hood (with retractable flaps) and ducting attached to an alkali scrubber or Multi-cyclone dust collector followed by an ID fan and a chimney of height 30 meters. Alkali scrubber may be opted for the cities where the scrubber bleed liquor can be discharged into sewerage system connected to terminal STP.
    (vii) Multiple pyres can be connected to common manifold duct leading to a common air pollution control device.

4. The proposed wood based crematory with modified pyre would achieve substantial reduction in air emissions, proper dispersion of treated emissions along with reduction in consumption wood; however it may still not possible to meet the emission standards prescribed for a waste incinerator. Reduction emissions from wood based pyre at par with emissions standards prescribed for conventional incinerators can be achieved by further modifying the emissions control systems, which may include installation of venturi scrubbers / bag dust collectors / activated carbon adsorption filters, which may be implemented in a phased manner.

5. Modified emission control systems are also required for the CNG based and electric crematoriums to meet the emission standards prescribed for a waste incinerator. In these crematoriums also, reduction of emissions at par with emissions standards prescribed for conventional incinerators can be achieved by installing venturi scrubbers / bag dust collectors / activated carbon adsorption filters / etc., which may be implemented in a phased manner.

6. To start with emission regulation from conventional crematoriums, CPCB proposes to implement modified wood based pyres with minimal air pollution control devices including a chimney height of 30 meters to ensure proper dispersion of treated emissions as shown in Figure-1. Further reduction in emission shall be achieved by installing augmented emission control systems throughout the country in a phased manner.

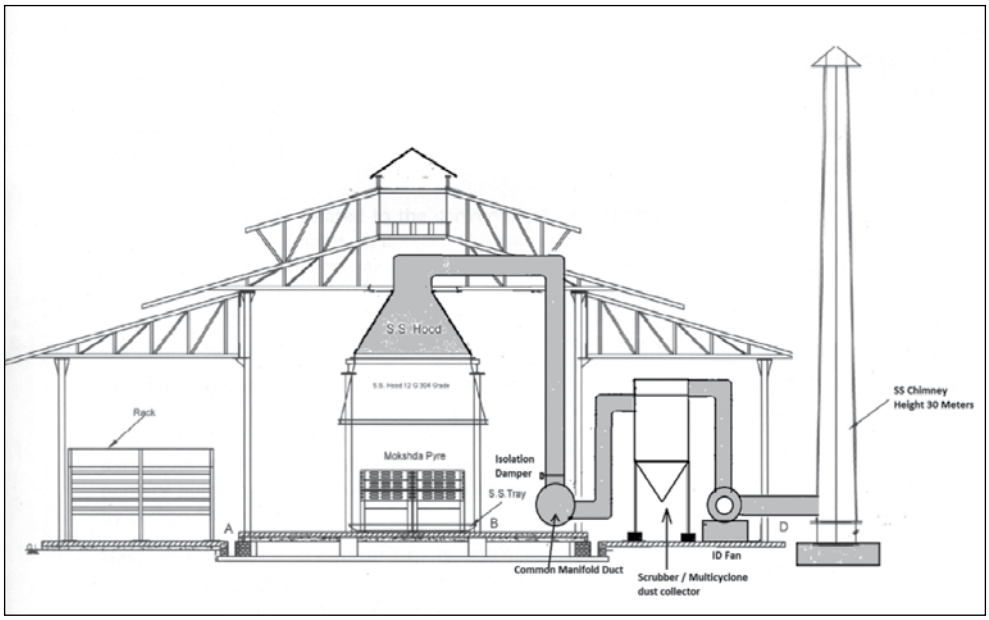
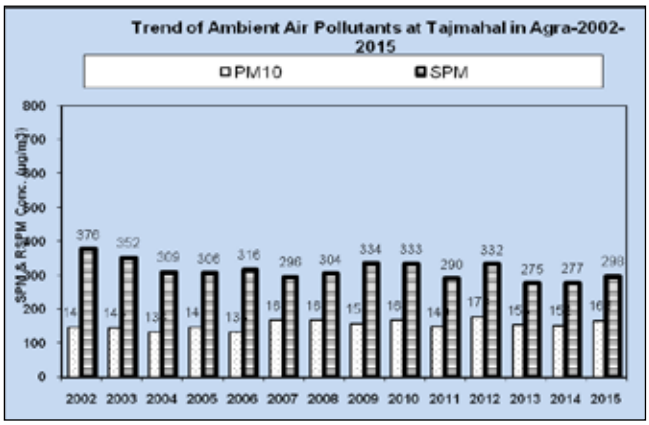
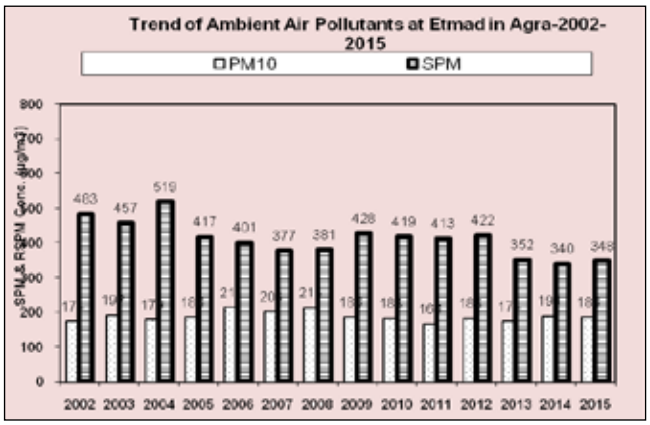


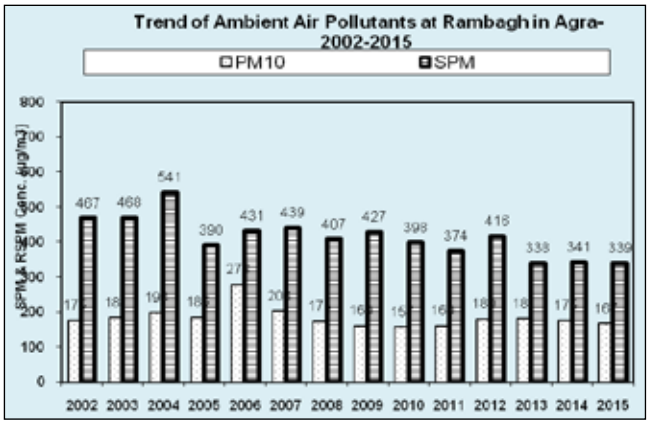
Figure 1: Wood based Crematorium with modifed pyre and air pollution systems

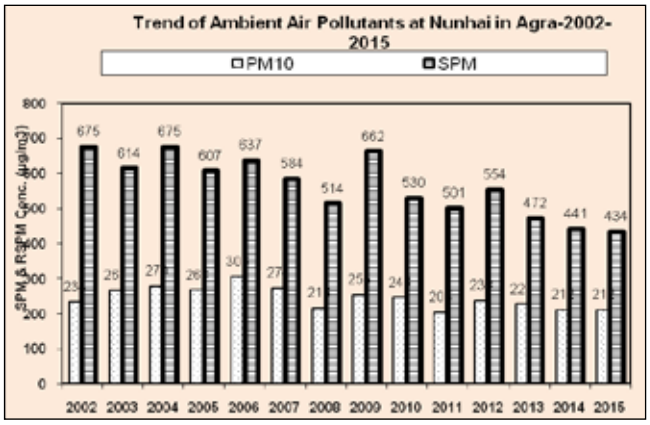
Yearly Trend of Air Quality in Agra (2002-2015):

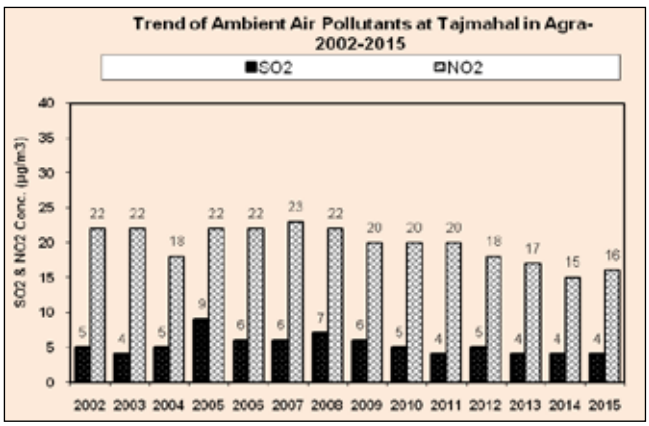
As per the direction of the Hon'ble Supreme Court, CPCB is monitoring the ambient air quality in Agra at Four location viz. Tajmahal, Etmad-ud-daulah, Rambagh (all are protected monuments) and Nunhai (Industrial Area) since 2002. The AAQM data collected during 2002 to 2015 of four monitoring parameters has been plotted as below. Decreasing trend in SPM was observed at all the four monitoring stations, while moderate increasing trend was observed in PM_{10} during these years. The SO_2 and NO_2 remained almost static with very little variation year to year.

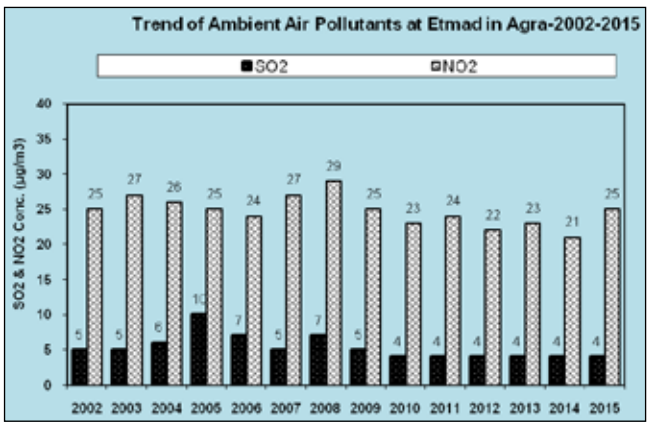

Trend of Ambient Air Pollutants at Tajmahal in Agra-2002-2015
PM10
SPM
SPM & RSPM Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

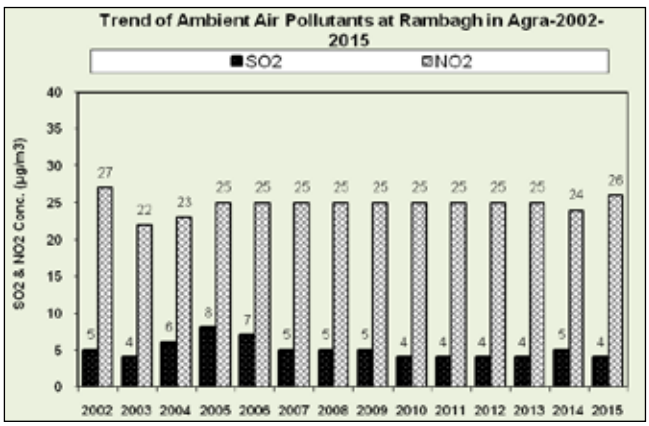

Trend of Ambient Air Pollutants at Etmad in Agra-2002-2015
PM10
SPM
SPM & RSPM Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

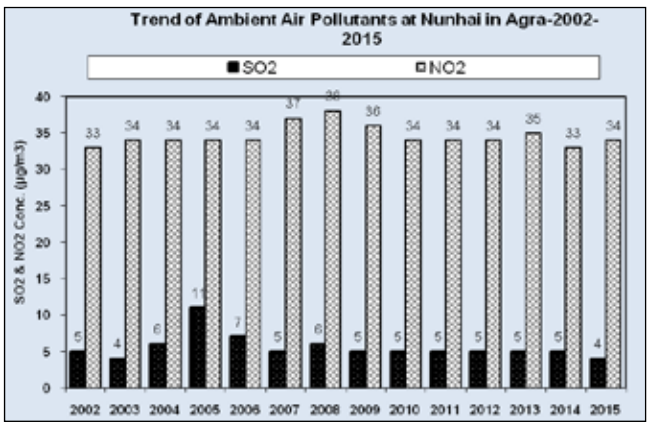

Trend of Ambient Air Pollutants at Rambagh in Agra-2002-2015
PM10
SPM
SPM & RSPM Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Trend of Ambient Air Pollutants at Nunhai in Agra-2002-2015
PM10
SPM
SPM & RSPM Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Trend of Ambient Air Pollutants at Tajmahal in Agra-2002-2015
SO2
NO2
SO2 & NO2 Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

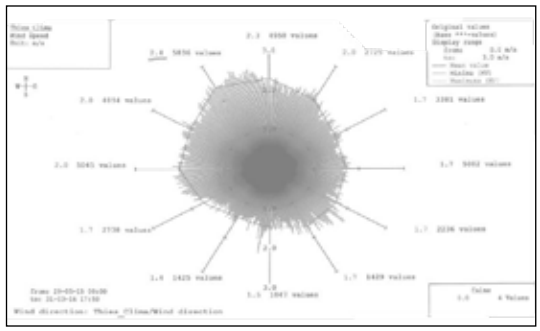

Trend of Ambient Air Pollutants at Etmad in Agra-2002-2015
SO2
NO2
SO2 & NO2 Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Trend of Ambient Air Pollutants at Rambagh in Agra-2002-2015
SO2
NO2
SO2 & NO2 Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Trend of Ambient Air Pollutants at Nunhai in Agra-2002-2015
SO2
NO2
SO2 & NO2 Conc. (µg/m3)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Meteorological data:

Met System has been installed (May 2015) in Agra office to collect real time metrological data. The monthly mean met values of the Temp., Humidity, Wind Speed; Wind Direction has been depicted in the picture. The monthly mean temperature varied from 160C (Jan.) to 33.50C (June) and Relative Humidity (%) is higher during July-August (during monsoon) & January (during winter thick fog) months. Prominent Wind direction is N to NNW, except during August (SSW) & September (WWN) and wind speed goes upto 2.5m/s.



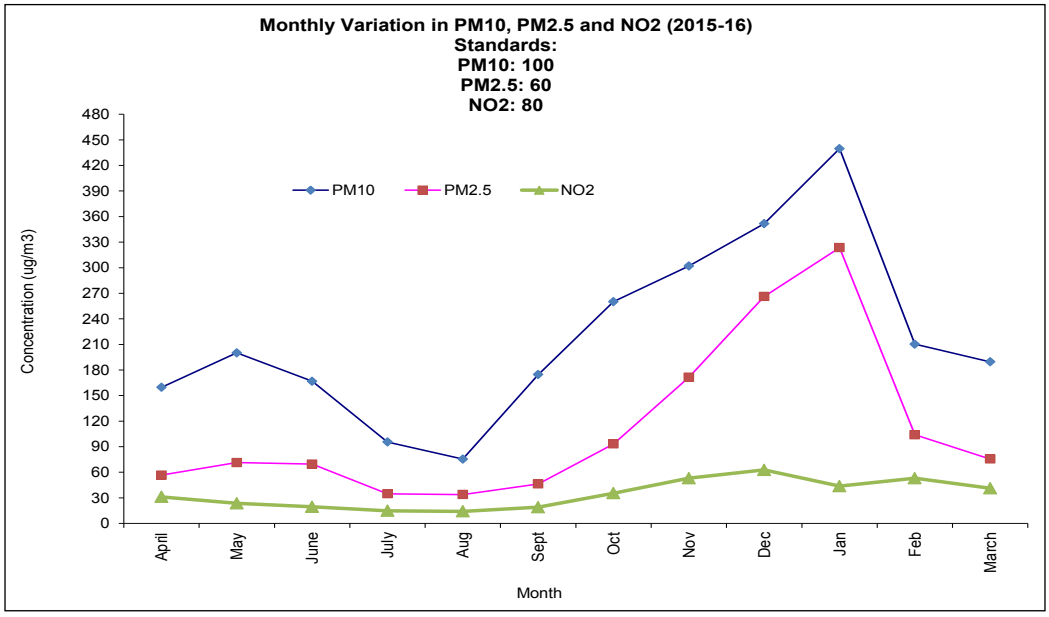
Ambient Air Quality Monitoring in Lucknow (2015-16)

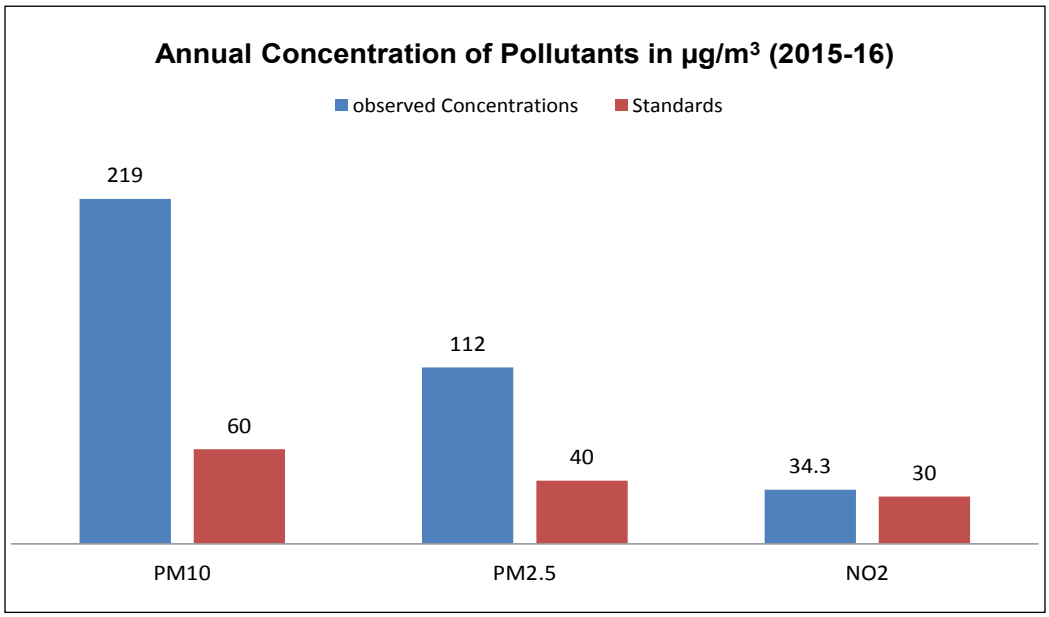
Ambient Air Quality Monitoring Station at Vikas khand, Gomti Nagar, Lucknow (residential area) has been established with the facility of monitoring the pollutants viz. PM_{10}, $PM_{2.5}$,SO_2 and NO_2,.The monitoring is being conducted under NAMP network with station code 783. Due to problem persist with EDB website; the data generated are being transmitted regularly through email to PAMS division of CPCB, Delhi

PM_{10} sampler (Respirable dust sampler: Make :Envirotech, APM: 460 NL for PM_{10} and APM 411 TE for gases) and $PM_{2.5}$ sampler (Make Thermo: Partisol FRM 2000) are used for Ambient air quality monitoring.

PM_{10} are monitored on 8-hourly intervals and gaseous sampling is being conducted on 4-hourly intervals whereas, $PM_{2.5}$ sampling is generally carried out on 24-hourly intervals. Air samples are processed in the laboratory of CPCB, Zonal Office Lucknow using standard methods.

The trend of monthly average concentration of pollutants monitored and annual average during the year has been depicted in following graphs;





Continuous Ambient Air Quality Monitoring (CAAQM) at Lucknow

A pilot network of three Continuous Ambient Air Quality Monitoring Stations has been set up under the project "Private Participation in the Management of Continuous Ambient Air Quality Monitoring Stations /Network under operation contract. Stations are being operated and maintained by Environnement S.A France and Environnement SA (India) Pvt.Ltd.and the data of various air pollutants including meteorological data are being disseminated online. Observations and trends of air pollutants monitored at all the three stations during the year 2015-16 are summarized below:

A. Kendriya Vidyalaya (Central School), Aliganj:

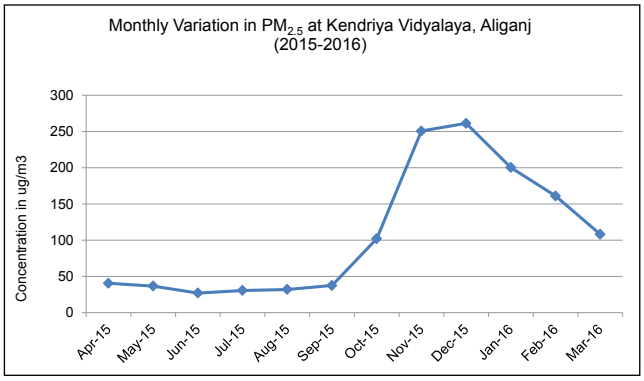
Area Category: Residential (Latitude- 26o54'2.2'' N, Longitude- 80o56'53.6'' E)

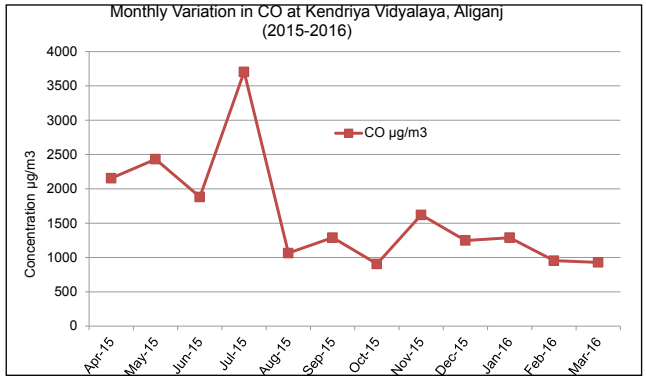
Parameters monitored: Temperature, Relative Humidity, Wind Speed, Wind Direction, Vertical Wind Speed, Barometric Pressure, Solar Radiation, SO_2, NO, NO_2, NO_x, PM_{10}, O_3, CO, Benzene, Toluene, Ethyl Benzene, MP-Xylene and O-Xylene.

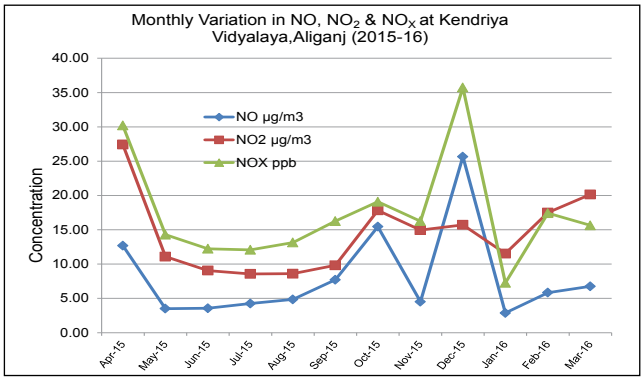
Table: Annual status of various parameters monitored at Kendriya Vidyalaya (Central School), Aliganj during 2015-2016

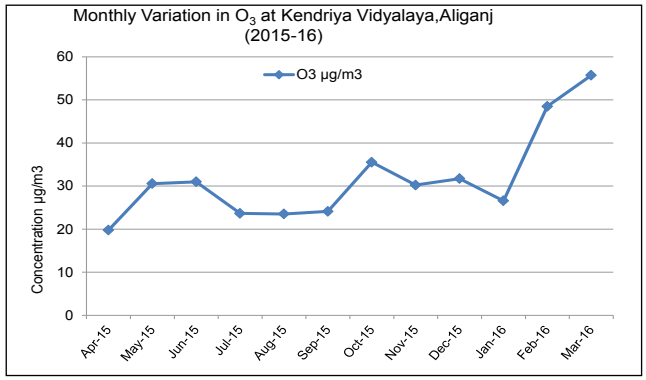
Parameters	Unit	Mean value	Min. value	Max. value
Nitrogen Monoxide (NO)	(µg/m³)	8.14	2.88	25.66
Nitrogen Dioxide (NO_2)	(µg/m³)	14.35	8.57	27.42
Oxides of Nitrogen (NO_x)	(ppb)	17.46	7.26	35.73
Sulphur Dioxide (SO_2)	(µg/m³)	10.67	3.02	23.74
Carbon Monoxide (CO)	(µg/m³)	1622.59	905.76	3703.42
Ozone (O_3)	(µg/m³)	31.74	19.76	55.71
$PM_{2.5}$	(µg/m³)	107.36	27.15	261.31
Benzene (C_6H_6)	(µg/m³)	1.49	0.13	3.86
Toluene (C_7H_8)	(µg/m³)	1.57	0.26	3.96
Ethyl Benzene	(µg/m³)	1.23	0.17	3.80

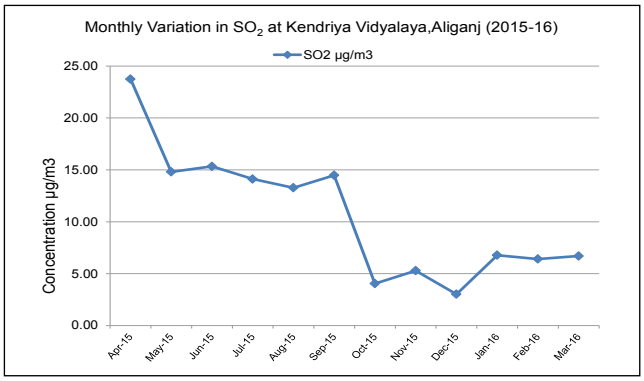
M+P-Xylene	($\mu g/m^3$)	1.34	0.11	3.78
O-Xylene	($\mu g/m^3$)	0.99	0.01	3.77
Temperature	^0C	26.39	16.35	32.78
Relative Humidity	%	62.18	43.56	78.71
Wind speed	m/s	0.88	0.03	1.22
Vertical Wind Speed	m/s	0.17	-0.02	0.65
Barometric Pressure	mbar	990.56	883.45	1011.23
Solar Radiation	W/m^2	208.82	90.56	374.34

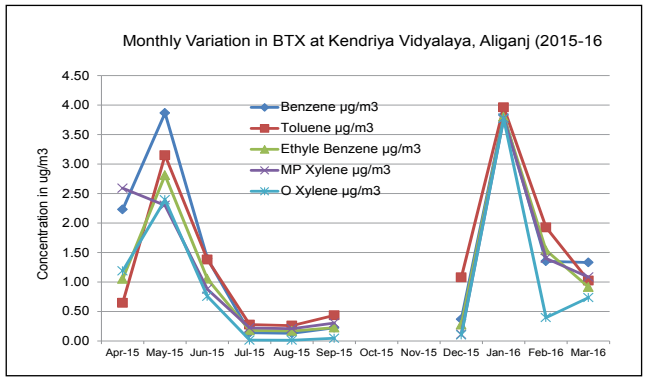












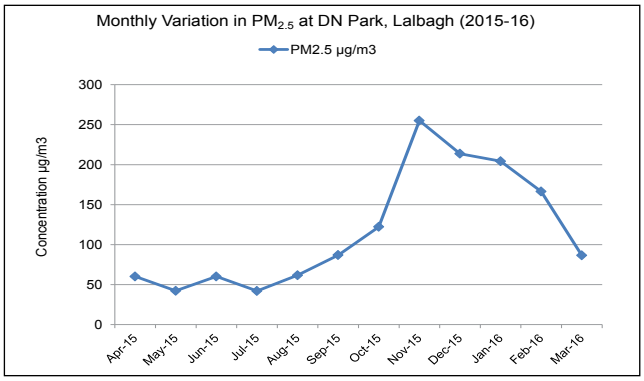
B. Dayanidhan (DN) Park, Lalbagh:

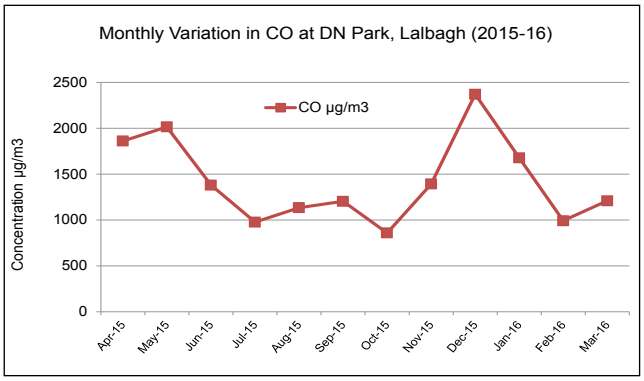
Area Category: Commercial (Latitude- 26o50'46.4'' N, Longitude- 80o56'16.5'' E)

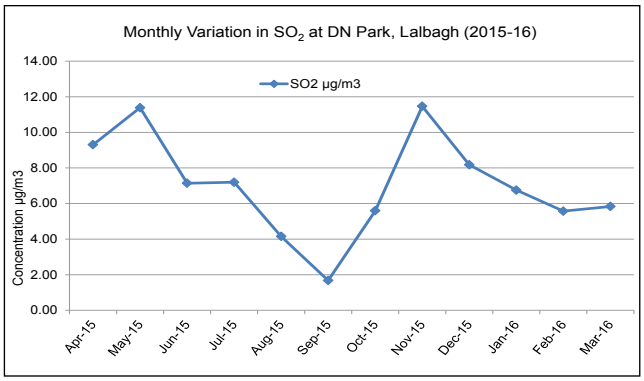
Parameters monitored: Temperature, Relative Humidity, Wind Speed, Wind Direction, Vertical Wind Speed, Barometric Pressure, Solar Radiation, SO_2, NO, NO_2, NO_x, PM_{10}, O_3, CO, Benzene, Toluene, Ethyl Benzene, MP-Xylene, O-Xylene.

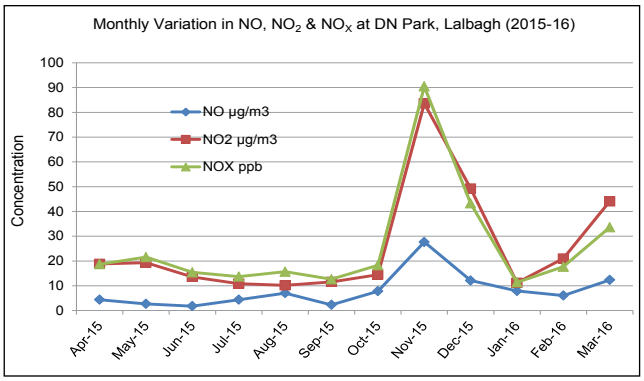
Table: Annual status of various parameters monitored at DN Park, Lalbagh during 2015-2016

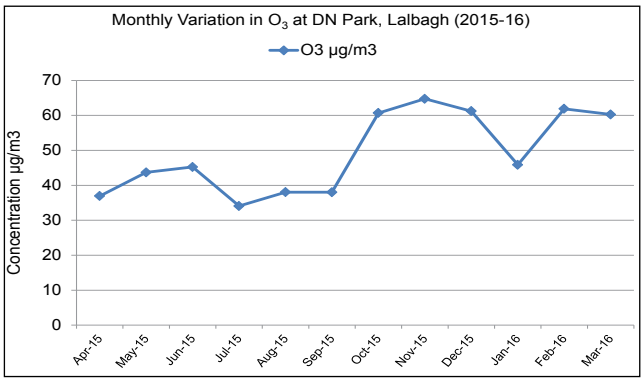
Parameters	Unit	Mean value	Min. value	Max. value
Nitrogen Monoxide (NO)	(µg/m³)	8.04	1.79	27.66
Nitrogen Dioxide (NO_2)	(µg/m³)	25.67	10.18	83.60
Oxides of Nitrogen (NO_X)	(ppb)	26.04	11.39	90.51
Sulphur Dioxide (SO_2)	(µg/m³)	7.02	1.67	11.46
Carbon Monoxide (CO)	(µg/m³)	1422.79	859.33	2370.76
Ozone (O_3)	(µg/m³)	49.23	34.07	64.75
$PM_{2.5}$	(µg/m³)	116.77	41.98	255.03
Benzene (C_6H_6)	(µg/m³)	1.09	0.07	5.73
Toluene (C_7H_8)	(µg/m³)	2.44	0.08	15.81
Ethyl Benzene	(µg/m³)	1.17	0.05	5.25
M+P-Xylene	(µg/m³)	1.55	0.06	7.22
O-Xylene	(µg/m³)	1.23	0.01	1.23
Temperature	^0C	27.43	15.03	34.65
Relative Humidity	%	55.55	69.18	40.49
Wind speed	m/s	0.82	1.14	0.40
Vertical Wind Speed	m/s	0.54	0.05	1.85
BP	mbar	996.59	973.08	1011.44
Solar Radiation	W/m²	261.25	1.45	445.56

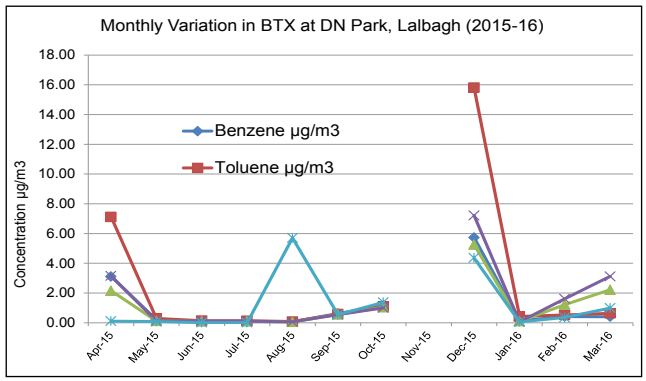












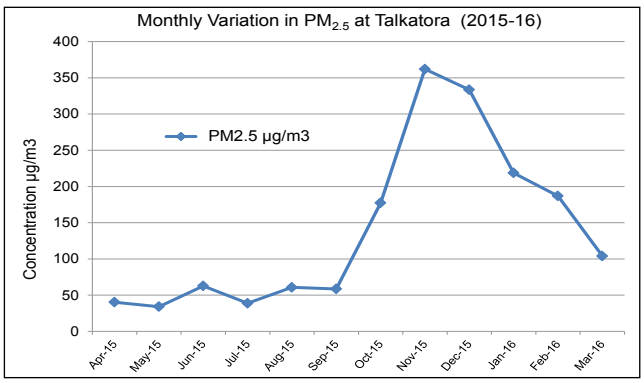
C. Talkatora Industrial Area, Talkatora:

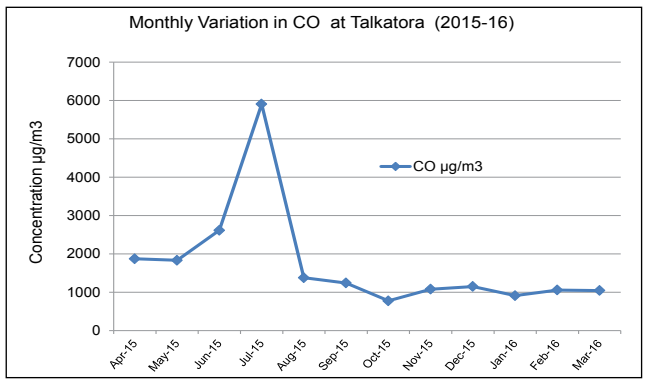
Area Category: Industrial (Latitude- 26o50'4.1'' N, Longitude- 80o53'42.0'' E)

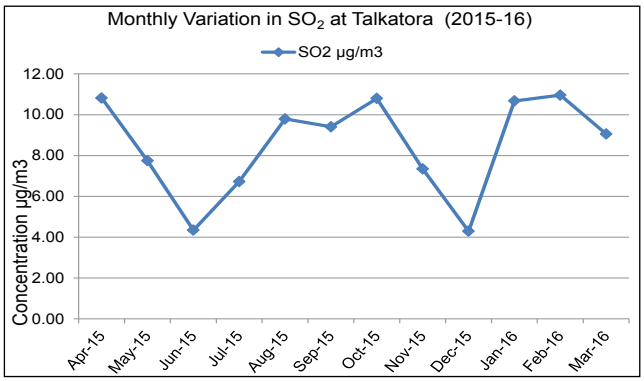
Parameters monitored: Temperature, Relative Humidity, Wind Speed, Wind Direction, Vertical Wind Speed, Barometric Pressure, Solar Radiation, SO_2, NO, NO_2, NOX, PM_{10}, NH_3, CO, Methane, Non-Methane, Total Hydrocarbon.

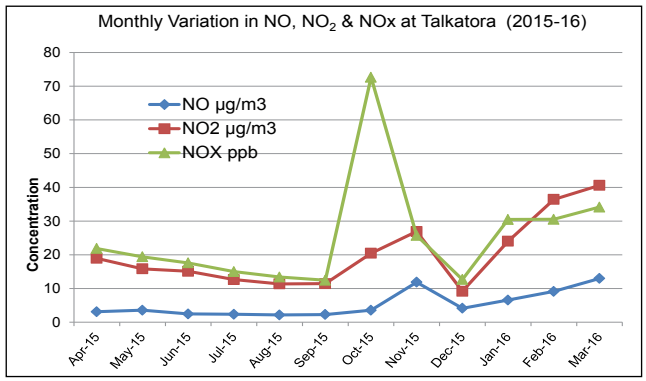
Table: Annual status of various parameters monitored at Talkatora Industrial Area, Talkatora during 2015-2016

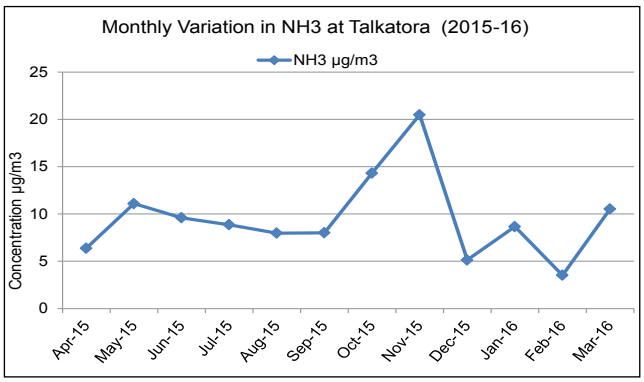
Parameters	Unit	Mean value	Min. value	Max. value
Nitrogen Monoxide (NO)	(µg/m³)	5.36	2.16	12.99
Nitrogen Dioxide (NO_2)	(µg/m³)	20.26	9.20	40.60
Oxides of Nitrogen (NO_X)	(ppb)	25.50	12.47	72.65
Ammonia (NH_3)	(µg/m³)	9.55	3.52	20.49
Sulphur Dioxide (SO_2)	(µg/m³)	8.50	4.29	10.96
Carbon Monoxide (CO)	(µg/m³)	1739.13	776.36	5905.70
$PM_{2.5}$	(µg/m³)	139.86	34.19	362.86
Methane (CH_4)	(µg/m³)	1218.76	492.10	5243.43
Non-Methanehydrocarbon (µg/m³)		1361.80	455.66	5008.98
Temperature	^{0}C	27.12	17.39	33.32
Relative Humidity	%	55.24	43.76	74.03
Wind speed	m/s	1.31	0.93	1.67
Vertical Wind Speed	m/s	0.39	0.12	0.70
BP	mbar	1005.55	995.17	1012.50
Solar Radiation	W/m²	288.06	173.43	449.85

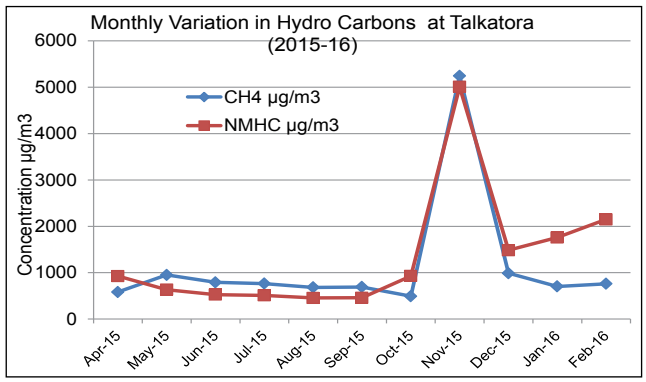












Study of total PAH in terms of benzene soluble fraction (BSF) of the repairable fraction of suspended particulate matter in ambient air of Coimbatore, Tamil Nadu

Toxic air pollutants, also called as Hazardous Air Pollutants (HAP) are those that are known or suspected to cause serious health effects. Examples of HAPs include poly aromatic hydrocarbons (PAH), heavy metals like arsenic, nickel, lead etc was carried out for Coimbatore city, Tamil Nadu. Coimbatore is the second largest city in the state of Tamil Nadu and one of the fastest growing cities in India. Major industries located include textiles, information technology, foundries and engineering. Air pollution is one of the major issues in the city. Also, CPCB has ranked Coimbatore as one of the critically polluted area, being ranked 34 out of 88 industrial clusters examined. Considering the above two facts, Coimbatore city was chosen as study area.

Poly aromatic hydrocarbons (PAH) are a large class of organic compounds containing two or more fused aromatic rings. They often result from incomplete combustion of fossil fuels. Many of PAH, including benzo (a) pyrene, are classified as carcinogenic or mutagenic and hence cause serious health problems.

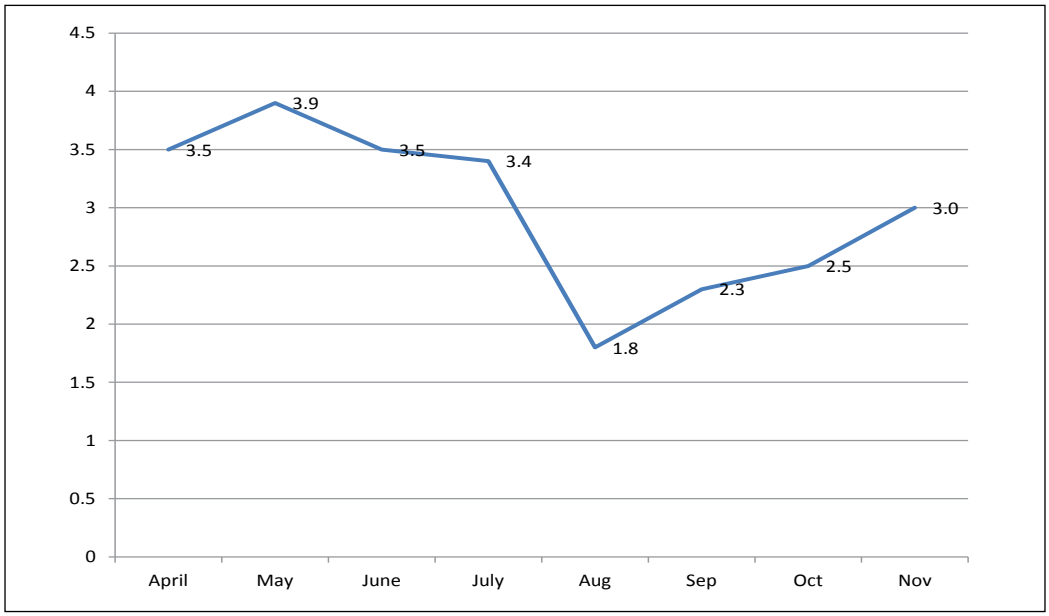
Considering their importance and carcinogenic nature, on 18th November 2009, National Ambient Air Quality Standards (NAAQS) were revised and Benzo (a) Pyrene, a known carcinogenic PAH and the metals, Arsenic and Nickel were included in the NAAQS.

Benzene soluble fraction (BSF) is one of the main fractions associated with these organics and gives an idea about the total organics, including PAH, present in the ambient air.

Study was carried out for the period April, 2015 to November, 2015 and the results are depicted below:

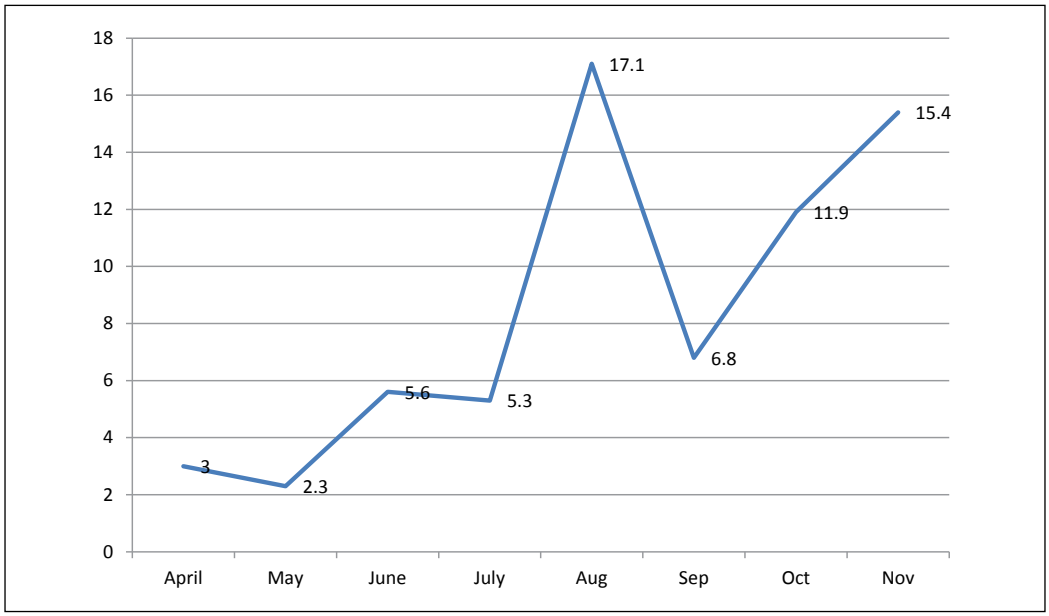
P.R. Puram:

Date	BSF,µg/m^3	RSPM,µg/m^3	% BSF in RSPM	Average BSF	Average % BSF in RSPM
01.04.15	9.1	40	22.8		
29.04.15	6.0	45	13.2	7.55	18
02.05.15	4.3	44	9.8		
23.05.15	3.5	31	11.3	3.9	10.55
13.06.15	4.3	32	13.5		
17.06.15	2.6	25	10.6	3.45	12.05
15.07.15	2.2	34	6.5		
22.07.15	4.5	29	15.6	3.35	11.05
05.08.15	2.0	52	3.8		
29.08.15	1.5	31	4.8	1.75	4.3
02.09.15	2.7	40	6.8		
30.09.15	1.8	37	4.8	2.25	5.8
03.10.15	1.2	18	6.9		
31.10.15	3.7	42	8.8	2.45	7.85
04.11.15	1.5	32	4.6		
28.11.15	4.5	71	6.4	3.00	5.5



Kurchi industrial area:

Date	BSF,µg/m^3	RSPM,µg/m^3	% BSF in RSPM	Average BSF	Average % BSF in RSPM
10.4.15	4.6	43	10.6		
24.4.15	1.4	50	2.8	3.0	6.7
5.5.15	4.4	79	5.6		
29.5.15	0.2	29	0.6	2.3	3.1
9.6.15	3.7	43	8.6		
12.6.15	7.6	45	16.9	5.65	12.75
17.7.15	1.7	36	4.6		
24.7.15	8.8	28	31.3	5.25	17.95
04.08.15	32.8	49	66.9		
25.08.15	1.4	27	5.2	17.1	36.05
01.09.15	7.9	57	13.8		
29.09.15	5.6	46	12.1	6.75	12.95
06.10.15	6.3	44	14.4		
27.10.15	17.6	46	38.3	11.95	26.35
03.11.15	6.2	33	18.8		
27.11.15	24.5	57	43.0	15.35	30.9



District collector office:

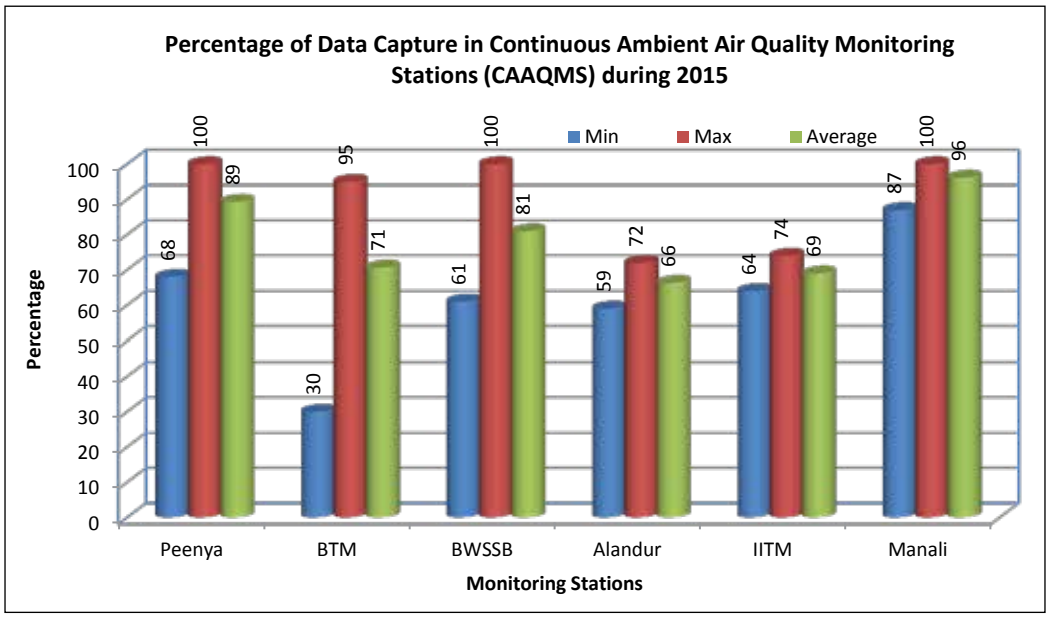
Date	BSF,µg/m^3	RSPM,µg/m^3	% BSF in RSPM	Average BSF	Average % BSF in RSPM
9.4.15	3.8	58	6.5		
27.4.15	5.1	41	12.5	4.45	9.5
4.5.15	4.4	37	12.0		
25.5.15	2.7	34	7.9	3.55	9.95
8.6.15	1.9	35	5.3		
15.6.15	2.3	29	8.0	2.1	6.65
16.7.15	1.6	70	2.3		
23.7.15	0.8	31	2.6	1.2	2.45
03.08.15	6.4	25	25.4		
31.08.15	8.5	33	25.9	7.45	25.65
03.09.15	11.6	27	42.8		
28.09.15	4.8	25	19.3	8.2	31.05
01.10.15	4.1	27	15.1		
29.10.15	2.1	32	6.4	3.1	10.75
02.11.15	7.9	25	31.5		
9.4.15	3.8	58	6.5	5.85	19.0

P.R.Puram area comes under the category of residential area. The values of RSPM are within the standard limit of 60µg/m^3. The BSF values are within the proposed limit of 20µg/m^3. Lower values in august may be attributed to heavy rain. Positive correlation was observed between RSPM and BSF values. Kurchi Industrial area station comes under the category of industrial area. RSPM values are within prescribed limit, except for the months of May and July. The BSF values are within the proposed limit. Positive correlation was observed between RSPM and BSF. District collector office comes under the category of residential area. The RSPM values are well below the prescribed limit. BSF values are well within the prescribed limit. Positive correlation was observed between BSF and RSPM.

"Ambient Air Quality at Various Locations in Bengaluru and Chennai Measured by Continuous Ambient Air Quality Monitoring Stations (CAAQMS)."

The Central Pollution Control Board, Zonal Office is operating six continuous ambient air quality monitoring stations, out of which three are in Bengaluru (1) BTM Layout (2) Kadabeshnahalli – BWSSBpremises and(3) Peenya industrial area and three locations inChennai are (1) Alandur(2) IITM and (3) Manali industrial area. The monitoring stations are equipped with multipoint calibrators by which each analyser can be calibrated as and when required on schedule basis. The data generated by these monitoring stations are linked with local and central networking stations apart from dissemination of data to public at each monitoring site through digital display board.

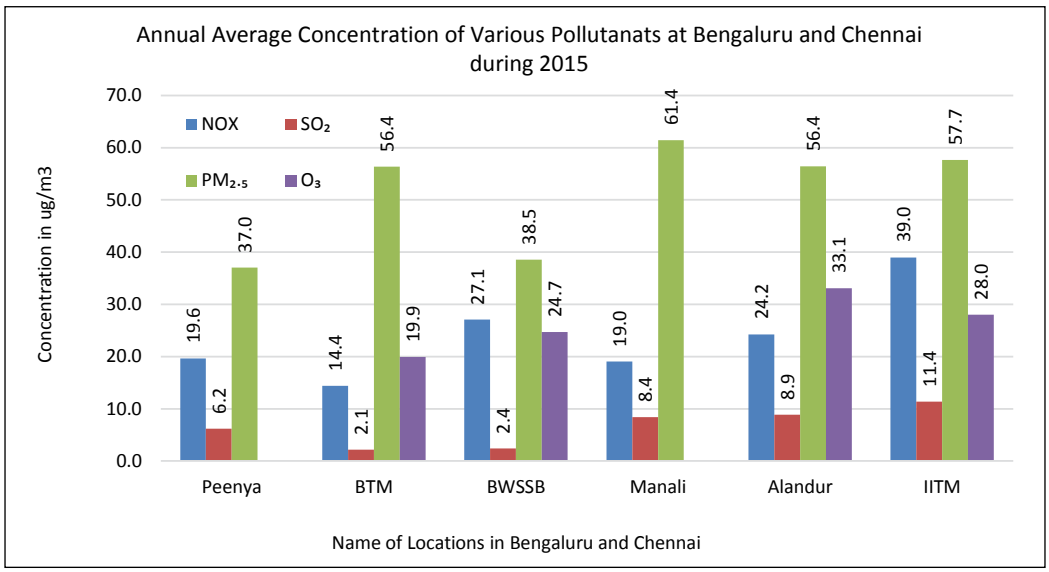
The hourly data generated are validated and processed every year. Similarly, the data generated at all six monitoring stations for the year 2015 are transferred to Central Networking station and further validated, processed for release of payment. The processed data reveals that the average data capture rate in Bengaluru is 83.3% and in Chennai it is 77% during the year 2015. The pictorial percentage of data, month wise captured in each monitoring stations Bengaluru and Chennai during 2015 is shown below.



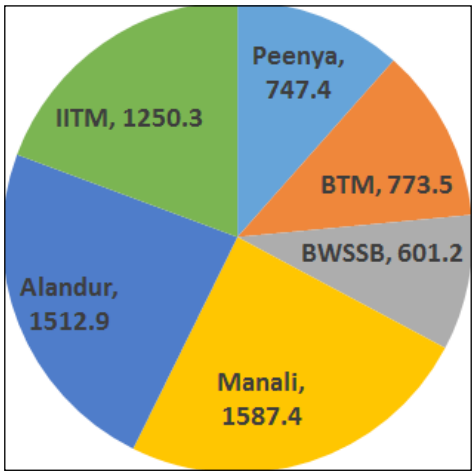
The annual average concentrations of various pollutants at these six locations in Bengaluru and Chennai are depicted in below table:

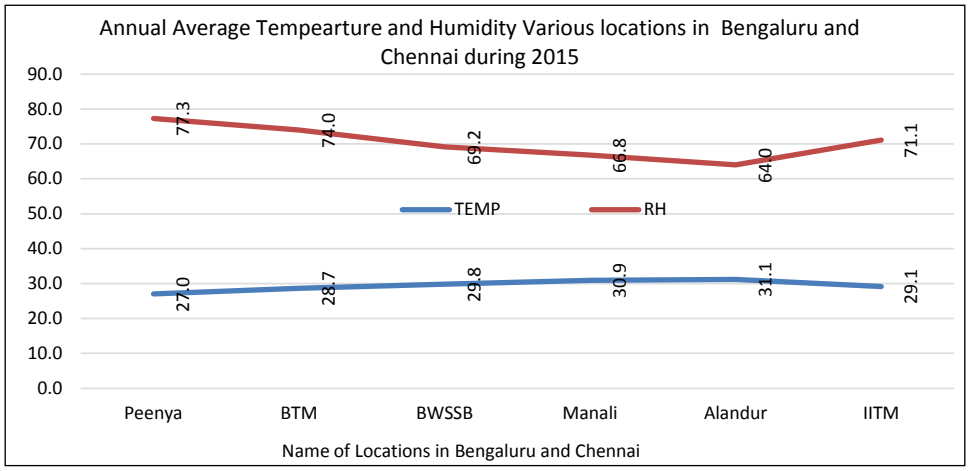
Locations	NO_x	SO_2	$PM_{2.5}$	O_3	CO	Temp	RH
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	°C	%
Peenya, Bengaluru	19.6	6.2	37.0	NM	747.4	27.0	77.3
BTM Layout,	14.4	2.1	56.4	19.9	773.5	28.7	74.0
Kadabeshnahalli (BWSSB), Bengaluru	27.1	2.4	38.5	24.7	601.2	29.8	69.2
Manali, Chennai	19.0	8.4	61.4	NM	1587.4	30.9	66.8
Alandur, Chennai	24.2	8.9	56.4	33.1	1512.9	31.1	64.0
IITM, Chennai	39.0	11.4	57.7	28.0	1250.3	29.1	71.1

Note: NM Means = Not Measured



Annual average concentration of Carbon Monoxide





Ambient air Quality at the Industrial Zones of Peenya, Bengaluru and Manali, Chennai during the year 2015

Parameters	Units	Peenya, Bengaluru			Manali, Chennai		
		Min	Max	Avg	Min	Max	Avg
Nitric Oxide(NO)	µg/m³	1.7	12.7	3.9	5.7	12.7	7.6
Nitrogen Dioxide($NO_{2)}$	µg/m³	5.4	34.5	15.7	8.0	18.6	11.5
Oxides of Nitrogen($NO_{X)}$	ppb	4.4	29.5	11.7	10.9	18.3	13.9
Ammonia($NH_{3)}$	µg/m³	9.0	43.5	22.8	20.1	101.8	55.6
Sulphur Dioxide($SO_{2)}$	µg/m³	1.8	24.8	6.2	3.9	21.4	8.4
Carbon Monoxide(CO)	µg/m³	253.8	1409.9	747.4	954.1	2462.3	1587.4
Particulate Matter ($PM_{2.5)}$	µg/m³	17.2	59.0	37.0	41.1	100.2	61.4
Methane($CH_{4)}$	µg/m³	422.7	943.8	686.6	1004.0	1257.0	1162.4
Non Methane(NMHC)	µg/m³	341.3	716.0	493.8	978.6	1518.9	1281.1
Total Hydrocarbon(THC)	µg/m³	787.1	1539.7	1162.8	2029.3	2689.0	2436.6
Temperature	°C	25.2	28.6	27.0	28.9	32.4	30.9
Relative Humidity	%	62.8	88.6	77.3	58.2	72.4	66.8

Parameters	Units	Peenya, Bengaluru			Manali, Chennai		
		Min	Max	Avg	Min	Max	Avg
Wind Speed	m/s	1.9	2.1	2.0	1.7	2.2	1.9
Wind Direction	Deg	148.6	230.9	186.4	154.0	229.1	191.6
Vertical Wind Speed	m/s	0.3	0.5	0.4	0.0	0.2	0.1
Barometric Pressure	mb	993.6	1011.9	1001.1	1002.9	1008.3	1006.0
Solar Radiation	W/m2	73.0	271.1	170.8	61.3	142.7	102.1

Ambient air Quality in the Residential area of BTM Layout and Kadabeshnahalli in Bengaluru during the year 2015

Parameters	Units	BTM			Kadabeshnahalli (BWSSB)		
		Min	Max	Avg	Min	Max	Avg
Nitric Oxide(NO)	µg/m³	1.0	11.4	3.5	1.1	27.6	6.2
Nitrogen Dioxide($NO_{2)}$	µg/m³	4.9	26.2	10.9	9.4	36.8	20.9
Oxides of Nitrogen($NO_{X)}$	ppb	3.7	23.5	9.5	5.6	32.0	14.6
Sulphur Dioxide($SO_{2)}$	µg/m³	1.0	8.6	2.1	0.9	4.7	2.4
Carbon Monoxide(CO)	µg/m³	241.1	1625.8	773.5	287.4	1369.9	601.2
Ozone($O_{3)}$	µg/m³	8.2	36.4	19.9	10.2	51.1	24.7
Particulate Matter ($PM_{2.5)}$	µg/m³	26.3	145.4	56.4	13.0	65.9	38.5
Benzene	µg/m³	0.0	6.2	0.3	0.2	6.8	3.0
Toluene	µg/m³	0.0	5.8	0.6	0.2	9.9	1.8
Ethyl Benzene	µg/m³	0.0	5.2	0.4	0.0	8.5	2.0
MP Xylene	µg/m³	0.0	6.4	0.4	0.1	5.8	0.8
O xylene	µg/m³	0.0	4.9	0.3	0.0	3.6	0.8
Temperature	°C	26.6	30.5	28.7	27.3	40.4	29.8
Relative Humidity	%	58.5	86.9	74.0	57.2	79.6	69.2
Wind Speed	m/s	2.0	2.7	2.2	0.8	2.0	1.3
Wind Direction	Deg	185.8	260.1	222.4	165.2	257.7	208.4
Vertical Wind Speed	m/s	0.4	2.4	0.7	0.3	0.5	0.5
Barometric Pressure	mb	978.7	1008.2	991.6	997.9	1016.0	1004.7
Solar Radiation	W/m²	90.0	332.3	184.3	122.3	310.3	223.2

Ambient air Quality in the Residential area of Alandur and IITM in Chennai during the year 2015

Parameters	Units	Alandur			IITM		
		Min	Max	Avg	Min	Max	Avg
Nitric Oxide(NO)	µg/m³	5.4	21.0	8.8	7.1	50.0	15.9
Nitrogen Dioxide($NO_{2)}$	µg/m³	8.9	26.2	15.4	11.3	61.2	23.1
Oxides of Nitrogen($NO_{X)}$	ppb	14.3	32.6	20.1	16.8	68.7	28.1
Sulphur Dioxide($SO_{2)}$	µg/m³	5.0	17.0	8.9	5.3	22.6	11.6
Carbon Monoxide(CO)	µg/m³	681.4	2579.4	1512.9	868.2	1873.5	1250.3
Ozone($O_{3)}$	µg/m³	22.2	57.6	33.1	12.0	54.8	28.0
Particulate Matter ($PM_{2.5)}$	µg/m³	24.4	118.7	56.4	31.8	101.3	57.7
Benzene	µg/m³	NV	NV	NV	2.0	5.3	3.3

Parameters	Units	Alandur			IITM		
		Min	Max	Avg	Min	Max	Avg
Toluene	µg/m³	NV	NV	NV	2.2	6.6	4.5
Ethyl Benzene	µg/m³	NV	NV	NV	5.5	16.5	11.9
MP Xylene	µg/m³	NV	NV	NV	1.6	4.9	3.5
O xylene	µg/m³	NV	NV	NV	0.8	2.7	2.0
Temperature	°C	29.3	33.3	31.1	26.6	31.2	29.1
Relative Humidity	%	49.2	80.2	64.0	54.5	82.9	71.1
Wind Speed	m/s	0.2	0.7	0.4	1.3	2.0	1.5
Wind Direction	Deg	215.3	302.1	264.1	131.9	227.5	174.2
Vertical Wind Speed	m/s	-0.2	0.1	0.0	0.0	0.4	0.2
Barometric Pressure	mb	1004.0	1049.6	1022.1	982.9	1059.6	1029.8
Solar Radiation	W/m²	32.4	73.4	40.4	187.0	285.2	236.3

Temporal and Statistical Analysis of CAAQMS Data of Bengaluru City

The Bengaluru city is positioned at 12.97° N 77.56° E and covers an area of 741 Sq. Km, the average elevation is 920 meters from mean sea level. Bengaluru officially known as Bengaluru is the third most populous city and fifth most populous urban agglomeration in India. Located in southern India on the Deccan plateau, at a height of over 3000 ft above sea level, Bengaluru is known for its pleasant climate throughout the year. The topology of Bengaluru is generally flat, through the western parts of the city are hilly.The city's roads, however, is not designed to accommodate the vehicular traffic, growing at an average of 8% annually, that prevails in Bengaluru. This leads to heavy slow traffic and traffic jams in Bengaluru.Bengaluru houses many small and medium scale industries in its Peenya industrial area that claimed to be one of the biggest in Asia 30 years ago.

The locations selected for air quality monitoring are as follow:

Sl. No.	Locations	Zone
1.	BTM Layout	Residential
2.	BWSSB (Kaadubeesanahalli)	Commercial
3.	Peenya	Industrial

Location showing the Monitoring Areas

The hourly CAAQMS data for four years (2011, 2012, 2013 & 2014) of 3 stations in Bengaluru city were validated. Validated data are used for statistical analysis such as t-test, correlation, regression and forecasting air pollution level using time series analysis technique.

Statistical analysis and Air Pollution Index for BTM station

Name of the Station	BTM Layout, Bengaluru											
Parameter	NO_x (µg/m^3)				SO_2 (µg/m^3)				RSPM (µg/m^3)			
Year	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
MIN	0.66	0.66	0.66	0.66	2.86	2.86	2.86	2.86	0.5	0.5	0.5	0.5
MAX	213.47	238.67	253.91	334.4	59.53	66.71	83.13	538.0	748.51	748.66	1384.5	696.73
MEAN	26.09	38.38	27.81	30.7	4.47	5.93	9.13	14.3	62.58	44.30	60	41.0
Standard Deviation	17.95	20.15	13.83	17.02	3.27	1.88	5.99	22.45	49.93	38.98	79.82	31.34
Percentage of violation	***	***	***	***	***	***	***	***	4.3	***	***	***
Severity of violation	5.33	5.96	6.34	8.36	1.19	1.33	1.66	10.76	12.47	12.47	23.07	11.61
Co-efficient of Variation	68.80	52.5	49.76	55.45	73.24	31.8	65.64	156.99	80	88.01	133.03	76.44
Co-efficient of Range	0.99	0.99	0.99	0.99	0.908	0.91	0.93	0.98	0.99	0.99	0.99	0.99
Pollution level	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low	High	Moderate	Moderate	Moderate
Year		Air Quality Index							Air Quality Criteria			
2011		60.30							Moderate Air Pollution			
2012		58.71							Moderate Air Pollution			
2013		63.94							Moderate Air Pollution			
2014		55.99							Moderate Air Pollution			

***→ *Within limits*

Statistical analysis and Air Pollution Index for BWSSB, Kaadubeesanahalli station

Name of the Station	BWSSB Kaadubeesanahalli, Bengaluru											
Parameter	NO_x (µg/m^3)				SO_2 (µg/m^3)				RSPM (µg/m^3)			
Year	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
MIN	0.66	0.66	0.66	0.66	2.86	2.86	2.86	2.86	0.5	0.5	0.5	0.5
MAX	260.718	246.34	337.1	301.9	92	13.22	9.8	395.3	734.32	1633.87	463.5	989.1
MEAN	27.84	37.57	32.9	33.9	3.5	4.93	3.6	11.9	53.81	57.17	64.8	55.0
Standard Deviation	26.11	18.83	16.63	29.91	1.18	1.14	0.89	28.40	32.60	64.97	37.74	46.86
Percentage of violation	***	***	***	***	***	***	***	***	***	***	8	***
Severity of violation	6.51	6.15	8.42	7.54	1.84	0.26	0.19	7.90	12.23	27.23	7.72	16.48
Co-efficient of Variation	93.79	50.14	50.55	88.33	33.84	23.29	25.20	238.65	60.58	113.64	58.28	85.25

Name of the Station	BWSSB Kaadubeesanahalli, Bengaluru											
Parameter	NO_x (µg/m^3)				SO_2 (µg/m^3)				RSPM (µg/m^3)			
Year	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
Co-efficient of Range	0.99	0.99	0.99	0.99	0.93	0.64	0.54	0.98	0.99	0.99	0.99	0.99
Pollution level	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low	Moderate	Moderate	High	Moderate
Year		Air Quality Index							Air Quality Criteria			
2011		58.14							Moderate Air Pollution			
2012		68.62							Moderate Air Pollution			
2013		66.33							Moderate Air Pollution			
2014		62.14							Moderate Air Pollution			

***→ *Within limits*

Statistical analysis and Air Pollution Index for Peenya station

Name of the Station	Peenya Industrial Area, Bengaluru											
Parameter	NO_x (µg/m^3)				SO_2 (µg/m^3)				RSPM (µg/m^3)			
Year	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014
MIN	0.66	0.66	12.4	0.66	2.86	2.86	2.86	2.86	0.5	0.5	0.5	0.5
MAX	269.78	221.84	99.1	320.7	298.0	241.26	240.50	103.0	818.25	17436.9	2329.6	1865.0
MEAN	26.33	30.53	35.5	30.2	15.55	14.34	9.6	6.5	55.61	110.03	78.4	51.1
Standard Deviation	25.62	19.67	6.59	16.49	12.39	9.83	10.91	3.63	36.07	293.54	119.50	74.92
Percentage of violation	***	***	***	***	***	***	***	***	***	83.38	30.66	***
Severity of violation	6.74	5.54	2.47	8.01	5.96	4.82	4.81	2.06	13.63	290.61	38.82	31.08
Co-efficient of Variation	97.32	64.45	18.58	54.58	79.71	68.61	113.64	55.96	64.87	266.78	152.42	146.61
Co-efficient of Range	0.99	0.99	0.77	0.99	0.98	0.97	0.97	0.94	0.99	0.99	0.99	0.99
Pollution level	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Low	Moderate	Critical	High	Moderate
Year		Air Quality Index							Air Quality Criteria			
2011		61.92							Moderate Air Pollution			
2012		98.60							Heavy Air Pollution			
2013		79.54							Heavy Air Pollution			
2014		87.23							Heavy Air Pollution			

***→ *Within limits*

Test for two sample assuming unequal variances (ttest) between BTM and BWSSB, Kaadubeesanahalli during 2011-2014

Test for equal means (t test) between BTM and BWSSB, Kaadubeesanahalli										
Parameters	**N BTM**	**N BWSSB**	**Mean BTM**	**Mean BWSSB**	**Variance BTM**	**Variance BWSSB**	**Difference between means**	**t stat**	**P two-tail (condition p<0.05 for significant difference in mean)**	**Inference**
NO_x	1328	1176	30.81	33.33	323.97	545.84	2.52	-2.99	0.00278	NO_x concentrations in both the locations are not similar.
SO_2	1293	1242	8.31	5.73	142.95	186.11	2.58	5.04	4.8538E-07	SO_2 concentrations in both the locations are not similar.
CO	1326	1248	787.23	734.01	326633.7	216237	53.22	2.59	0.00942	CO concentrations in both the locations are not similar.
O_3	1325	1240	37.45	32.86	678.10	511.42	4.59	4.77	1.8925E-06	O_3 concentrations in both the locations are not similar.
RSPM	1266	1221	52.26	57.65	3006.30	2266.01	5.39	-2.62	0.00872	RSPM concentrations in both the locations are not similar.

Test for two sample assuming unequal variances (ttest) between BTM and Peenya during 2011-2014

Test for equal means (t test) between year BTM and PEENYA										
Parameters	**N BTM**	**N PEENYA**	**Mean BTM**	**Mean PEENYA**	**Variance BTM**	**Variance PENNYA**	**Difference between means**	**t stat**	**P two-tail (condition p<0.05 for significant difference in mean)**	**Inference**
NO_x	1327	1234	30.80	30.77	324.19	336.37	0.03	0.047	0.96207	NO_x concentrations in both the locations are similar.
SO_2	1293	1268	8.31	11.30	142.95	104.56	2.99	-6.80	1.26E-11	SO_2 concentrations in both the locations are not similar.
CO	1326	1258	787.23	719.47	326633	1290795	67.76	1.89	0.05766	CO concentrations in both the locations are similar.
RSPM	1266	1134	52.26	75.53	3006.30	31784.93	23.27	-4.22	2.6E-05	RSPM concentrations in both the locations are not similar.

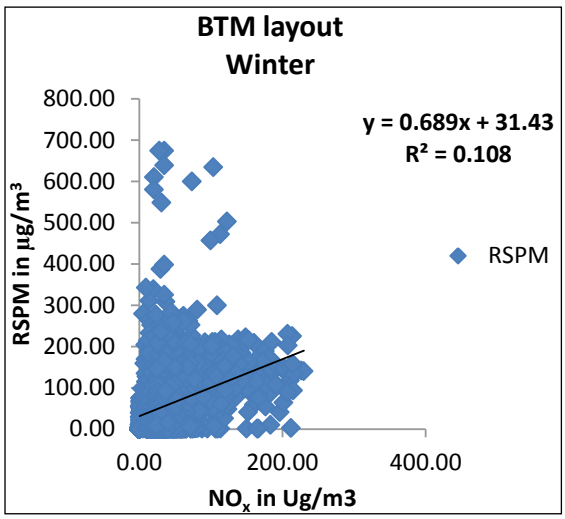
Test for two sample assuming unequal variances (ttest) between BWSSB and Peenya during 2011-2014

Test for equal means (t test) between BWSSB, Kaadubeesanahalli and PEENYA										
Parameters	**N BWSSB**	**N PEENYA**	**Mean BWSSB**	**Mean PEENYA**	**Variance BWSSB**	**Variance PEENYA**	**Difference between means**	**t stat**	**P two-tail (condition p<0.05 for significant difference in mean)**	**Inference**
NO_x	1175	1234	33.30	30.77	545.48	336.37	2.53	2.94	0.00322	NO_x concentrations in both the locations are not similar.
SO_2	1242	1268	5.73	11.30	186.11	104.56	5.57	-11.54	5.166E-30	SO_2 concentrations in both the locations are not similar.
CO	1248	1258	734.01	719.47	216236	1290795	14.54	0.41	0.67482	CO concentrations in both the locations are similar.
RSPM	1221	1134	57.65	75.53	2266.01	31784.93	17.88	-3.26	0.00110	RSPM concentrations in both the locations are not similar.

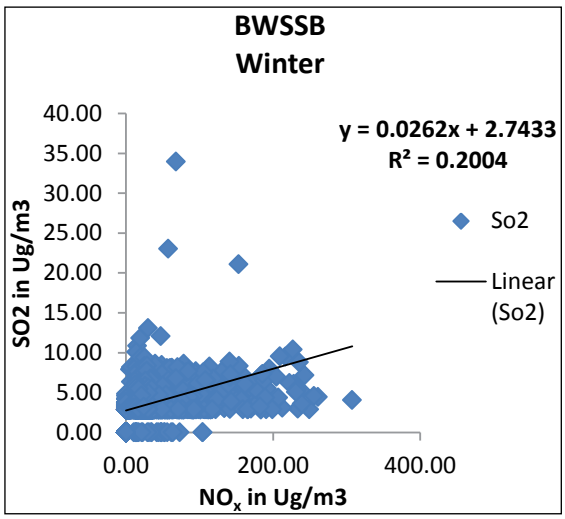
Correlation among pollutants

Location	Season	Parameters	Correlation coefficient (r)
BTM layout	Winter	NO_x-RSPM	0.33
BWSSB	Winter	SO_2-NO_X	0.45
BWSSB	Winter	O_3-SO_2	0.41
BWSSB	Winter	RSPM-NO_X	0.31
BWSSB	Winter	RSPM-SO_2	0.31

Regression Analysis Among Pollutants



Regression graph b/w NOX& RSPM

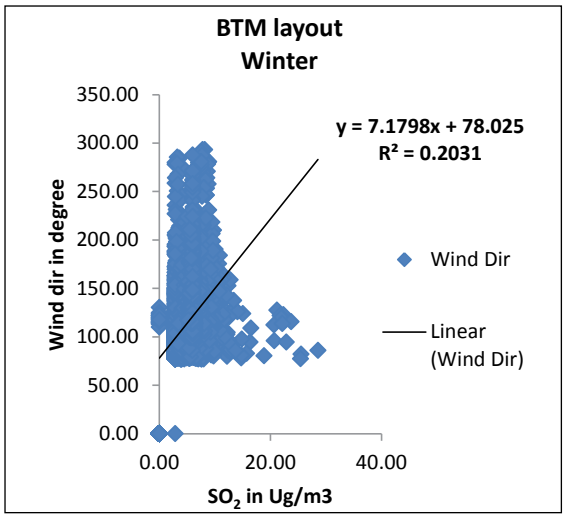


Regression graph b/w NOX& SO_2

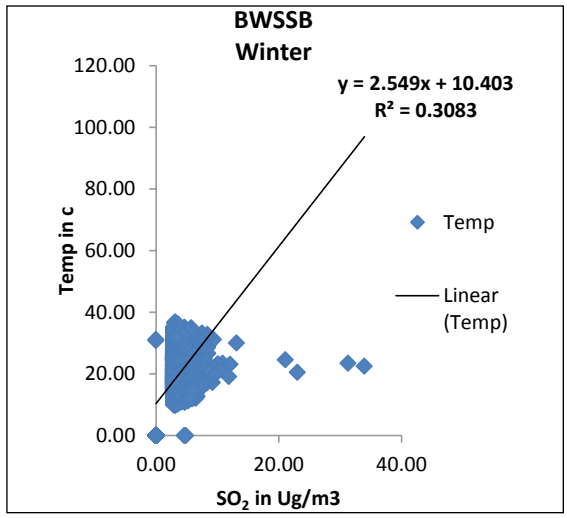
Correlation among pollutants and meteorological parameters

Location	Season	Parameters	Correlation coefficient (r)
BTM layout	Winter	T-SO_2	0.36
BTM layout	Winter	T-O_3	0.33
BTM layout	Winter	WD-SO_2	0.43
BTM layout	Summer	T-O_3	0.42
BTM layout	Summer	RH-O_3	-0.39
BTM layout	Summer	WD-O_3	-0.32
BTM layout	Rainy	RH-O_3	-0.31
BTM layout	Rainy	WS-O_3	0.32
BTM layout	Pre-winter	T-NO_x	0.37
BTM layout	Pre-winter	RH-O_3	-0.37
BTM layout	Pre-winter	WD-O_3	-0.33
BWSSB	Winter	T-SO_2	0.56
BWSSB	Winter	T-O_3	0.40
BWSSB	Winter	WS-O_3	0.59
BWSSB	Winter	WD-SO_2	0.45
BWSSB	Summer	T-O_3	0.56
BWSSB	Summer	RH-O_3	-0.41
BWSSB	Summer	WS-O_3	0.31
BWSSB	Rainy	T-O_3	0.48
BWSSB	Rainy	RH-O_3	-0.48
BWSSB	Rainy	WS-CO	0.32
Peenya	Summer	RH-CO	-0.32
Peenya	Pre-winter	RH-CO	-0.29

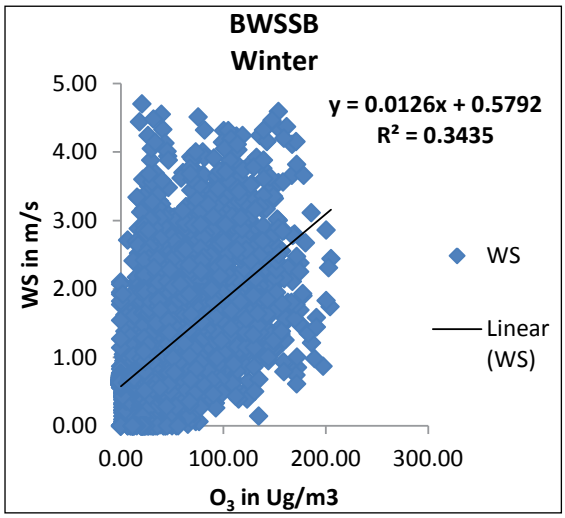
Regression Analysis Between Pollutants And Meteorological Parameters



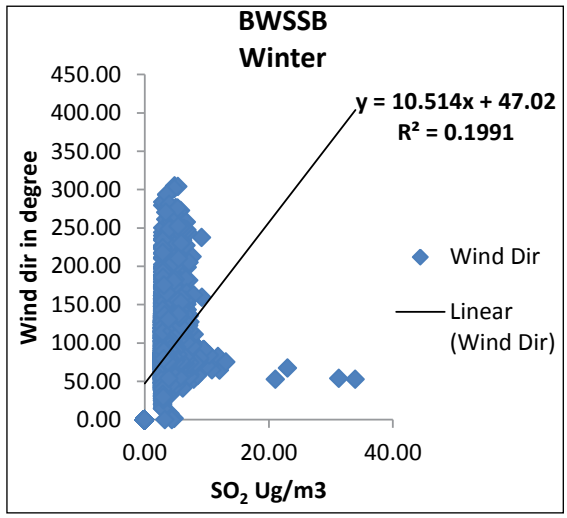
Regression graph b/w SO_2 & WD



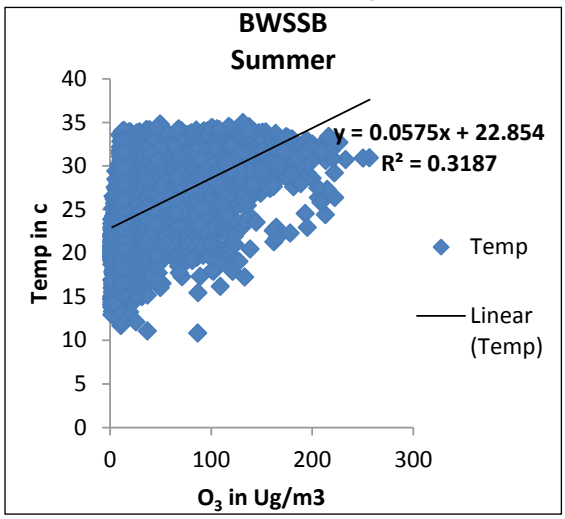
Regression graph b/w SO_2& TEMP



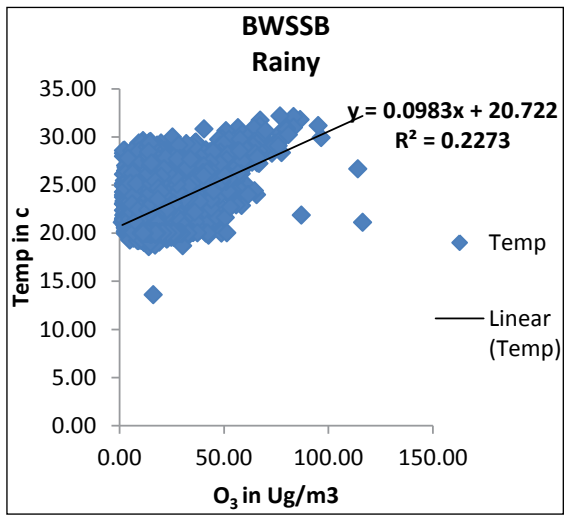
Regression graph b/w O_3& WS



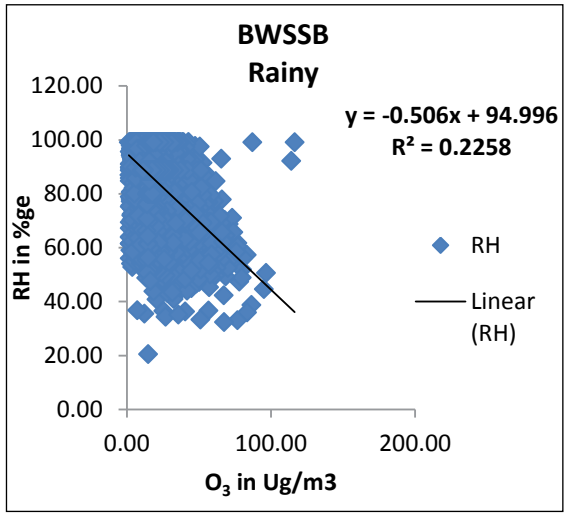
Regression graph b/w SO_2& WD



Regression graph b/w O_3& TEMP

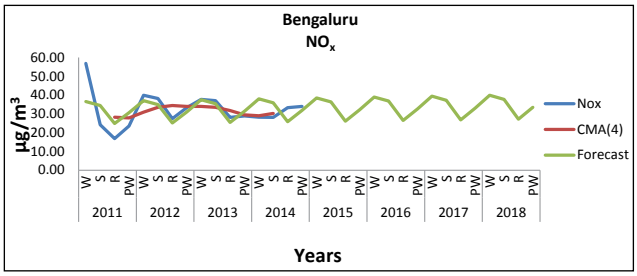


Regression graph b/w O_3& TEMP



Regression graph b/w O_3& RH

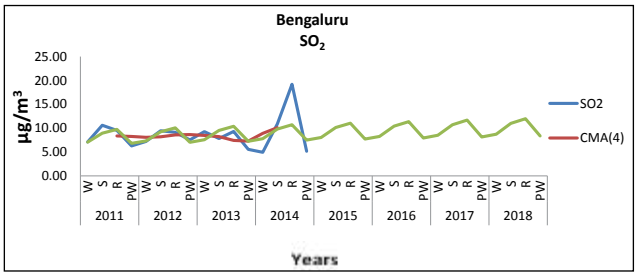
Seasonal Time series analysis of NO_x at Bengaluru



Seasonal wise prediction of NOX at Bengaluru

Year	BENGALURU			
	W	S	R	PW
2015	38.45	36.32	26.14	32.22
2016	38.94	36.78	26.47	32.63
2017	39.43	37.24	26.80	33.04
2018	39.92	37.70	27.13	33.44

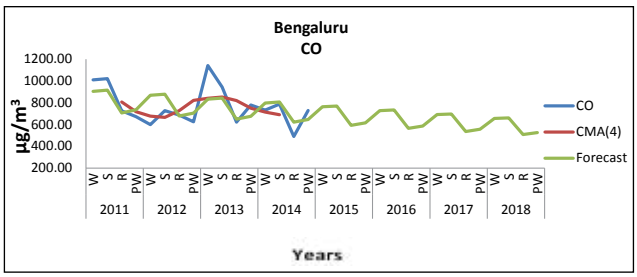
Seasonal Time series analysis of SO_2 at Bengaluru



Seasonal wise prediction of SO_2 at Bengaluru

Year	BENGALURU			
	W	S	R	PW
2015	8.04	10.13	11.04	7.72
2016	8.28	10.43	11.36	7.94
2017	8.51	10.72	11.68	8.16
2018	8.75	11.01	12.00	8.38

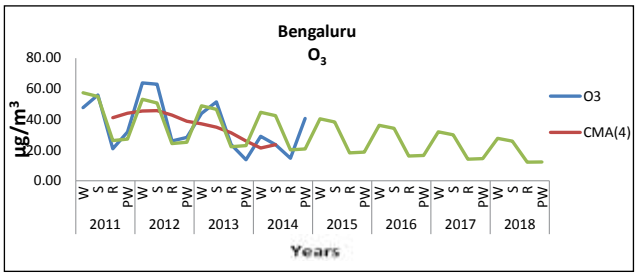
Seasonal Time series analysis of CO at Bengaluru



Seasonal wise prediction of CO at Bengaluru

Year	BENGALURU			
	W	S	R	PW
2015	762.65	770.29	593.25	616.08
2016	727.00	733.86	564.86	586.24
2017	691.36	697.44	536.47	556.40
2018	655.71	661.01	508.08	526.56

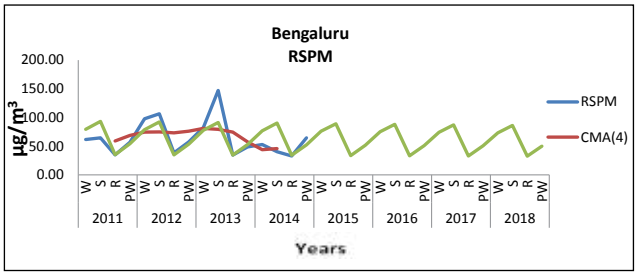
Seasonal Time series analysis of O_3 at Bengaluru



Seasonal wise prediction of O_3 at Bengaluru

Year	BENGALURU			
	W	S	R	PW
2015	40.42	38.34	18.20	18.71
2016	36.16	34.20	16.18	16.57
2017	31.91	30.05	14.16	14.43
2018	27.66	25.91	12.13	12.29

Seasonal Time series analysis of RSPM at Bengaluru



Seasonal wise prediction of O_3 at Bengaluru

Year	BENGALURU			
	W	S	R	PW
2015	75.89	89.04	33.59	51.65
2016	75.01	88.00	33.19	51.04
2017	74.13	86.96	32.80	50.43
2018	73.24	85.92	32.41	49.83

Seasonal wise validation of actual and predicted value of year 2015

Year		2015		
		Predicted	Actual	Difference in %
NO_x	W	38.45	31.57	0.18
SO_2	W	8.04	6.58	0.18
CO	W	762.65	523.39	0.31
O_3	W	40.42	27.35	0.32
RSPM	W	75.89	91.53	-0.21
NO_x	S	36.32	23.37	0.36
SO_2	S	10.13	4.58	0.55
CO	S	770.29	583.10	0.24
O_3	S	38.34	31.64	0.17

Development of methodology for assessment of CO_2 absorption through Green Belt emission from industrial process and its Carbon budgeting in selected industrial sector.

The cement industries are categorised as highly polluting industries due to its air pollution potential. The dust escaping from cement factories is often transported by wind and deposited in areas close and far away from the industry. These include agricultural lands, natural vegetation, towns and villages. Such depositions of particulate matter and other pollutants interfere with normal metabolic activities of plants, causing direct injury and impairment of growth and quality and may ultimately lead to decrease in plant yield. In the country as a whole, green belt development around the industrial/urban settlement will act as a cost effective solution for air pollution abatement. Green belt designing in an appropriate scientific manner not only reduces air pollution, but also sequester carbon dioxide, attenuates noise pollution and provides habitat for wild life and enhances aesthetic appearance. Most of the SPCBs have suggested industries to develop greenbelt in 30% of the total industrial area. CPCB has published list of plant species that can be grown in Industrial area. The green belts in industrial area are primarily developed for abatement of

particulate matter and attenuation of noise pollution. However, in the wake of climate change and global warming due to industrial greenhouse gases emissions, carbon sequestration in forests and agricultural land has gained importance. In this study an attempt has been made to assess the quantity of carbon sequestered in green belt of an industry in comparison to the quantity of carbon dioxide emitted from it. Also the pollution tolerant species suitable for growths in greenbelt around cement industry are identifies.

In the present study, the particulate matter and carbon dioxide emission loads from selected cement industries are estimated, impact of the air pollution on the plant species present in the industrial green belt are assessed, and air pollution dispersion model was developed using ISCST3 software for one industry. The pollution tolerant species are selected. The particulate matter and CO_2 emission loads were calculated based on the emission factors and production data. Gaussian dispersion model for PM, CO_2 and CO during summer and winter were developed to identify the major air pollution impact area and impact on receptors such as agricultural land and villages surrounding the industry. Based on the spatial dispersion of the pollutants and maximum ground level concentration, the suitable locations for developing green belt were identified in one industry. Total chlorophyll content (TCH), relative water content (RWC), leaf extract pH and ascorbic acid in the leaves of selected species were studied to assess the impact of air pollution on plants. Simultaneously, the carbon sequestration potential of the plant species present around the industry was estimated. Based on the carbon sequestration potential of the plants, most suitable species for carbon sequestration and air pollution attenuation in the industrial area were recommended.

The major environmental issues of the cement industry are emissions of greenhouse gases like CO_2 generated from decomposition of the carbonate raw material like calcination of limestone, burning of fossil or alternate fuel and use of grid or captive power. There is no limit for CO_2 emissions from cement plants in India. The cement industry contributes 5% of total global carbon dioxide emissions. The approximate contributions of each of the three main sources of CO_2 emissions are calcinations 50 to 55%; fuel combustion 35 to 45%; electricity up to 10%. CO_2 emissions from clinker production amounts therefore at about 0.5 kg/kg clinker. The total CO_2 emissions across the world varies between 0.36 to 1.09 kg per kg cement produced for dry and wet cement production process for various fuels and various clinker/cement ratios, while specific emission from India is 0.93 kg CO_2/kg of cement. The Indian cement industry are exploring various options such as utilisation of alternate fuel, modernisation of air pollution control equipment, the use of treated waste water for dust suppression and green belt development to reduce emission load.

Since plants can play an important role in reducing air pollution, the concept of green belt development in and around industrial areas has gained much attention in the recent past. It is applied as a pollution mitigation tool in industrial sites, urban development or for an historical site/sensitive area protection plan. Vegetation acts as living filters to minimize air pollution by absorption, adsorption, detoxification, accumulation and/or metabolization without sustaining serious foliar damage or decline in growth. Identification of suitable plant species for green belts is very important.

Green belt needs an appropriate scientific design for effective reduction in air pollution. Tree height, width of green belt, distance of green belt from the source, visibility etc are some design parameters of green belts to be considered for effective air pollution reduction. The species used in green belts should be pollutant tolerant. Levels of air pollution tolerance vary from species to species, depending on the capacity of plants to withstand the effect of pollutants without showing any external damage. The tolerance level of a plant species can be evaluated through an empirical number indicating the Air Pollution Tolerance Index (APTI) which is calculated based upon leaf extract pH, ascorbic acid, total chlorophyll, and relative water contents. A pH on the higher side and increased level of ascorbic acid improves tolerance against air pollution. APTI and some relevant biological and socioeconomic characters can be used to calculate anticipated performance index (API) which is then used to evaluate the suitability of a species for green belt. Since the appropriateness of a species to be used in green belt may be site specific; some of the characteristics of an ideal plant for green belt are fast growth rate for quick development of a canopy; strong branches for a durable canopy to withstand storms; large leaf size for enhanced retention of pollutants; dense foliage for

better trapping of pollutants; relatively good tolerance to insects and diseases, tolerance to soil compaction and nutrient stress, and long life span for extended longevity of the green belt itself.

The details of the industries selected for study are as follow:

Industry Code			
Sl No	**Industry code**	**Capacity (TPD)**	**Agro Climatic Zone**
1	Unit 1	1500	Central Dry Zone
2	Unit 2	1000	Central Dry Zone
3	Unit 3	10000	North Eastern Dry Zone
4	Unit 4	17500	North Eastern Dry Zone

The Botanical Garden at University of Agricultural Sciences, Bengaluru was selected as control site. The ambient air quality study and physiochemical properties of species were studied in the control site to compare the effect of particulate matter on plant species.

The survey and documentation of vegetation present in the green belt was carried out by divided the green belt around the cement industries into four zones. The details of the zoning are as follow:

1. Zone I- in and around the industry
2. Zone II- within 0.5 km radius of the industry
3. Zone III- 1 km away from the industry
4. Zone IV- 1.5 – 2 km away from the industry.

The plant species present in each zone were identified and the distance of their location from the industry was studies to understand the clustering pattern of the species.

The botanical garden at the Gandhi Krishi Vignan Kendra, University of Agricultural Sciences, Bengaluru was selected at control site. The pollutants such as PM_{10}, $PM_{2.5}$, SO_2 and NO_2 in ambient air were monitored for 24 hours. The monitoring results are as follow:

Ambient Air Quality in the control site (24 hr average)			
Parameter	**Unit**	**Concentration**	**Standard (24 hr average)**
PM_{10}	µg/m^3	85.7	100
$PM_{2.5}$	µg/m^3	37.5	60
SO_2	µg/m^3	BDL	80
NO_2	µg/m^3	20.65	80
* BDL: Below detectable limit. detectable limit for SO_2 is 4 µg/m^3			

The physiological properties of plant species in control site are studied and the results are as follow:

Physiological properties of plant species in control site					
Species	**RWC (%)**	**Ascorbic Acid (mg/g)**	**Total Chlorophyll Content (mg/g)**	**pH**	**APTI**
Ficus	95.48	0.20	1.69	6.97	9.55
Cassia	93.11	1.59	1.59	5.09	9.31
Dalbergia	92.73	0.52	0.67	4.99	9.27
Alstonia	92.58	0.20	0.86	6.25	9.26

Physiological properties of plant species in control site					
Species	RWC (%)	Ascorbic Acid (mg/g)	Total Chlorophyll Content (mg/g)	pH	APTI
Tamarind	92.36	1.55	0.96	4.69	9.24
Bougainvillae	91.89	1.20	0.49	6.01	9.19
Grevilia	91.02	0.49	0.99	5.69	9.10
Syzigium cumini	90.18	2.05	0.87	4.74	9.02
Sapota	90.02	3.21	0.58	6.10	9.00
Holoptelia	89.12	0.50	0.26	6.32	8.91
Chromalaena odorata	88.54	1.21	1.09	5.71	8.85
Cipadessa	88.14	1.54	0.70	4.50	8.81
Swietenia	87.63	2.58	0.90	6.78	8.76
Peltophorum pterocarpum	87.06	1.79	0.96	5.56	8.71
Samania	86.99	0.88	0.98	4.98	8.70
Annona	86.36	0.51	0.55	6.12	8.64
Mango	86.17	3.20	1.09	6.48	8.62
Azadirachta indica	85.76	1.76	0.95	5.40	8.58
Hippe	84.72	1.59	0.90	4.81	8.47
Lantana camara	82.33	0.36	0.80	6.71	8.23
Eucalyptus	81.87	2.73	0.83	4.37	8.19
Pongamia pinnata	81.61	0.61	0.99	5.87	8.16
Duranta	76.51	0.58	0.87	6.78	7.65
Nerium	72.31	0.82	0.88	6.11	7.23
Butea	69.54	0.47	0.92	7.02	6.95
Santalum album	66.42	0.91	1.00	5.58	6.64
Muntingia calbura	62.88	0.76	0.95	6.02	6.29
Tecoma	54.03	0.53	0.83	6.24	5.40

CO_2 sequestered by tree species at Control Site						
Tree species	Hight (Ft)	Diameter (Inch)	Carbon content (kg)	Total CO_2 Sequestered (kg)	Age (yrs)	Kg CO_2/Yr
Mahagony	50	26.1	2222.819	3696.62	50	73.93
Holoptelia	45	19.73	1143.674	1901.97	40	47.55
Grevilia	45	10.5	540.0022	898.04	20	44.9
Eucalyptus	40	8.912	345.5661	574.69	15	38.31
Pterocarpus	35	19.73	889.5243	1479.31	40	36.98
Ficus benghalensis	40	16.55	715.1104	1189.25	33	36.04
Syzigium	35	19.09	833.0612	1385.41	40	34.63
Pongamia	35	18.14	751.8378	1250.33	40	31.26
Teak	40	14.32	535.5394	890.62	30	29.69
Albizia	40	15.91	661.1597	1099.53	38	28.94

CO_2 sequestered by tree species at Control Site						
Tree species	Hight (Ft)	Diameter (Inch)	Carbon content (kg)	Total CO_2 Sequestered (kg)	Age (yrs)	Kg CO_2/Yr
Mango	22	8.276	163.8795	272.54	10	27.25
Alistonia	38	14.32	508.7624	846.09	32	26.44
Tamarind	28	13.36	326.56	543.08	22	24.69
Pongamia	35	16.87	650.0192	1081	50	21.62
Terminalia	25	13.36	291.5714	484.89	25	19.4
Neem	23	7.95	158.4028	263.43	15	17.56
Dalbergia	30	10.5	360.0015	598.69	50	11.97
Cassia	25	6.05	99.44944	165.39	18	9.19
Santalum	15	3.81	23.80175	39.58	10	3.96
Santalum	18	3.18	19.83479	32.99	10	3.3
Annona	18	4.13	33.5208	55.75	28	1.99

Based on the air quality modelling study, it is identified that the maximum ground level concentration is towards south west and south of the industry. The distance of maximum ground level concentration is at 1.2 kms from the unit. Hence, ideally green cover or plantation shall be extended till 1.2 kms from the industry to effectively attenuation of pollutants.

Based on the results of the particulate matter and CO_2 emission loads, model of the spatial dispersion of the pollutants and carbon sequestration potential of the plant species estimated in the study, the following conclusions and recommendations are made:

1. The study in four cement Industries suggested that the green belt present in the vicinity of the cement industries are not sufficient to harvest the carbon dioxide emitted by the Industry.
2. In addition to the green belt development, industries should explore and implement measures for carbon dioxide capture and storage at the source of emissions.
3. The number of tree species for complete assimilation of CO_2 may look unrealistic, but trees are the reliable sink for the carbon dioxide. The land available for the green belt in the industry may not be sufficient for growing large number of trees.
4. The land available, like community land, waste land, road side, railway track etc. within 8-10 km radius of the cement industry should be made use of for green belt development with consent of respective departments.
5. The industry may involve the farming community in development of Green belt in the form of Agro-forestry system.
6. Economically important plant species such as horticulture crops, Mango, Guava, Sapota, Jack fruit, Jamoon (Syzygium), Tamarind, Biofuel species like, Pongamia, neem, Mahua, Simarouba, Aphanamixis, fodder trees like Hebbevu (Melia dubia), Susbania,other species like Teak, Mahagony, which has high carbon fixing ability may be grown with the involvement of farming community.
7. Tree species such as Albezia, Neem, Pongamia, Mahua, Mahogany, Teminalia species, Jacaranda, Samanea, Industryingtonia, Lagastromia, Tabebuia species may be grown as roadside plantation.
8. The plantation in green belt with a minimum spacing of 5mx3m to 5mx 5m should be maintained to ensure proper nutrient availability and aeration for growth of trees.

9. The pits for planting should be 2ft X 2ft X 2ft, for poor and lateritic soil 1m depth should be maintained. For planting, red earth, sand and manure should be added in 1:1:1 ratio.
10. For plantation in mining areas, pits should be filled with good quality red earth soil.
11. Watering should be done for the first year of planting.
12. Silvicultural practices should be followed for plantations.
13. The burning of the leaf litter should be avoided, which adds CO_2 into the atmosphere.
14. Manure pits should be developed for reincorporation of litter and other biomass into the soil.
15. The industries may assess the spatial extent of the impact of particulate matter emissions using air quality modelling so that the mitigation measures may be implemented in the affected areas.

Common names of selected tree species found in the green belt.

Cipadessa baccifera	Narachalu gida/Bettada bevu	*Cipadessa baccifera*	Narachalu gida/Bettada bevu
Cocos nucifera	Coconut/Thenginamara	*Roystonea regia*	Raajataale/royal palm
Cordia obliqua	Challehannu/Chikkachalle	*Samanea saman*	Tuugumangi mara/malemara
Dalbergia sissoo	Pachaarimara/Karemuthala	*Santalum album*	Sandal/Shreegandha
Delonix regia	Kathikaye mara/Kempu turaaye	*Spathodea campanulata*	Uchekai mara/neerukai
Dendrocalamus strictus	Gandubidiru/Kiribidiru	*Streblus asper*	Mitlimara/thimili
Duranta repens	Huchu elasi/Husielasi	*Swietenia hahagoni*	mahagony
Erythrina indica	Haalivaana/nimbataru	*Syzygium cumini*	Jambunerale/nerale
Eucalyptus globulus	Neelagiri mara/nilgiri	*Tamarindus indica*	Hunase mara/tamarind
Euphorbia nerifolia	Elegalli/dundugalli	*Tecoma stans*	Koorane challare/Gante hoo
Ficus benghalensis	Aalada mara/banyan	*Tectona grandis*	Tegada mara/Saaguvaani mara
Ficus mysorensis	Goonimara/Adikegooli	*Terminalia arjuna*	Bilimathi/Thoremathi
Ficus racemosa	Athimara/Athihannu	*Terminalia catappa*	Kaadu badami
Ficus religiosa	Aralimara/Ashwatha	*Thevetia nerifolia*	Karaveera
Gliricidia sepium	Gobbarada gida	*Wrightia tinctoria*	Beppale mara
Grevillea robusta	silver oak	*Ziziphus mauritiana*	Yelachi/Elanji
Hibiscus mutabilis	Kempu suryakanthi	*Limonia acidissima*	Belada mara
Hibiscus rosa-sinensis	Kempu dasavaala/dasavaala	*Madhuca indica*	Hippemara/aluppe
Holoptelea intergrifolia	Tapsi mara/Neelavaahi	*Morinda tinctoria*	Alam/Haladipaavate
Jacaranda mimosifolia	Neeli paadari	*Moringa oleifera*	Nuggemara/Mochakamara
Kigelia pinnata	Aanetoradu kaayi	*Muntingia calabura*	Gasagase hanninamara
Lagerstroemia reginae	Challa/nandi	*Musa paradisiaca*	Banana/ baalegida
Lantana camera	Rojaan gida/chadaranga	*Nerium indicum*	Kanigile/Kasthuri patte
Leucaena leucocephala	Tankeshwara/Subaabul	*Pongamia pinnata*	Karanja/Honge mara
Parkia biglandulosa	Shivalingi mara	*Prosopis cineraria*	Perumbe/Bannimara
Peltophorum pterocarpum	Bettada hunase/ copper pod	*Prosopis julifera*	ballari jaali
Phoenix sylvestris	Eechalu mara/seendimara	*Pterocarpus santalinus*	Rakthachandana
Phyllanthus emblica	Bettada nellikaye/Aamla	*Pithecellobium dulce*	Siime hunase/Chakhalimara

Photographs of plant species

Acacia arabica

Acacia auriculiformis

Acacia chundra

Acacia leucophloea

Acacia nilotica

Acalypha indica

Achras sapota

Ailanthus excelsa

Albizia lebbeck

Albizia amara

Alstonia scholaris

Annona squamosa

Annona reticulata

Areca catechu

Azadirachta indica

Bambusa vulgaris

Bauhinia purpurea

Bauhinia racemosa

Bougainvillea spectabilis

Butea monosperma

Calliandra haematocephala

Carica papaya

Cassia javanica

Cassia siamea

Cipadessa baccifera

Cocos nucifera

Cordia obliqua

Ziziphus mauritiana

Dalbergia sissoo

Delonix regia

Dendrocalamus strictus

Duranta repens

Erythrina indica

Eucalyptus globulus

Ficus benghalensis

Ficus mysorensis

Ficus racemosa

Ficus religiosa

Gliricidia sepium

Grevillea robusta

Hibiscus mutabilis

Hibiscus rosa-sinensis

Holoptelea intergrifolia

Jacaranda mimosifolia

Kigelia pinnata

Lagerstroemia reginae

Lantana camera

Leucaenia leucocephala

Limoniaacidissima

Madhuca indica

Morinda tinctoria

Moringa oleifera

Muntingia calabura

Musa paradisiaca

Nerium indicum

Parkia biglandulosa

Peltophorum pterocarpum

Phoenix sylvestris

Phyllanthus emblica

Pithecellobium dulce

Pongamia pinnata

Prosopis cineraria

Prosopis juliflora

Pterocarpus santalinus

Roystonea regia

Samanea saman

Santalum album

Spathodea campanulata

Streblus asper

Swietenia mahagoni

Syzygium cumini

Tamarindus indica

Tecoma stans

Tectona grandis

Terminalia arjuna

Terminalia catappa

Thevetia nerifolia

Wrightia tinctoria

Ambient Air & Noise monitoring during Deepawali :

The Noise and air pollution are hazards to the ambient environment and a cause of concern due to busting of fire crackers during Deepawali. It is, therefore, necessary to conduct ambient noise and air quality monitoring during this festival to understand the level of pollution and correlate with the effectiveness of different abatement programs. Like every year, Central Pollution Control Board, State Pollution Control Boards and Pollution Control Committees carried out extensive ambient noise and air quality monitoring across the country during Deepawali festival on November 11, 2015.

This Report is a compilation of ambient noise (248 locations) and ambient air quality (103) locations) data covering 22 states/UTs in the country and incorporates comparison with data of previous year. In general, as compared to last year there was decrease in Noise level at 44 locations in 2015, while increased Noise level was observed at most of other locations. Also, as compared to last year, NO_2, SO_2 and PM_{10} levels were

lesser in concentration at 27, 28, and 27 locations, respectively SPCBs / PCCs there was increase in the levels of pollution in the country during Deepawali days in 2015. The salient observations are as under:

Noise Monitoring:

With respect to noise levels on the festival day, there was decrease in noise levels at 44 locations as compared to 2014. The details of these locations are described at table: 1.

Table - 1: Decrease in Noise level in 2015 at different locations.

State-wise number of Monitoring Locations				
Name of the State	City	Locations	Deepawali Day	
			2014	2015
Andaman & Nicobar	Port Blair	Aberdeen Bazaar (C)	82	66
		G.B. Pant Hospital (S)	77	50
		Haddo (C)	82	67
		Shadipur (C)	72	59
Chhatisgarh	Bilaspur	At Office building Vyapar Vihar (C)	72	58
		Traffic Police Thana, (R)	82	78
	Korba	Darri Jamnipali (R)	82	79
		Near Tehsil Office (R)	77	74
	Ambikapur	Raghunath District Hospital (S)	80	55
	Jagdal Pur	Sanjay Market Chowk (C)	96	89
	Raigarh	Housing Board Colony (R)	91	68
		RO CECB (R)	84	83
Delhi	New Delhi	Mayur Vihar Ph-II (R)	83	79
DD	DD & DNH	Silvassa Kilvani Chokdi Gram (S)	76	74
Gujarat	Vadodara	M S University (R)	74	64
Himachal Pardesh	Kullu	Himuda complex beasa moar (C)	66	59
	Una	Rotary Chowk(R)	64	63
	Shimla	Rigde (C)	67	60
	Parwanoo	Sector IV (R)	69	66
Meghalaya	Shillong	Lower Motinagar	71	49
Puducheery	Poducherry	Muthiapet (R)	82	78
Tamil Nadu	Chennai	Triplicane (R)	86	84
		Nungambakkam (R)	87	82
		Sowcarpt (M)	84	79
	Salem	Sri Saradha Balamandhir (R)	81	68
	Trippur	Rayapuram- (R)	79	71
	Coimbatore	Ponniyarajapuram (R)	82	80
	Madurai	K. Pudur (S)	82	77
		Madurai Corporation South (M)	87	73
	Tirunelveli	Samathanapuram (C)	88	83
		Pettai Nearer to nursing home (S)	90	85

State-wise number of Monitoring Locations				
Name of the State	City	Locations	Deepawali Day	
			2014	2015
Tripura	Dharmangar	Railway Stataion (C)	72	69
		Dharmanagar circuit house (R)	60	52
	Ambassa	Kulai District Hospital (C)	54	51
	Udaipur	Bhawaliya Basti (R)	59	55
		Dalubari Gate (S)	75	63
		Ambassa Bazar (S)	73	72
		Brahmabari (C)	76	68
		Bridge Chowmuhani (R)	71	65
		West Bank of Amar Sagar (R)	64	62
		Hospital Area (S)	59	58
Uttar Pardesh	Jhansi	Shivaji Nagar(R)	79	64
	Lucknow	Mayur Vihar, Indira Nagar(R	79	78
	Gorakh Pur	Avas vikas Colony (R)	89	85

Ambient Air:

The most signification observation in 2015 was that there was decrease in Ambient Air Quality concentration levels as compared to last year Deepawali day with respect to SO_2 NO_2, PM_{10}, and at 28, 27 and 27 locations, respectively. Table: 2

Table - 2: Decrease in, SO_2, NO_2 PM_{10} concentration in 2015 at different locations.

State	Cities showing decrease in parameters concentration		
	Parameters		
	SO_2	NO_2	PM_{10}
Andaman & Nicobar	Port Blair	Port Blair	
Arunachal Pradesh			Itanagar
Chhattisgarh State	Raipur	Raipur	Durg Bhilai
	Korba	Bilaspur	Raipur
		Jagdalpur	Bilaspur
			Korba
Delhi	Janakpuri	Pragati Maidan	Pitampura
		Pitampura	Janakpuri
		Janakpuri	
DD & DNH	Silvassa Kilvani Chokdi Gram		Silvassa Kilvani Chokdi Gram
Gujarat		Vadodara	

Himachal Pradesh	Dharmshala	Dharmshala	Dharmshala
	Manali	Manali	Manali
	Sunder Nagar	Sunder Nagar	Sunder Nagar
	Shimla	Shimla	Shimla
	Parwanoo	Parwanoo	Parwanoo
	Kala Amb	Kala Amb	Kala Amb
	Paonta Sahib	Paonta Sahib	Paonta Sahib
Madhya Pradesh	Nagda	Nagda	Nagda
	Ujjain	Ujjain	Ujjain
Poducherry	Anna Nagar	Anna Nagar	Anna Nagar
	Kovilpattu, karaikal	Kovilpattu, karaikal	
Tamil Nadu	Chennai	Vellore	Chennai
	Vellore	Cuddalore	Vellore
	Cuddalore	Trippur	Salem
	Salem	Trichy	Trippur
	Trippur	Dindigul	Trichy
	Trichy	Madurai	
	Dindigul		
Uttar Pradesh	Agra	Agra	Agra
	Luckow	Luckow	Luckow
West Bengal	Kasba		Shyambazar
	Salt Lake		Kasba
	Tollygunge		
Total	**28**	**27**	**27**

Monitoring of Air Quality & Noise Levels during Deepawali at Lucknow

Ambient Air Quality

To see the effect of various activities i.e. bursting of crackers etc., the monitoring of ambient air quality was carried out during Deepawali Festival (Pre-Deepawali and Deepawali day). PM_{10}, SO_2, NO_2 were monitored for 24 hours at two representative locations viz. MayurVihar, Indira Nagar & Vikas Khand on November 05, 2015 (Pre- Deepawali) and November 11, 2015 (Deepawali day).

The detailed analysis report is given below. The following observations were made while comparing Pre-Deepawali day data with Deepawali day;

Significant increase was observed in the average concentrations of PM_{10} at Vikas Khand Gomti Nagar (221 to 326 µg/m^3) however, average concentration at MayurVihar, Indira Nagar was almost unchanged on Deepawali day (290 to 305 µg/m^3).

Increase in average concentrations of SO_2 (from BDL to 7.6 µg/m^3 in Vikas Khand Gomti Nagar and BDL to 5.3 µg/m^3 in MayurVihar, Indira Nagar) was observed during Deepawali day (MDL for SO_2 =4 µg/m^3).

Significant increase in average concentrations of NO_2 (from 36.0 to 49.0 µg/m^3 in Vikas Khand Gomti Nagar and 21.0 to 31.0 µg/m^3 in MayurVihar, Indira Nagar) was also observed during Deepawali day.

Table: Ambient Air Quality during Deepawali Festival, 2015

Monitoring Locations	Parameters Monitored					
	Normal Day (November 05-06, 2015)			Deepawali Day (November 11-12, 2015)		
	SO_2	NO_2	PM_{10}	SO_2	NO_2	PM_{10}
MayurVihar, Indira Nagar	BDL	21	290	5.30	31	305
Vikas Khand, Gomtinagar	BDL	36	221	7.6	49	326
NAAQ Standard	80	80	100	80	80	100
All values (24 hourly average) are in µg/m³						
For average calculation of SO_2 BDL has been taken as conc. 2.0 µg/m³ (50% of MDL value i.e. 04 µg/m³						

Noise Level:

dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing. The noise levels (dBA) at MayurVihar, Indira Nagar and Gomti Nagar (Minimum, maximum and Leq) are shown in following Tables ahead. Brief observations on noise level monitoring are as below;

- The Leq noise levels were found increased on Deepawali day when compared with Pre-Deepawali day at MayurVihar, Indira Nagar and Gomti Nagar.
- Significant increase was observed on the day of festival in terms of Lmax (dBA) in Gomti Nagar whereas, MayurVihar, Indira Nagar was found unchanged in terms of Lmax.

Table : Noise Level during Deepawali festival, 2015 at MayurVihar, Indira Nagar

Mayur Vihar, Indira Nagar, Lucknow	Normal Day (November 05-06, 2015)			Deepawali Day (November 11-12, 2015)		
Time Duration (Hours)	Lmin	Lmax	Leq dB (A)	Lmin	Lmax	Leq dB (A)
18:00 to 19:00	44.9	101.9	65.6	49.4	99.3	67.8
19:00 to 20:00	45.3	85.4	56.6	50.5	98.9	71.6
20:00 to 21:00	44.9	90.0	58.7	53.7	106.9	82.5
21:00 to 22:00	45.1	87.5	57.7	55.7	110.5	81.8
22:00 to 23:00	41.8	84.7	53.8	52.2	100.6	74.2
23:00 to 00:00	37.6	83.3	49.6	42.7	99.2	64.4

Table : Noise Level during Deepawali festival, 2015 at Gomti Nagar

Vikas Khand, Gomti Nagar, Lucknow	Normal Day (November 05-06, 2015)			Deepawali Day (November 11-12, 2015)		
Time Duration (Hours)	Lmin	Lmax	Leq dB (A)	Lmin	Lmax	Leq dB (A)
18:00 to 19:00	51.5	84.4	53.0	50.3	108.2	72.0
19:00 to 20:00	48.8	96.1	63.0	54.0	106.9	63.3
20:00 to 21:00	49.0	97.7	57.4	55.7	114.5	66.2
21:00 to 22:00	49.0	84.8	51.5	55.9	111.9	75.2
22:00 to 23:00	47.0	81.0	53.6	50.6	112.6	55.4
23:00 to 00:00	38.6	83.1	46.4	52.1	95.2	54.8

Monitoring of Noise Levels & Air Quality during Deepawali at Agra:

Central Pollution Control Board, Agra has carried out Monitoring of Ambient Air Quality on Pre Deepawali (05th Nov.-15), and Deepawali day (Nov. 11, 2015) at 02 monitoring stations of CPCB namely Etmad-ud-daulah & Tajmahal and noise monitoring at Arjun Nagar (residential) & Kamla Nagar (residential) area. PM_{10} exceeding the 24hourly standard while SO_2 & NO_2 are within the 24 hourly standards of sensitive zone.

Table-11- Ambient Air Monitoring during Deepawali festival, 2015

Monitoring Locations	Normal Day (05.11.2015)			Diwali Day (11.11.2015)		
	PM_{10}	SO_2	NO_2	PM_{10}	SO_2	NO_2
Tajmahal	150	BDL	12	295	BDL	23
Itmad-ud-daulah	299	BDL	41	346	04	29
NAAQ Std. (24hr)	100	80	80	100	80	80
Note: all values (24hourly avg) are in µg/m³, BDL: Below detection limit						

Noise Monitoring:

The noise monitoring was carried out at Arjun Nagar (residential type) & Kamla Nagar (residential) area during Pre Deepawali (5th Nov., 2015, 6.00PM to 12.00AM) & Deepawali day (11th Nov., 2015, 06.00PM to 12.00AM). The observed noise values exceed the standard values for residential area.

Location : Arjun Nagar (R)	Normal Day (05.11.2015)			Deepawali Day (11.11.2015)		
Time duration	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
18:00 to 19:00 hrs	85.2	98.7	61.5	119.5	130.2	76.8
19:00 to 20:00 hrs	90.9	100.9	66.5	118.8	137.4	80.7
20:00 to 21:00 hrs	86.0	94.7	65.0	119.1	138.4	83.4
21:00 to 22:00 hrs	102.3	115.4	62.5	124.2	135.6	89.3
22:00 to 23:00 hrs	92.7	97.1	66.7	125.8	137.8	91.2
23:00 to 24:00 hrs	86.0	103.1	54.9	120.7	130.3	87.2

Location : Kamla Nagar (R)	Normal Day (05.11.2015)			Deepawali Day (11.11.2015)		
Time duration	Lmin	Lmax	Leq dB(A)	Lmin	Lmax	Leq dB(A)
18:00 to 19:00 hrs	53.4	91.3	61.5	53.4	114.6	77.5
19:00 to 20:00 hrs	53.4	83.0	58.9	53.4	108.1	72.5
20:00 to 21:00 hrs	53.4	117.5	77.5	54.1	103.5	70.3
21:00 to 22:00 hrs	53.4	87.3	77.5	59.6	117.5	80.8
22:00 to 23:00 hrs	53.4	96.9	60.9	63.0	127.2	101.1
23:00 to 24:00 hrs	53.4	75.9	57.5	56.3	126.6	90.8

Monitoring during Deepavali at Bengaluru

Central Pollution Control Board (CPCB), Zonal Office, Bengaluru carried out ambient air quality monitoring at three locations in Bengaluru during November 5-6, 2015 (normal day) and during November 11-12, 2015 (Deepavali day) from 6 A.M to 6 A.M on 24 hourly basis. Noise monitoring was also carried at same locations on November 5 & 11, 2015 between 17.00 hrs. to 24.00 hrs. The locations of air quality and noise level measured by both manual and online continuous stations are listed in table below:

The pollutants measured are Respirable Suspended Particulate Matter (PM_{10}), $PM_{2.5}$ and the gaseous

pollutants are Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_x) in the manual monitoring. In Noise Measurement, the parameters are Leq dB (A), percentiles of L10, L50, L90, Lmin, Lmax etc. In the continuous ambient air quality monitoring about 7-9 pollutants and 6 meteorological parameters are measured on 24 hours' basis.

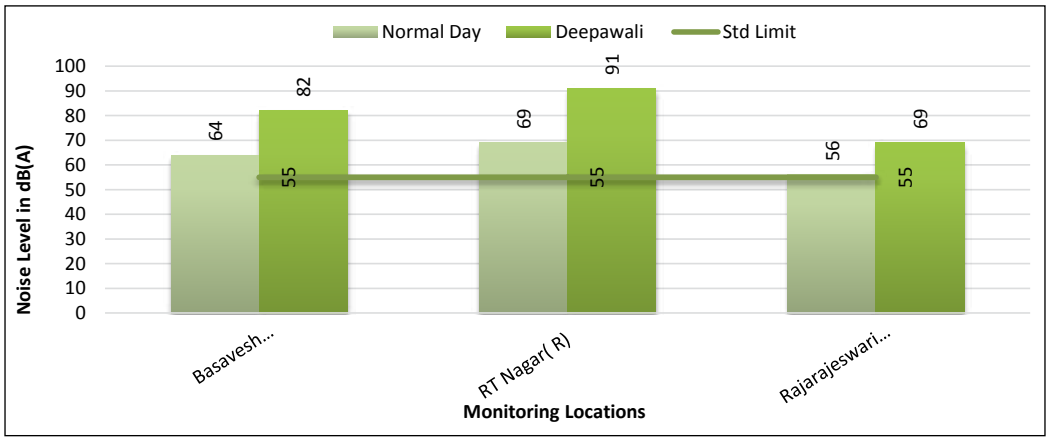
Ambient Air and Noise Monitoring Locations

Sl. No	Locations	Zone	Longitude (East)	Latitude (North)
Name of Locations of Ambient Noise level Measured by Manual method				
1	RT Nagar	Residential	77°35.727"	13°01.721"
2	Basaveshwar Nagar	Residential	77°32.674"	12°59.062"
3	Rajarajeswari Nagar	Residential	77°31.346"	12°31.231"
Name of Locations of Noise level Measured by Online continuous method				
1	Peenya	Industrial	77°30´11.45	13°1´4.28"
2	MG Road	Commercial	77°34´15.44	12°58´38.54
3	Shivanahalli	Residential	77°35´40.15	12°59´0.54"
4	Kadabeshnahalli	Residential	77°34´34.58	12°54´45.45
5	BTM Layout	Residential	77°35´10.96	12°54´30.36
6	Yeswanthpur	Residential	77°33´28.13"	13°1´5.04"
7	White Field	Industrial	77°45´5.18	12°56´15.27
8	Domlur	Residential	77°38´17.78	12°57´48.86
9	RVCE College	Commercial	77°29´58.5"	12°55´23.15
10	NIMHANS	Silence	77°35´32.95	12°56´15.27
Name of Locations of Ambient Air Quality Measured by Manual method				
1	RT Nagar	Residential	77°35.727"	13°01.721"
2	Basaveshwar Nagar	Residential	77°32.674"	12°59.062"
3	Rajarajeswari Nagar	Residential	77°31.346"	12°31.231"
Name of Locations of Ambient Air Quality Measured by Online continuous method				
1	Peenya	Industrial	77°30´11.45"	13°1´4.28"
2	BTM Layout	Residential	77°35´10.96"	12°54´30.36"
3	Kadabeshnahalli, (BWSSB)	Residential	77°34´34.58"	12°54´45.45"

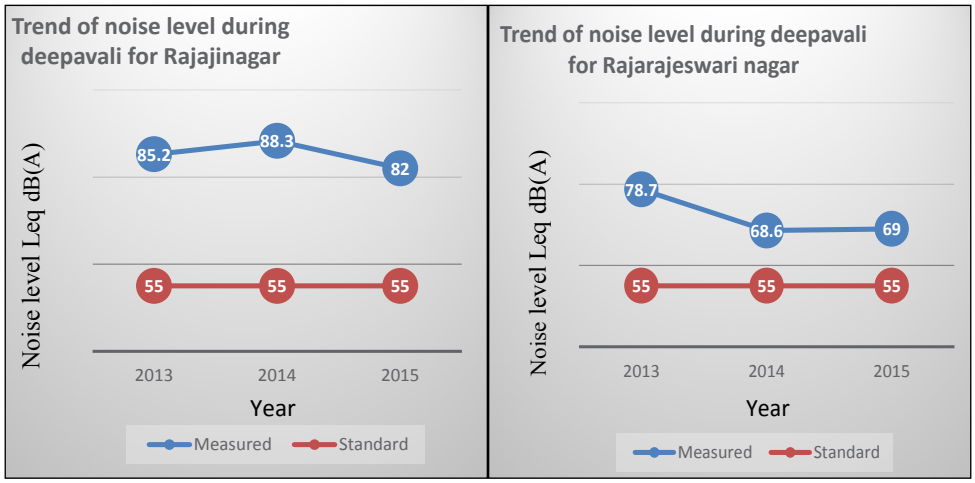
Status of Ambient Noise Level measured manually

Noise Levels	Basaveshwar Nagar		Rajarajeswari Nagar		RT Nagar	
	Normal Day	Deepavali Day	Normal Day	Deepavali Day	Normal Day	Deepavali Day
Leq(A)	64	82	56	69	69	91
Min	40	35	39	42	41	48
L90	55	57	46	53	60	63
L50	62	78	49	55	65	72
L10	65	62	55	64	72	86
Max	92	114	98	102	95	119

Ambient Noise level at various monitoring locations



Trend of ambient Noise level during Deepavali



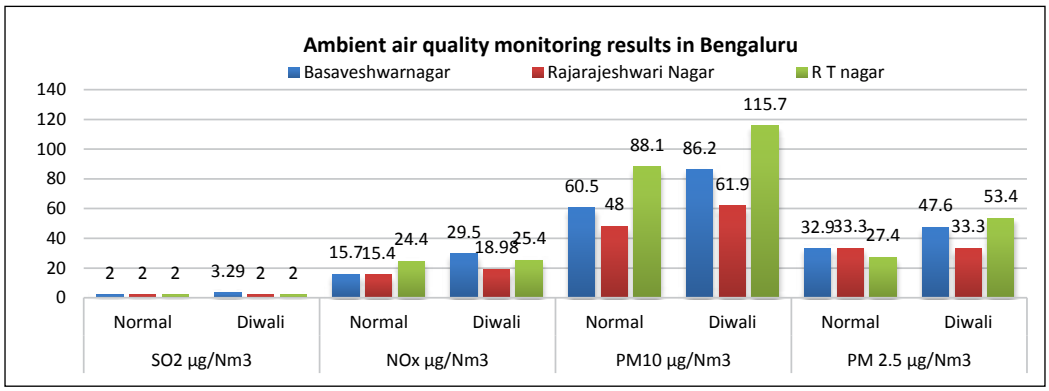
Trend of Real Time ambient Noise on Deepavali day

S.N	City	Stations	Ambient Noise level in Leq dB (A-24 hrs)					Trend
			2011	2012	2013	2014	2015	
1	Bangalore	Nisarga Bhawan	60	51	59	65.4	67	↑
2		Parisara bhawan	64	62	61	64.7	66	↑
3		BTM layout	65	63	62	68.7	68	↓
4		Marathahalli	57	55	61	65.6	62	↓
5		Peenya	59	57	56	63.5	63	↓
6		Yeswantpur	-	-	-	73.3	73	↓
7		Whitefield				75.4	66	↓
8		Domlur				74.7	70	↓
9		RVCE				61.5	62	↓
10		NIMHANS				71.6	66	↓

Online Ambient Noise Levels at Various locations

Ambient Air Quality Monitoring Results

Parameter→ Location↓	SO2µg/Nm^3		NOxµg/Nm^3		PM10µg/Nm^3		PM 2.5 µg/Nm^3	
	Normal	Deepavali	Normal	Deepavali	Normal	Deepavali	Normal	Deepavali
Basaveshwarnagar	2	3.29	15.7	29.5	60.5	86.2	32.9	47.6
Rajarajeswari Nagar	2	2	15.4	18.98	48	61.9	33.3	33.3
R T nagar	2	2	24.4	25.4	88.1	115.7	27.4	53.4
Concentration range	BDL	BDL-9.75	BDL-52.5	9.98-38.8	42.5-98.3	34.8- 227	27.4-33.3	33.3-53.4
Standard limit	**80**		**80**		**100**		**60**	
All values are expressed in 24 hourly basis (µg/m^3), BDL: PM_{10}- 5 µg/m^3 ,SO_2: 4 µg/m^3, NO_x: 9 µg/m^3								



There was continuous rainfall in Bengaluru around Deepavali due to which there was a significant drop in bursting of crackers, hence noise level remarkably reduced in most of the areas. But by the evening of 11-11-2015, the rain reduced and bursting of fireworks was more as compared to other days. Due to rains and less vehicular traffic flow during Deepavali, the ambient air quality in respect of SO_2, NO_x and RSPM is similar to normal day in spite of busting of fireworks.The ambient noise levels on Deepavali and as well as on normal day is not complying with the national ambient noise standards.

Due to consistent persuasion and continuous public awareness created by CPCB and KSPCB to observe "Right to Sleep", the bursting of crackers was considerably reduced after 10:00 PM.The trend of noise level during Deepavali is decreasing in most of the areas. The percentage of Noise level exceedance during deepavali period is ranging from 18% to 60% and on normal day it is ranging from 1% to 7%.

SO_2, NO_x and $PM_{2.5}$ values are within the National Ambient air quality standards at three locations where manual monitoring was conducted. On Deepavali day, PM_{10} in RT nagar was 116 µg/m^3 against the standard limit against 100 µg/m^3.

MONITORING OF AMBIENT NOISE LEVELS AMBIENT AIR QUALITY DURING DEEPAWALI FESTIVAL VADODARA

The bursting of crackers during Deepawali festival contributes noise as well as ambient air pollution. In order to assess the pollution load with respect to ambient air and noise, the West Zone Office has carried out monitoring for ambient air quality and Noise pollution survey at three prominent locations in Vadodara namely Harinagar representing Residential category, MS University representing Silent zone and Fatehgunj representing Commercial zone during Pre-Deepawali and Deepawali festival.

The findings of noise level monitoring are as under:

- **At Fatehgunj Circle (Commercial)**, the observed Leq values ranged from 72.7 dB(A) to 79.5 dB(A), Lmax values ranged from 89.0 dB(A) to 100.9 dB(A) and Lmin values ranged from 65.3 dB(A) to 69.6 dB(A) during Pre-Deepawali day monitoring period. The Leq values ranged from 75.9 dB(A) to 79.7 dB(A),Lmaxvalues ranged from 94.1 dB(A) to 109.1 dB(A) and Lmin values ranged from 64.7 dB(A) to 67.2 dB(A) during Deepawali day monitoring period. The hourly increment in Leq during the Deepawali in comparison to Pre-Deepawali day ranged from -3.3 to 7.0 dB(A) during the monitoring period.
- **At M.S. University Campus (Sensitive)**, the observed Leq values ranged from 55.0 dB(A) to 59.80 dB(A), Lmax values ranged from 69.65 dB(A) to 82.6 dB(A) and Lmin values ranged from 48.6 dB(A) to 52.5 dB(A) on Pre-Deepawali day monitoring period. The Leqvalues ranged from55.6 dB (A) to 67.6 dB(A), Lmax 72.9 dB(A) to 96.4 dB(A) and Lmin values ranged from 50.1 dB(A) to 56.5 dB(A) respectively on Deepawali day monitoring period. The hourly increment in Leq on the Deepawali day in comparison to pre- Deepawali day ranged from 0.6 to 12.4 dB(A) during the monitoring period.
- **At Harinagar (Residential)**, the observed Leq values ranged from 59.4 dB(A) to 78.7 dB(A), Lmaxvalues ranged from 78.5 dB(A) to 115.4 dB(A) Lmin values ranged from 51.9 dB(A) to 67.3 dB(A) on Pre-Deepawali day monitoring period. The Leqvalues ranged from8.1 dB(A) to 86.3 dB(A), Lmax values ranged from 88.0 dB(A) to 119.0 dB(A) and Lmin values ranged from and 49.9 dB(A) to 58.3 dB(A) on Deepawali day monitoring period. The hourly variation in Leq during the Pre- Deepawali in comparison to Deepawali day ranged from 4.0 to 13.2 dB(A) during the monitoring period.

  The measured noise values are mostly exceeding the ambient noise levels because of bursting of crackers and vehicular movement.

  The findings of ambient air quality monitoring are as under:

- **At Fatehgunj Circle (Commercial)**, the 24 hourly SO_2 concentration remains BDL during Pre-Deepawali and Deepawali period. The 24 hourly average NO2concentration during pre-deepawali day was 50.1 µg/m^3 whereas during the Deepawali day, the 24 hourly average concentration was 38.03 µg/m^3. The measured values of SO_2 and NO_x are observed to be within the National Ambient Air Quality Standard of 80ug/m^3 for 24hrs average.

  The 24 hourly concentration of PM_{10} during pre-deepawali day was 285.66 µg/m^3 whereas during the Deepawali day, 24 hourly concentration was 268.17 µg/m^3. The measured values of PM_{10} exceeded the National Air Quality Standard of 100ug/m^3 for 24hrs average.

- **At M.S. University Campus (Sensitive)**, the 24 hourly SO_2 concentration remains BDL during Pre-Deepawali and Deepawali period. The 24 hourly average NO2concentration during pre-deepawali day was 43.37 µg/m^3 whereas during the Deepawali day, the 24 hourly average NO_2 concentration was 24.4 µg/m^3. The measured values of SO_2 and NO_x were observed to be within the National Ambient Air Quality Standard of 80ug/m^3 for 24hrs average.

  The 24 hourly concentration of PM_{10} during pre-deepawali day was 149.0 µg/m^3 whereas during the Deepawali day, 24 hourly concentrations was 239.21 µg/m^3. The measured values of PM_{10} exceeded the National Air Quality Standard of 100ug/m^3 for 24hrs average.

- At Harinagar (Residential), the 24 hourly SO2concentration remains BDL during Pre-Deepawali day whereas the 24 hourly concentration during Deepawali day was 20.65 µg/m^3. The 24 hourly average NO2concentration during pre-deepawali day was 53.17 µg/m^3 whereas during the Deepawali day, the 24 hourly average NO_2 concentration was 31.52 µg/m^3. The measured values of SO_2 and NO_x were observed to be within the National Ambient Air Quality Standard of 80ug/m^3 for 24hrs average.

  The 24 hourly concentration of PM_{10} during pre-deepawali day was 295.85 µg/m^3 whereas during the Deepawali day, 24 hourly concentrations was 340.38 µg/m^3. The measured values of PM_{10} exceeded the National Air Quality Standard of 100ug/m^3 for 24hrs average.

Monitoring during Deepawali at Bhopal

The Zonal Office (Central), Central Pollution Control Board, Bhopal has Conducted Ambient Air & Noise level monitoring in Bhopal city during celebration of Diwali festival in the year 2015 (Pre Diwali on 05.11.15 & on Diwali 11.11.15) to assess the impact of bursting of crackers on environment. Intensive Ambient Air Quality and ambient Noise level monitoring was conducted at selected three locations in the city. The weather condition during entire monitoring was found clear. Heavy bursting of crackers on the day of Diwali was observed all over the Bhopal city. The major observations derived from monitoring results are as below-

- In commercial area SO_2 concentration found to be from BDL to 19µg/m^3 and NO_2 – 41 to 47µg/m^3 from pre Diwali to the day of Diwali.
- Respirable Suspended Particulate Matter was gone up to 419µg/m^3 at Nehru Nagar during Diwali. In normal days the concentration of PM_{10} goes up to 116µg/m^3 i.e. more than the prescribed limit of 100µg/m^3.
- At all the three monitoring locations (TT Nagar, Nehru Nagar & Shahjahanabad) Noise level on Diwali found to be exceeded around 1.5 times than the prescribed noise standards.

Study on presence of Pesticides in Drinking water sources

To overcome problem of pest in agricultural fields, farmers are using huge quantity of pesticides. These pesticides solve their problem up to certain extent but runoff water of irrigation deteriorates surface as well as ground water quality. Pesticides are such hazardous substances which could not be treated in conventional water treatment plants. Thus assess detection of pesticides in drinking water sources and the outlets of water treatment plants are very important. To assess pesticides concentration three drinking water sources of Bhopal had been selected for study of Organo-chlorine pesticides (OCP) & Organo-phosphorus pesticides (OPP).

Intake point on River Narmada

During recent years water of River Narmada is being supplied in few areas of Bhopal city and maximum area of the city water is being supplied from Upper Lake and Kolar reservoir after conventional treatment followed by disinfection. Under

this project Water samples were collected thrice in a year from main water bodies and their subsequent treatment plant outlets. Sampling has been done from water supply intake points of River Narmada, Upper Lake-Bhopal and Kolar Reservoir and analysed for following pesticides with the help of Gas Chromatography:-

- Organo-Chlorine Pesticides (OCP) :- (α-BHC, β-BHC, γ-BHC or Lindane, δ-BHC, Aldrine, α Endosulphan, β EndoSulphan, Dieldrin, pp-DDE, pp-DDT, op-DDT).
- Organo-Phosphorus Pesticide (OPP) :- (Mono Chrotophos, Dimethoate, M-parathion, Malathion, Chloropyriphos, Ethion).
- The presence of above pesticides in all water samples is found to be Below Detection Limit (BDL) (detection limit for OCP-0.03ppb & OPP-0.02ppb).

6.10 Ground Water Quality Monitoring Around The Distillery

In compliance of Hon'ble National Green Tribunal, Central Bench, Bhopal order dated 07 January 2016 in the matter of case No. - 25/2014 "Shri Babulal Banjara Vs M.P. Govt. and 9 other" ground water monitoring from open wells/ tube wells located in and around the premises of 07 distilleries of Madhya Pradesh has been conducted. The joint monitoring has been carried out in four phase during 18.01.2016 to 19.02.2016.

S. No.	Name of the Distillery	Ground water data interpretation
01	M/s Vindhyachal Distilleries Pvt. Ltd. Pilukhedi	The ground water monitoring has been carried out at 08 locations. On the basis of analysis data it is found that pH, Nitrate and Fluoride are well within the limit. The Chloride and Sulphate are found above the limit at four locations. The TDS, Alkalinity and Total hardness is found above the prescribed limit of drinking water standards (IS 10500-2012) at all locations.
02	M/s Agrawal Distillery Pvt. Ltd, Katkut Badwah	The ground water monitoring has been carried out at 04 locations. On the basis of analysis data it is found that Chloride, Sulphate and Fluoride are well within the limit. pH is found marginally high at one location. The TDS, Alkalinity and Total hardness are found above the prescribed limit of drinking water standards (IS 10500-2012) at all locations.
03	M/s Associated alcohol and breweries Pvt. Ltd, Badwah	The ground water monitoring has been carried out at 06 locations. On the basis of analysis data it is found that pH Nitrate and Fluoride are well within the limit. The Chloride and Sulphate are found marginally high at two locations. The TDS, Alkalinity and Total hardness are found above the prescribed limit of drinking water standards (IS 10500-2012). However, dug wells are being used for agriculture purpose except Dilip Mandloi's well.
04	M/s Gwalior Alocobrew Private Limited, Rairu, Gwalior, M.P.	The ground water monitoring has been carried out at 07 locations. On the basis of analysis data it is found that pH, Sulphate and Nitrate are well within the limit. The values of Chloride are above at three locations, Fluoride is found above the limit at two locations. TDS is found high at four locations. The Alkalinity and Total hardness are found above the prescribed limit of drinking water standards (IS 10500-2012) at all locations.
05	M/s Som Distilleries Ltd. Sehatganj, Raisen	The ground water monitoring has been carried out at 04 locations. On the basis of analysis data it is found that pH, Nitrate and Fluoride are well within the limit. TDS and Chloride are found above the standard at one location. The Total hardness is found above the prescribed limit of drinking water standards (IS 10500-2012) at three locations.

06	M/s Great Galleon Ltd, Village Sejwaya, Ghatabillod	The ground water monitoring has been carried out at 05 locations. On the basis of analysis data it is found that pH Nitrate and Fluoride are well within the limit. The Chloride is found above the limit at two locations. The TDS, Alkalinity and Total hardness are found above the prescribed limit of drinking water standards (IS 10500-2012).
07	M/s Oasis distilleries Ltd. Village Borali, Badnawar	The ground water monitoring has been carried out at 04 locations. On the basis of analysis data it is found that pH and Nitrate are well within the limit. Total alkalinity is found marginally high at two locations. The TDS, Chloride and Total hardness are found above the prescribed limit of drinking water standards (IS 10500-2012) at three locations however, these ground water sources are being used for agriculture purpose.

Bio-Mapping of River Chambal in Madhya Pradesh

Physicochemical parameters of water bodies always indicate time specific quality of water. The impact of various pollutants on the ecology of water body also reflected through biological parameters. The study of biological parameters (Bio-monitoring) always depicts long term impact of pollutants in terms of water quality criteria and class of water. Bio-monitoring is one of the most effective methods of determining water quality classes (A,B,C,D,E) which includes collection of benthic macro invertebrates belonging to the Mollusca, Annelida, Platyhelminthes, Nemathelminthes and Arthropoda- (Crustacea and Insecta) classes. Survey of river Chambal from its origin (Janapav) to Kota, Rajasthan has been done for selection of sampling points. Upstream of river Chambal almost found dried during 08 month of the year.

Total 19 points have been selected on the river Chambal and 02 rounds of sampling have been completed. In River Chambal at Kota (upstream and downstream) artificial substratum (cages with pebbles) had been hanged at 03 locations of the river for continuous assessment of river water quality by macro-benthos for next 02 years.

Families identified in the study are - Corbiculidae, Hydropsychidae, Potamidae, Belastomatidae, Ranatridae, Psephanidae, Gomphidae, Libellulidae, Caenidae, Leptophlebidae, Planorbidae, Lymnaeidae, Assiminidae, Bithynidae, Thiaridae, Palaemonidae, Atydae, Viviparidae etc.

On the basis of the identified families the water quality of Chambal River from its origin (Janapav) to Kota, Rajasthan is found to be lying in "C-Class" which is fit for drinking purpose after conventional treatment and disinfection.

Study on Development of Development of Environmentally Sound Management of End of Life Vehicles (ELVs) in India

With the rapid growth in the vehicular population in the country, the issue pertaining to disposal & recycling of End of Life Vehicles (ELVs) in an environmentally sound manner has emerged as an area of concern. In view of the same, CPCB and GIZ-IGEP (Indo German Environment Programme) initiated a collaborative study to address the issue of ELVs in the country. Before development of the guidelines for ELVs in the country,

it was decided to carry out in-depth analysis of the ELV- sector in India to come up with more realistic & feasible guidelines for ELVs . The in-depth analysis of ELV market in Delhi was already done, therefore to make the study more representative of the entire country, five automotive hubs namely Chennai, Pune, Indore, Jamshedpur & Kolkata were selected for assessment of ELV sector. So far the sector study of ELVs in these five hubs has been completed and the report on ELV sector in the country has been finalised. Further the on the basis of outcomes of the sectoral report and international practices, CPCB has came up with national Guidelines on Environmentally sound recycling & disposal of ELVs in India. The guidelines will be finalized upon consultation with the concerned Ministries & Department

Assessment of Pollution Generated from the Road Transport Sector in six cities

A study on assessment of pollution generated by the road transport sector in six cities was taken up by CPCB along with The Energy & Resource Institute (TERI). The six cities those were assessed were Ahmadabad, Hyderabad, Kolkata, Patna, Luck now & Sholapur (These cities were selected from the list of 16 polluted cities identified by the Hon'ble Supreme Court of India). The study aimed at estimation of pollution load from road transport sector, assessment of load from different categories of vehicles, identification of vehicle segment that is contributing most towards total pollution load and development of city specific action plan for containing vehicular pollution in these cities. The study report has been published by CPCB

Vehicular Pollution Control Programme in India

The emissions from vehicles are of immense concerns as they are released at ground level in proximity of our breathing zone and hence have maximum impact on the general population. As a result of rapid economic growth, there is tremendous increase the numbers of motor vehicles, the sales of motor vehicles in India have nearly tripled between 2001 and 2010. The measures for controlling vehicular emission in the country are not confined to any single ministry; rather it involves various ministries work collectively for reducing vehicular emission in the country. A brief on vehicular measures those have been taken up recently by the government for controlling vehicular pollution in the country are as below

New Vehicles

- BS-IV Emission Norms implemented in around 72 cities, while BS-III standards have been implemented in the rest of the country.BS-IV Emission norms proposed across the country by April 1, 2017
- As per the recent Notification (Draft) dated February 2016) of the Ministry of Road Transport & Highways, BS-VI emission norms will be implemented for all categories of vehicles w.e.f April 1, 2020.
- A reduction of 89% & 50% in the emissions of NOX & PM respectively from a heavy duty vehicle is expected by leapfrogging from BS-IV to BS-VI. Further a reduction of 68% & 82% in emission of NOX & PM respectively from Diesel based passenger cars are also expected from leapfrogging.
- Presently the percentage of sulphur in BS-IV fuel both gasoline & Diesel is 50 ppm. Further with the implementation BS-VI fuel, the content of sulphur in the fuel will further reduce to 10 ppm.
- Fuel Efficiency Norms for passenger cars have been notified by Ministry of Power in consultation with BEE (Bureau of Energy Efficiency) vide its notification S.O. 290(E) dated January 30 2014. The fuel efficiency standards are proposed for the year 2017 & 2022. The Fuel efficiency standards will be measured in terms of carbon dioxide (CO_2) emission.

In-Use Vehicles

- New PUC norms have been notified vide GSR 103(E) dated February 23, 2012 for both gasoline and diesel B.S-IV vehicles , wherein besides idle emission limits for gasoline vehicles, high idle emission limits have also been proposed and it is implemented from February 2013.

- MoRTH (Ministry of Road Transport & Highways in collaboration with ARAI has proposed to develop model I&C (Inspection & Certification) centers in all the states and the said model will further be replicated by all state governments in their respective states.

Alternate Fuels

- Around 26 lakhs CNG vehicles are plying across the country. In Delhi around 8 lakhs CNG vehicles are there.
- The National Electgric Mobility Mission Plan (NEMMP) 2020, the mission document for the NMEM that was approved by the National Council for Electric Mobility (NCEM) on 29th August, 2012, sets the vision, lays the targets and provides the joint Government – industry vision for realizing the huge potential that exists for full range of efficient and environmentally friendly electric vehicle (including hybrids) technologies by 2020.
- The Ministry of Petroleum & Natural Gas has set up a Hydrogen Corpus Fund with a corpus of Rs.100 crore with contribution from five major Oil Companies and Oil Industry Development Board (OIDB) for supporting Research and Development in various aspects of hydrogen, which could substitute part of natural gas as transport fuel in future.

CHAPTER – VII

ENVIRONMENTAL RESEARCH

7.0 Central Pollution Control Board laboratories

CPCB laboratories play an important role in assessing the status of environment comprising analysis of various matrices such as water, air, soil, hazardous waste, solid waste, waste oil etc.

7.1 National Reference Trace Organics Laboratory:

CPCB has developed ultra trace organics laboratory as National Reference Trace Organics Laboratory in collaboration with GTZ-ASEM for analysis of trace organic pollutants as well as for analysis of Persistent Organic Pollutants in various environmental matrices including hazardous waste. The scientific Experts from USA, Canada and consultant from ERGO Forschungesellschaft mbH, Hamburg, Germany have provided basic inputs during planning and establishment of the laboratory. The Laboratory was inaugurated on 6th September 2006 by Secretary of Environment, MoEF&CC, Govt. of India. The laboratory is one among the very few of its kind in India and has State of the Art Technology and infrastructure for analysis of Organic Pollutants at Trace Levels including Dioxin and Furan in environmental samples. The infrastructural facilities have been developed conforming with the International Standards.

MAJOR FUNCTIONS:

- Analytical support and services to other laboratories, State Pollution Control Boards, Pollution Control Committees and Govt. Organizations.
- Analysis of various organic parameters for routine and specific monitoring activities, analysis related to characterization of waste, Legal cases, Environmental Surveillance etc.
- Research and Development Projects Studies – In-house and Collaborative Projects.
- Standardization of new methodologies for analysis of specific pollutants.
- Data processing, compilation, interpretation, report writing and preparation.
- Technical review and comments on Research project proposals.
- Comments on National / International Technical reports, documents etc.
- Scientific Training and laboratory related services to State Pollution Control Boards / Committees
- Characterization and analysis of Hazardous Waste and Solid Waste
- Scientific Services for mass awareness
- Executing functions for Powers delegated by MoEF&CC for grant of recognition to Environmental Laboratories under Section 12 and 13 of Environment (Protection) Act, 1986.

THRUST AREAS

- Monitoring of Hazardous pollutants such as PCBs, Dioxin (PCDDs) and Furan (PCDFs) in Environmental Matrices
- Assessment of PCDD / PCDF in ambient air of Critically Polluted areas of country
- Persistent Organic Pollutants and its affect on Human health

PROGRAME / SCHEME / PROJECT ACTIVITIES UNDERTAKEN

MEASUREMENT OF HAZARDOUS ORGANIC COMPOUNDS DIOXIN (PCDDS) AND FURAN (PCDFS) IN ENVIRONMENTAL SAMPLES :

Dioxin-Furan are commonly referred to a group of chemical compounds with chlorine substituted up to eight possible positions at dioxin and furan molecules and technically referred as polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofuran (PCDFs). Out of 75 theoretically possible PCDD congeners and 135 PCDF congeners, 7 PCDD congeners and 10 PCDF congeners are having considerable toxicity. These congeners are monitored as per internationally practiced convention in environmental matrices.

Dioxin & Furan are combustion by-products emitted from combustion as well as industrial operations involving organic matter and high temperatures. Due to their emissions from combustion and industrial processes and many other sources, these compounds are released into the environment and dispersed into ambient air. Dioxin & Furan have been observed to have been distributed between particulate matter as well as vapour phase in the ambient air. Due to their inherent toxicity and human health effect these compounds are regularly monitored in stationary source emission, industrial solid wastes, ambient air, biological tissues and edible items of animal origin as few among many environmental matrices.

Under the purview of project, the following sub-activities have been executed during the year:

- **Monitoring of Dioxin – Furan in Stationary Source Emissions**

  The monitoring of Dioxin – Furan has been undertaken in stationary source emission from one industrial waste incinerator and one municipal waste incinerator on request of Hazardous Waste Management Division of CPCB.

- **Monitoring of Dioxin – Furan in Ambient Air of Delhi at selected four NAMP locations**

  Monitoring of Ambient Air of Delhi has planned by selecting four National Ambient Air Monitoring Program (NAAMP) Stations at Delhi with consideration to even representation of different parts of the geographical area of Delhi.

  1. Pitampura NAAMP Station (Residential location in North Delhi)
  2. Janakpuri NAAMP Station (Residential location in West Delhi)
  3. Siri Fort NAAMP Station (Residential location in South Delhi)
  4. Shahdara NAAMP Station (Industrial location in East Delhi)

  The sampling of ambient air at selected locations is planned for three seasons i.e. May – June (Summer / Pre-Monsoon), September – October (Post Monsoon) and December – January (Winter). The monitoring of Dioxin-Furan Congeners (17 congeners) in Ambient Air at Delhi being undertaken at following selected NAQMP Stations at Delhi during FY 2015-2016.

Residential	Industrial
Janakpuri	Shahdara
Pitampura	
Siri Fort	

Sampling of Ambient Air is conducted using PUF-HV Sampler for collecting particulate and vapour phase fractions of Dioxins-Furans. The particulate and vapour phases have been extracted separately in order to assess phase distribution of these compounds in ambient air. The sample extracts were subjected to column chromatographic cleanup for removal of co-extracted interfering compounds. The concentrated sample extracts have been analyzed for 17 congeners of dioxin-furan by High Resolution Gas Chromatography – High Resolution Mass Spectrometry (HRGC-HRMS).

- **Ambient Air Dioxin-Furan Monitoring at Municipal Waste Dumping Sites of Delhi**

  The monitoring of Dioxin-Furan Congeners (17 congeners) in Ambient Air at Delhi have been undertaken at selected two municipal solid waste Land Fill Sites at Delhi.

  1. Ghazipur Land Fill Site
  2. Bhalaswa Land Fill Site

  Ambient air sampling, sample extraction, sample extract cleanup and sample extract analysis has been undertaken. The study is being continued for second phase.

- **Monitoring of Dioxin-Furan in river Yamuna water at selected locations in Delhi-NCR**

  Water Quality Monitoring of River Yamuna was planned at Delhi-NCR stretch by selecting five locations with consideration to confluence points of major drains or nearby drains to the river. 1 liter of water samples were collected in amber coloured glass bottles from each of the following locations at rive Yamuna during the month of June 2015.

  - Baghpat (upstream of confluence of Drain No. 8 to Yamuna)
  - Wazirabad (downstream of confluence of Drain No. 2 to Yamuna)
  - Rajghat (downstream of confluence of local Drain to Yamuna)
  - ITO (downstream of confluence of local Drain to Yamuna)
  - Okhla (downstream of confluence of Shahdara Drain to Yamuna)

  Water Samples were extracted by liquid-liquid extraction with dichloromethane (methylene chloride) in separatory funnel. Sample extract cleanup, extract analysis steps are identical as detailed above for ambient air samples.

VOLATILE ORGANIC COMPOUNDS (VOCS) MEASUREMENT IN DRINKING / SURFACE WATER SAMPLES BY PURGE AND TRAP GC-MS

Volatile Organic Compounds (VOCs) are carbon-containing compounds that readily evaporate at normal air temperature. Fuel oils, gasoline, industrial solvents, paints, and dyes are the major sources of VOCs. US-EPA had identified 68 most common VOCs for environment assessment from the known sources. These 68 VOCs cover a wide range of chemical compounds that have different chemical and physical properties and different levels of toxicity. Chlorinated VOCs are associated with commercial and industrial use and include dozens of chemicals that are typically very mobile, persistent, and toxic in the environment. Non-chlorinated VOCs are associated with gasoline, fuel oils, and industrial solvents. These non-chlorinated chemicals are persistent, volatile, but less toxic than the chlorinated solvents. VOCs are very mobile and these may be dissolved and washed out with run off water reaching surface water resources and may also leach into the ground water.

During year 2015–2016 (upto 31st December, 2015), two rounds of monitoring have been undertaken in ground and surface water locations at Critically Polluted Areas of Dombivili & Aurangabad (Maharashtra); Angul – Talchar (Odisha), Dhanbad (Jharkhand) and Haldia (West Bengal). The water samples collected have been analyzed for 43 VOCs by Purge & Trap GC-MS analysis using USEPA Method 524.2.

SELECTED PERSISTENT ORGANIC POLLUTANTS (POPs) IN AMBIENT AIR OF URBAN AND RURAL AREAS

Persistent Organic Pollutants (POPs) are chemical substances that originate from man-made sources associated with the production, use, and disposal of certain organic chemicals, produced commercially for pest and disease control, crop production and industrial use. They are known for their persistence, bioaccumulation, potential for long range environmental transport (through air, water or migratory species) and for adverse effect on environment and human health.

In the Stockholm Convention on Persistent Organic Pollutants during May, 2001, member countries including India signed a treaty for urgent actions to reduce and eliminate the releases of these chemicals to the global environment. The Stockholm convention on Persistent Organic Pollutants came into force on 17th May 2004, and initially 12 POPs were listed as 'Dirty Dozen'. In May, 2009, and 2011, 9 new POPs and one pesticide POP (endosulphan) have been included in the list. Accordingly, as on date twenty two chemicals (12 initial 10 new) have been recognized as POPs for global action, which are causing adverse effect on humans and the ecosystem.

There are several reports in India on POPs, especially DDT, HCH and endosulphan measurement in soil, sediments, surface water, ground water and biota including human. However, very little information available on the atmospheric concentration of identified POPs. During year 2015–2016, (up to 30th December, 2015), two rounds of monitoring have been undertaken in ambient air at selected four urban locations viz. Shahadra (~East), Pitampura (~North), Janakpuri (~West) and Sirifort (~South) and one rural location at Loni in National Capital Region, Delhi. The collected particulate and gaseous factions of the POPs in ambient air samples have been analyzed for selected POPs (organo-chlorine pesticides and polychlorinated biphenyls) using USEPA Methods TO-4A.

METHODOLOGY DEVELOPMENT AND STANDARDIZATION OF TRACE ORGANICS PARAMETERS AS PER NOTIFICATION UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

Carbamate pesticides are widely used in homes, gardens, and agriculture, and kill insects in a similar fashion as organophosphate insecticides. Carbamate pesticides are mainly used in agriculture, as insecticides, fungicides, herbicides, nematocide, or sprout inhibitors. Their mode of action is inhibition of cholinesterase enzymes, affecting nerve impulse transmission. A potential use is in public health vector control. The carbamate used as insecticides and nematocide, are generally stable and have a low vapour pressure and low water solubility. The commonly registered carbamate pesticides for use in India are Aldicarb, Carbaryl, Diuron, Captan, Carbofuran, Fenobucarb, Methiocarb, Methomyl and Thiodicarb.

During the year, the standardization of methodology have been undertaken using Capillary High performance liquid chromatography equipped with Diode array detector (HPLC-DAD) for higher sensitivity analysis of trace concentrations of carbamate pesticides in water and wastewater.

MONITORING OF PESTICIDE RESIDUES AT NATIONAL LEVEL - SPONSORED PROJECT BY MINISTRY OF AGRICULTURE, NEW DELHI (IARI Funds)

Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, New Delhi and nodal department i.e. Project Coordinating Cell, All India Network Project (AINP) on Pesticide Residues, Indian Agricultural Research Institute New Delhi has been continuously sponsoring a project “Monitoring of Pesticide Residue at National Level” to Central Pollution Control Board, Delhi since October, 2006.The objective of the study is to evaluate pesticides levels in ground water, surface water and soil samples in National Capital Territory Delhi. About 112 locations of surface water and 100 locations for the Soil Samples have been selected and Monitored in National Capital Region i.e. Uttar Pradesh (Ghaziabad, Guatam Budh Nagar Bulandshahar, & Bagpat), Haryana (Sonepat) and Delhi (Alipur Block, Kanjhawala Block, Najafgarh, Nizamuddin & Okhla). During the year, the Monitoring of Pesticide Residue has been undertaken on monthly basis in about 75 surface water samples. The following groups of Pesticides being monitored on monthly basis:

Pesticide group	Pesticides monitored (33 Nos.)
Organo-chlorine Pesticides: (14 Nos.)	α-HCH, β-HCH, γ-HCH, δ-HCH, Endosulfan-I, Endosulfan-II, Endosulfan sulfate, Dicofol, p,p’-DDE, p,p’-DDD, p,p’-DDT, Aldrin, Dieldrin, Heptachlor
Organo-phosphorous pesticides: (9 Nos.)	Chlorpyriphos, Dimethoate, Ethion, Malathion, Methylparathion, Phorate, Phosphamidon, Quinolphos, Profenophos

Synthetic Pyrethroids: (6 Nos.)	α-Cypermethrin, Deltamethrin, Fenpropethrin, Fenvalerate, λ-Cyhalothrin, β-Cyfluthrin
Herbicides: (4 Nos.)	Pendimethalin, Alachlor, Butachlor, Fluchloralin

MONITORING OF MICROPOLLUTANTS (PESTICIDE RESIDUES + TRACE HEAVY METALS) IN WATER AND SEDIMENTS OF RIVER GANGA

Central Pollution Control Board has initiated, the monitoring of micropollutants (pesticides + Trace Heavy Metals) at River Ganga during the reporting year in water and sediment at all the predetermined sampling locations, form Gangotri to Ganga Sagar. During First Round, the monitoring of Ganga River at Uttarakhand and Uttar Pradesh stretch up to Downstream of Kanpur has been carried out for following 21 locations:

Sampling stn No.	Sampling Locations	Sampling stn No.	Sampling Locations
	Ganga River Stretch in Uttarakhand		Ganga River Stretch in Uttar Pradesh
1.	Bhagirathi at Gangotri	12.	Ganga at Garhmukteshwar
2.	Alkananda B/C at Rudra Prayag	13.	Ganga at Anoop Shahar U/S
3.	Alkananda A/C at Rudra Prayag	14.	Ganga at Anoop Shahar D/S
4.	Bhagirathi B/C at Dev Prayag	15.	Ganga at Narora
5.	Alkananda B/C at Dev Prayag	16.	Ganga at Kachhla Ghat
6.	Alkananda A/C at Dev Prayag	17.	Ganga at Kannauj U/S
7.	Mandakini B/C at Rudra Prayag	18.	Ganga at Kannauj D/S
8.	Ganga at Rishikesh U/S	19.	Ganga at Bithoor
9.	Ganga at D/S Raiwala	20.	Ganga at Kanpur U/S
10.	Ganga at Haridwar D/S	21.	Ganga at Kanpur D/S
11.	Ganga at D/S Roorkee		

The water and sediment samples were analyzed for 31 pesticides viz. Organo-chlorine pesticides (13 Nos.), Organo-phosphorous pesticides (8 Nos.), Herbicides (6 Nos.) and Synthetic Pyrethroids (4 Nos.) and 14 trace heavy metals as detailed below:

A. PESTICIDES	
Pesticide group	**Pesticides monitored and analyzed**
Organochlorine Pesticides (13 Nos.)	α-HCH, β-HCH, γ-HCH, δ-HCH, Endosulfan-I, Endosulfan-II, Endosulfan sulfate, Dicofol, p,p'-DDE, p,p'-DDD, p,p'-DDT, Aldrin, Dieldrin, Heptachlor
Organo-phosphorous pesticides (8 Nos.)	Chlorpyriphos, Dimethoate, Ethion, Malathion, Methylparathion, Phorate, Phosphamidon, Quinolphos, Profenophos
Synthetic Pyrethroids (6 Nos.)	α-Cypermethrin, Deltamethrin, Fenpropethrin, Fenvalerate, λ-Cyhalothrin, β-Cyfluthrin
Herbicides (4 Nos.)	Pendimethalin, Alachlor, Butachlor, Fluchloralin

Trace Metals: Following 14 Nos. of trace heavy metals were analyzed in collected water and sediment samples from River Ganga:

B. TRACE METALS			
S. No.	Trace metals	S. No.	Trace metals
1.	Arsenic (As)	8.	Iron (Fe)
2.	Mercury (Hg)	9.	Manganese (Mn)
3.	Cadmium (Cd)	10.	Nickel (Ni)
4.	Lead (Pb)	11.	Selenium (Se)
5.	Chromium (Cr)	12.	Vanadium (V)
6.	Copper (Cu)	13.	Zinc (Zn)
7	Cobalt (Co)	14.	Antimony (Sb)

The pesticides residue concentration was Not Traceable (NT) in all water samples. However, in river Sediments, pesticide residues have been found at few locations, while at other locations, it was Not Traceable (Below Detection Limit).

The concentration of Arsenic, Cadmium, Lead, Chromium, Copper, Cobalt, Nickel, Selenium, Vanadium and Antimony were below detection limit in water samples at all the locations. However, Iron and Manganese have been found in most of the water samples.

Cadmium, Mercury, Antimony and Selenium were below detection limit at all the locations of Uttarakhand and Uttar Pradesh in sediment samples while the concentration of Lead, Chromium, Copper, and Nickel was found at few locations.

DEVELOPMENT AND STANDARDIZATION OF METHODOLOGY FOR DETERMINATION OF SPECIFIC PESTICIDES IN AQUEOUS AND SOIL ENVIRONMENT SAMPLES

Organo-phosphorous Pesticides refers to a group of insecticides. The term is used often to describe organic phosphorus containing compounds, especially when dealing with the neurotoxic compounds. Organo-phosphate pesticides irreversible inactive nerve functions in insects, humans and many other animals. Even at relatively low levels, organo-phosphorus may be most hazardous to the brain development of foetuses and young children. Organo-phosphate pesticides degrade rapidly by hydrolysis on exposure to sunlight, air and soil, although small amounts can be detected in food and drinking water. The ability to organo-phosphorous pesticides to degrade comparatively rapidly made them an attractive alternative to the persisted organo-chlorides pesticides such as DDT, Aldrin and Dieldrin. The organo-phosphorous pesticides, like other pesticides group have greater acute toxicity, poisoning risks to the people who may be exposed to large amount.

National Reference Trace Organics Laboratory, CPCB has been monitoring Organo-phosphorous pesticides namely – Phorate, Dimethoate, Parathion-Methyl, Chloripyriphos, Monocrotophos, Malathion, Ethion, Azinphos-Methyl, Chloripyriphos-Methyl, Diazinon, Disculfoton, Fenitrothion, Fonofos, Parathion-Ethyl, Anolophos and Phosmet around sixteen compounds in environmental matrixes under various project. To extend the scope of Organo-phosphrous pesticides monitoring in aqueous and soil samples development of methodology for some of the specific pesticides i.e. Acephate, Omethoate, Dichlorvos, Methamidophos and Edifenphos have been initiated and being undertaken.

SCIENTIFIC RESEARCH PAPERS PUBLISHED DURING YEAR 2015-2016

- Health Risk Due to Sixteen PAHs in Residential Street Soils from Industrial Region, Ghaziabad, Uttar Pradesh, India. Journal of Environment Protection and Sustainable Development, 2015, 1 (2):101-106.
- Quantification of Nitrophenols, Chlorophenols and Hexachlorocyclohexanes in Agricultural Soils in the Vicinity of Industrial Area for the Assessment of Human Health Hazard and Risk. Human and Ecol Risk Assess: An International Journal, 2016, 22 (1): 39-49.

INTER-LABORATORY PROFICIENCY TESTING (PT) PARTICIPATION of CPCB HQ AND ZONAL LABORATORIES FOR ANALYSIS OF PHYSICO-CHEMICAL AND TRACE ORGANICS PARAMETERS

The Quality system which includes quality assurance policies and all quality control processes to ensure that the analytical data produced by the laboratory of utmost quality that demonstrate the competence of the laboratory. Quality assurance is the definite programme for laboratory operation that specifies the measures required to produce reliable data of known precision and accuracy.

To maintain the quality assurance, Central Pollution Control Board HQs and five Zonal Office Laboratories (Lucknow, Vadodara, Bangalore, Kolkata and Bhopal) have participated in Interlaboratory PT programme conducted by M/s Environmental Resource Associates (ERA), USA - A Waters Company, during December, 2015 with coverage of various Physico-chemical parameters, Microbiological parameters, Chemical, Trace organics parameters, and Air parameters. The performance of the laboratories during PT Programme had been satisfactory with Z score below ± 2.0. However, in respect of few parameters, the performance needs improvement for which the Root Cause analysis and Corrective Action being undertaken.

RECOGNITION OF LABORATORIES UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

Central Pollution Control Board, Delhi has been delegated the powers by Government of India vide Gazette Notification No. SO 145 (E) dated February 21, 1991 for recognition of environmental laboratories of Govt. / Semi Govt. organization Public Sector Undertaking and Educational Institutions under section 12(1)(b) & 13 to carry out the functions entrusted to the Environmental laboratories under the Environment (Protection) Act, 1986.

Ministry of Environment & Forests & Climate Change MoEF&CC) has constituted the Expert Committee for this purpose at Central Pollution Control Board with objective to review of all the cases of Recognition of Environmental Laboratories under the Environment (Protection) Ac, 1986. The Central Pollution Control Board has organized three (3) meetings of Expert Committee during the year 2015-2016 (upto December, 2015) for assessment, review and recommendation of cases of Private / Government laboratories for recognition. The Minutes of meeting have been circulated to MoEF&CC for further necessary action.

During April 2015 to March 2016 four applications of Govt./Public Sectors Environmental Laboratories have been received, scrutinized and comments put-up before the Expert Committee and on recommendations of Expert Committee, approved in the Board Meeting, following Govt., Public Sector Laboratories have been notified in Govt. of India Gazette for recognition under the Environmental (Protection) Act 1986 :

1. **Central Laboratory Central Pollution Control Board**
   Parivesh Bhawan
   East Arjun Nagar
   Delhi-110032
2. **Pollution Control Research Institute BHEL**
   Ranipur Haridwar-249403
   Uttarakhand
3. **Regional Laboratory**
   Maharashtra Pollution Control Board
   Jog Centre, 3rd Floor, Pune-Mumbai Road
   Wakdewadi Shivagi Nagar, Pune- 411003
   Maharashtra
4. **Zonal Office Laboratory**
   Central Pollution Control Board
   Central Zonal Office
   Sahkar Bhawan ,
   3rd Floor North T.T. Nagar
   Bhopal – 462003

PARTICIPATION IN JOINT INSPECTIONS OF PRIVATE AND GOVERNMENT LABORATORIES FOR CONSIDERATION OF NEW / RENEWAL OF RECOGNITION UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

Central Pollution Control Board has participated in joint inspections of private laboratories alongwith Ministry of Environment & Forests & Climate Change (MoEF&CC) and respective State Pollution Control Boards for consideration of recognition of private environmental laboratories under the Environment (Protection) Act, 1986. Central Pollution Control Board has also participated in joint inspections of government sector laboratories alongwith State Pollution Control Board / CPCB Zonal offices for consideration of their recognition under the Environment (Protection) Act, 1986 during the year.

7.2 Air Laboratory

The laboratory activity and its operations are continually improved and maintained for quality data generation in environmentally safe conditions & systems. In this direction, the laboratory has enhanced the capability for quality data and systematic data generation by widening its scope of operations, as below. The Air Laboratory is recognized under the provisions of Environment (Protection) Act, 1986 as well as per ISO 17025 NABL Accreditation.

Table 7.1 : List of Parameters Covered and New Parameter Proposed Under Scope of NABL Accreditation (ISO/IEC 17025:2005):

S. No.	Product/Material of Test	Specific Test Performed
Location 1, Parivesh Bhawan, East Arjun Nagar, Delhi		
(a)	Air & Gases Ambient Air	SPM, Particulate matter (PM_{10}), *Particulate matter ($PM_{2.5}$) *NH3, Sulphur Dioxide (SO_2) (Chemical method), Oxides of Nitrogen (NO_2) (Chemical method), *Particulate Benzo-a-Pyrene (BaP), *Benzene
(b)	Metals in Particulate matter (PM_{10})	Pb, Cd, Ni, Cr, Cu, As*
(c)	*Cations in Particulate matter	Lithium, Sodium, Ammonium, Potassium, Magnesium, Calcium, Strontium, Barium
(d)	*Anions in Particulate matter	Fluoride, Chloride, Nitrite, Sulphate, Phosphate, Bromide Nitrate
(e)	Ambient Noise Level	Equivalent Sound Level Leq in db(A) in ambient air
(f)	Meteorological Parameters	Temperature, Relative humidity ,*Atmospheric ,Pressure, *Wind speed, *Wind direction, *Solar radiation, *Rain fall
(g)	Source/Stack Emissions	Particulate Matter(PM), Sulphur Dioxide (SO_2) Chemical method, Carbon Monoxide (CO),Oxygen (O_2) and Carbon Dioxide (CO_2) (Instrumental Method), Oxides of Nitrogen (NO_2) Chemical method, *HCl & HF , *HCl & HF (total)
Location 2 - ITO (BSZ Marg), Delhi		
(a)	Air & Gases Ambient Air	Particulate matter (PM_{10}), Sulphur Dioxide (SO_2) Chemical method ,Oxides of Nitrogen (NO_2) Chemical method
***Location 3 - IHBAS, Dilshad Garden**		
(a)	Air & Gases Ambient Air	SO_2, Oxides of Nitrogen , Carbon Monoxide, Particulate Matter , Size<2.5 µm ($PM_{2.5}$ Analyser)
***Location 4 - DMS, Shadipur**		
(a)	Air & Gases Ambient Air	SO_2 ,Oxides of Nitrogen , Carbon Monoxide, Particulate Matter , Size<2.5 µm ($PM_{2.5}$ Analyser), Ozone, Benzene
***Location 5,NSIT, Dwarka,**		
(a)	Air & Gases Ambient Air	SO_2 , Oxides of Nitrogen , Carbon Monoxide, Particulate Matter , Size<2.5 µm ($PM_{2.5}$ Analyser),Ozone, Benzene
**proposed new parameters*		

Occupational Health and Safety Management System Certification of CPCB Delhi Laboratories:

CPCB Delhi has been awarded certification license by BIS on Occupational Health and Safety Management System (OH & SMS) under IS 18001:2007/12 during 2014. The effectiveness of system is being reviewed on regular basis. Two rounds of Internal audit and one Management review was conducted during the reporting year. The certification maintained has Our system has successfully satisfied the surveillance audit conducted by BIS on completion of one year of award in December 2015.

OH & SMS team in CPCB, HQs is also coordinating the activities regarding implementation of OH & SMS or OHSAS at zonal office level. Southern Zonal office Bengaluru and East Zonal office Kolkata got awarded by BIS under IS 18001:2007/12 with our assistance. North Zonal office Lucknow is in the process of obtaining license and member of our OH & SMS team has performed internal audit for them. Some salient improvement system operations are presented below:

- *Facilities provided through engineering solutions in laboratories*

  The state of art facilities have been extended to Air Laboratory to have better work place through integrated Air Handling System similar to National Reference Trace Organic Laboratory and Water Laboratory, HQs Delhi.

  Proper fire safety systems with fire/smoke sensors at all places connected to central fire control panel. All corners and seating cabinets are equipped with speakers connected to PA system. Auto-controlled special fire fighting gadgets are fitted in sophisticated instrumentation laboratory. Fire extinguishers are available and regularly checked for their operational performance.

- *Improvements for Operational Control*

  All the constituent laboratories at HQs Delhi have upgraded their system or implemented systematic operational control for OH & SMS issues against each activity identified under HIRA. These include use of PPEs, Fume Hoods, Emergency showers, Eye washing facilities, Proper earthing etc.

- *Implementation and total compliance on Improvement Plans under OH & SMS*

  All the constituent laboratories have implemented their improvement plans identified after HIRA exercise.

7.3 Water Laboratory:

The Water Laboratory is providing services to providing services (i.e., for physico-chemical Analysis of Water ,Wastewater, Soil & Solid Waste) to other divisions of CPCB such as PCIs, PAMS, NGRBA Cell, follow up Honorable NGT, High Court, & Supreme courts, Public complaints etc.

Programme/Scheme/ Project Activities Undertaken:

In addition to routine analytical activities, the laboratory has undertaken Research & Development Activities on water and wastewater treatment technology and analytical quality control programs also .

BIOLOGICAL TREATMENT OF HIGH ALKALI AND HIGH ACIDIC EFFLUENTS WITH SELECTIVE MICROBIAL PURE COLLABORATIVE PROJECT WITH IGI&B-CSIR)

1. Online measurement of BOD using selective mixed culture (Joint collaboration with, IGI&B-CSIR).
2. Treatment of Domestic Effluents Using ECO-BIO-BLOCK (Japanese Patented Product) in a Pilot Project at Mayur Vihar –Phase-I Drain .
3. Treatment of Water (Drinking Purpose) using patented & ZLD Technology based SRP

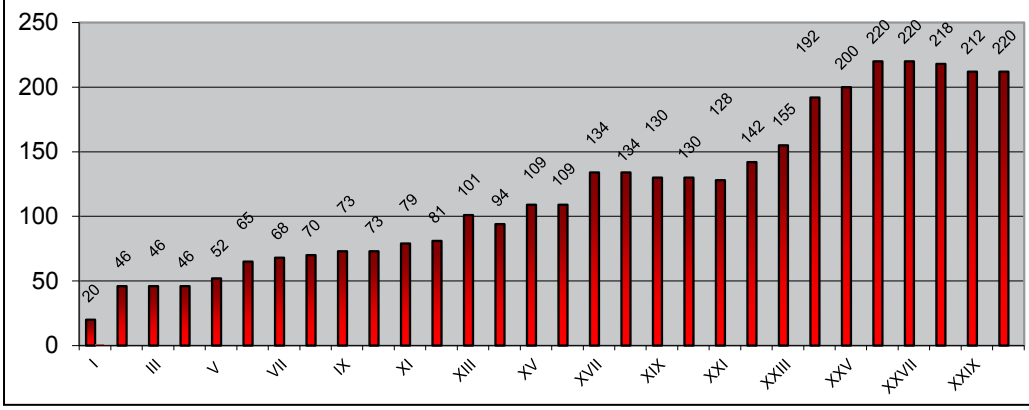
   (Sludge–Reagent-Product) treatment technology . The pilot water treatment plant (0.5 MLD capacity) based on SRP technology has been constructed and successfully operated since last one and half year at Bhagirathi Water Treatment Plant .

Indian Patent Certificate Received for one patent Title "An Integrated Plant For Treatment of Raw Water Using Discarded Sludge to Produce Drinking Water". Patent No. 215808, Date of grant 03/03/2008.

ANALYTICAL QUALITY CONTROL (AQC/WATER) FOR CENTRAL AND STATE POLLUTION CONTROL BOARDS, POLLUTION CONTROL COMMITTEES AND FOR LABORATORIES RECOGNISED UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

Central Pollution Control Board (CPCB) is maintaing vast water quality monitoring network with a aim to evaluate the status of water quality of different sources. In this programme CPCB is monitoring 1019 water quality monitoring stations under GEMS, MINARS, GAP and YAP Programmes comprising rivers, lakes, wells, and ground waters spread over 27 States and 6 Union Territories through various State Pollution Control Boards (SPCB). Comparability of data quality within the collaborative programme is the key challenge to water testing laboratories. The quality of data must be of the desired quality to formulate the policy by the decision makers based on the data generated in the monitoring programmes. Therefore, to obtain relevant and reliable data, the analytical process has to proceed under a well established quality assurance programme with external proficiency test as an inherent component. To ensure the reliability of the data. "Analytical Quality Control (AQC)" was initiated by CPCB starting with 20 laboratories during year 1991. During year 2014-15, 229 laboratories of SPCB/PCC, E.P. Act recognized laboratories have participated. During 30th to 31st AQC exercise 17 parameters have been covered, 6 Nos. heavy metals and 11Nos. physico-chemical parameters. The performance of the laboratories in the 30th AQC Exercise for Heavy Metals parameters ranged between 86.8 to 93 % and overall performance was around 89%. The performance of the laboratories in the 31st AQC Exercise for physico-chemical parameters ranged between 76.22 to 90.55% and overall performance was around 84.5 % .

Figure 7.1 GROWTH OF AQC/ WATER PROGRAMME (1991-2014)

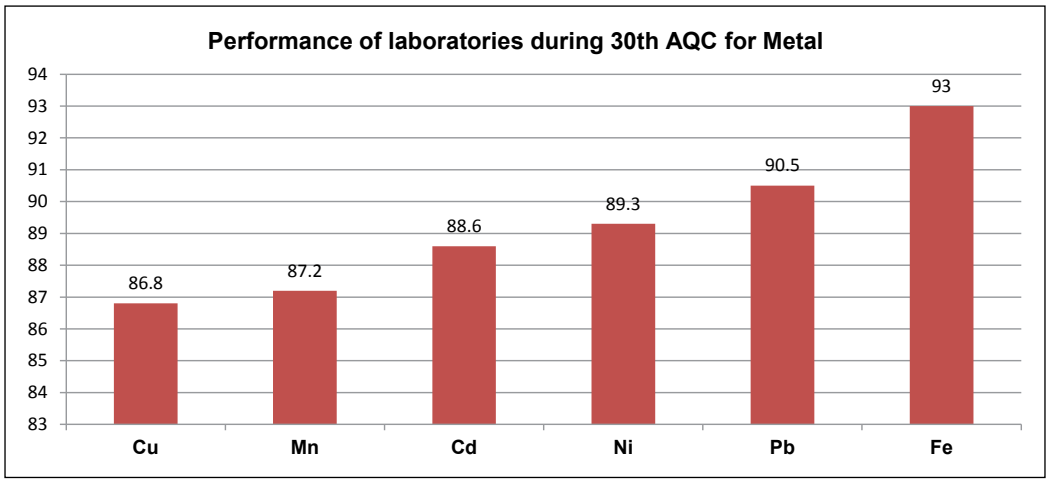


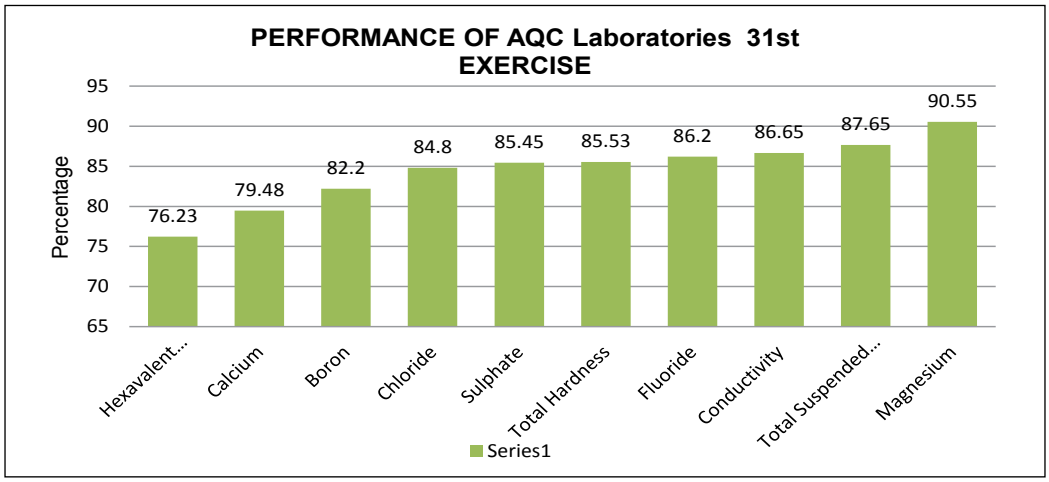
Two synthetic samples labeled as A & B of each 1 litre volume prepared in laboratory by adopting standard procedures and precautions and distributed to all participating laboratories by Courier service to avoid any transport delay. Samples were also analyzed in CPCB laboratory for determing at "Reference value" for comparison and to estimate the acceptable limits of the reported values.

Table:7.2 LIST OF PARAMETERS COVERED UNDER AQC / WATER PROGRAMME (30h & 31st Exercise)

S. No.	Parameter	S. No.	Parameter
01.	Iron (Fe)	11.	Sulphate
02.	Cadmium (Cd)	12.	Nitrate
03.	Copper (Cu)	13.	Calcium
04.	Manganese (Mn)	14.	Magnesium

S. No.	Parameter	S. No.	Parameter
05.	Nickel (Ni)	15.	Boron
06.	Lead(Pb)	16.	Haxavalent Chromium (Cr+6)
07.	Conductivity	17.	Total Suspended Solids
08.	Total Hardness		
09.	Chloride		
10.	Fluoride		





Recommendations for AQC Scheme

The overall findings of the performance of AQC exercises reveal the fact that Internal QA/QC system in the laboratories to be strengthened. The analytical capability of these laboratories could be improved by adopting the following major steps.

- Strengthening of Internal AQC System
- Periodic calibration of instruments
- Using high quality chemicals and glassware
- Providing good quality distilled water

- Improving the laboratory work atmosphere
- Providing analytical training to laboratory analysts.
- Conducting Regional Workshop at various regions
- Adopting robust quality assurance system
- Participation in Inter-laboratory AQC exercises by all laboratories of Pollution Control Boards and Committees.

DEVELOPMENT AND DISTRIBUTION OF WATER TESTING KIT:

Environmental awareness plays a vital role in prevention and control of pollution in industrial as well as at community levels. Assessment of water quality to understand any impact of water pollution needs a laboratory facility, which is not instantly available in remote areas. Keeping this in view, the Central Pollution Control Board has developed a Water Testing Kit (WTK) to assess the water quality of surface, ground and potable water bodies in field the use by conditions. The kit designed and developed by a team of scientists of the Board is intended for students, NGOs and public.

During financial year 2015-16 about 16 Water Testing kits were distributed to various NGOs, schools, and others, under the mass awareness program.

Fig.: Water Testing kit Developed by Central Pollution control Board during year 1995.

Analysis of Samples:

The Water Laboratory have analyzed grand total 1850 numbers of samples (out of which , 1000 Wastewater, 650 freshwater and 200 of soil & hazardous waste samples.) in the financial year 2015-2016.The above samples were collected from STPs , ETPs, Polluting Industries, Drains, Rivers, Ground Water(Tube Wells), Direction of Honorable Supreme court, High Court, NGT and public complains etc.

7.4 INSTRUMENTATION LABORATORY:

PARTICIPATION IN JOINT INSPECTION OF PRIVATE AND GOVERNMENT LABORATORIES FOR CONSIDERATION OF NEW/ RENEWAL OF RECOGNTION UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

ENVIRONMENTAL LABORATORIES WITH VALID RECOGNITION UNDER SECTION 12(1) B OF THE ENVIRONMENT (PROTECTION) ACT, 1986

The Environmental laboratories (Govt./Semi-Govt./Public Sector Undertakings/ Educational Institutes) with valid recognition under the Environment (Protection) Act, 1986 are as below:

S. No.	Name of laboratory	Gazette notification no. and date	Validity up to
1.	Environmental Engineering Laboratory MECON Ltd. Vivekananda Path, Doranda Ranchi- 834002 Jharkhand	Legal 42(3)/87 dated 14th August, 2014	13th August, 2019
2.	Environmental Laboratory Project and Development India Ltd. (PDIL) P.O. Sindri- 828122 District – Dhanbad Jharkhand	Legal 42(3)/87 dated 14th August, 2014	13th August, 2019
3.	Central Laboratory M.P. Pollution Control Board Paryavaran Parisar E-5, Arera Colony,Bhopal- 462016	Legal 42(3)/87 dated 14th August, 2014	13th August, 2019
4.	Goa State Pollution Control Board Laboratory Dempo Towers Ist Floor, EDC Patto Plaza, Panaji Goa-403001	Legal 42(3)/87 dated 14th August, 2014	13th August, 2019
5.	Central Laboratory Maharashtra Pollution Control Board, Kalpataru Point, 2nd – 4th FI Opp. Cine Planet Cinema, Near Sion Circle, Sion (E) Mumbai- 400022	Legal 42(3)/87 dated 10th March,2015	9th March, 2020
6.	Central Laboratory Central Pollution Control Board, Parivesh Bhawan East Arjun Nagar Delhi-110032	Legal 42(3)/87 dated 11th December,2015	10th December,2020
7.	Pollution Control Research Institute BHEL Ranipur Haridwar-249403 Uttarakhand	Legal 42(3)/87 dated 11th December,2015	10th December,2020
8.	Regional Laboratory Maharashtra Pollution Control Board, Jog Centre, 3rd Floor, Pune-Mumbai Road, Wakdewadi Shivagi Nagar, Pune- 411003 Maharashtra	Legal 42(3)/87 dated 11th December,2015	10th December,2020
9.	Zonal Office Laboratory , Central Pollution Control Board, Central Zonal Office, Sahkar Bhawan, 3rd Floor North T.T. Nagar Bhopal – 462003	Legal 42(3)/87 dated 11th December,2015	10th December,2020
10.	Environment Protection Training and Research Institute (EPTRI) Survey No.91/4, Gachibowli Hyderabad-500032	Legal 42(3)/87 dated 7th March,2016	6th March 2021
11.	Punjab Biotechnology Incubator SCO: 7 & 8, Phase –V SAS Nagar (Mohali) -160059 Punjab	Legal 42(3)/87 dated 7th March,2016	6th March 2021
12.	M/s Quality Control Laboratory Indian Oil Corporation Limited Bongaigaon P.O. Dhaligaon-783385 Dist. Chirang Assam	Legal 42(3)/87 dated 7th March,2016	6th March 2021

RECEIPT AND REGISTRATION OF ENVIRONMENTAL SAMPLES

Samples collected under various projects, programmes i.e. NAAQMP, ESS and HWMP by Head Office, The environmental Zonal Offices of CPCB & SPCB are being received at Centralized Sample Receiving section of central Laboratroy, Delhi & being registered before processing and analysis. During the year total no. of 7272 samples have been received & registered for analysis as below:

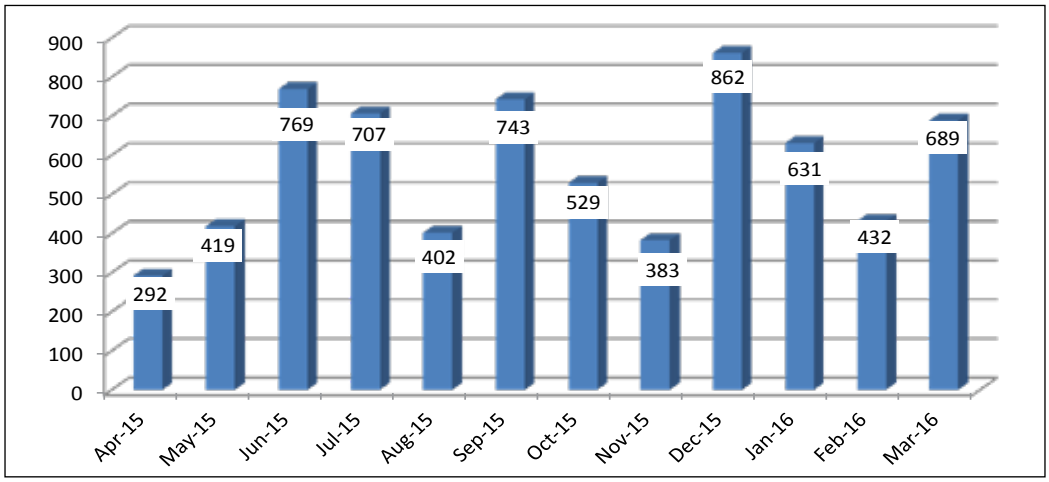


Figure: 7.5 Month wise receipt of Environmental samples at Central Laboratory, HQ- Delhi for Analysis during 2015-16

INSTALLATION OF ICP-MS

The instrument ICP-MS was purchased under Water Cess fund Project for Strengthening and up gradation of Central Laboratory of CPCB during the year 2015-16 The system has been installed successfullyat Instrumentation Laboratory and made operational. During the year total about 538 samples were analyzed for 4626 measurements using ICP-MS.

Figure:7.6 Inductively Coupled Plasma – Mass Spectrometer

7.5 METALS IN ROAD SIDE DUST AND PLANTS LEAVES AT SELECTED LOCATIONS IN DELHI

A short term study has been carried out to determine the metals found in Road side dust and leaf dust on the roadside plants. The samples were collected fortnightly for three rounds of sampling during months of January and February 2016 from eight locations; Singhu Border, Dhaula Kuan, Ashram, ISBT, ITO, Dilshad Garden, Anand

Vihar and CPCB Office, Arjun Nagar. The integrated dust samples were collected in the dust pan with the help of brush from footpaths and divider and transferred into the plastic bags after mixing it properly and transported to the laboratory whereas the leaf dust was collected by picking up the leaves as such, kept in the plastic bags and transported to the laboratory for further processing. In the laboratory the pre-dried samples of dust removed from the leaves and the road side dust were digested and analyzed using ICP-AES for 14 metals viz. As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sb, Se, V, Zn and Hg.

Figure: 7.7 Sampling of Road dust and Leaf dust of road side plants

Sailent Findings

- Out of the 14 metals,analyzed 5 metals were not detected namely Arsenic, Cadmium, Antimony, Selenium and Mercury were found Detectable . The cobalt where found, it was almost negligible.
- The values of various metals were found higher in the leaf dust than the roadside dust except for Dilshad garden and Anand Vihar where it was equal, greater or lower than the roadside dust. There is much variation in the metal data of leaf dust and not depicted any particular trend.
- The value of Iron found exceptionally high at all the locations covering almost 95% of sum of all the metals analyzed Zinc, Manganese, Copper and Lead were found in decreasing order respectively while Chromium, Nickel and Vanadium were observed in traces.

  [Fe>Zn>Mn>Cu>Pb]
- Looking into date-wise variation of each metal for the different monitoring dates, there is no significant variation in case of lead and chromium. Copper was found high at Dilshad Garden in second & third round while manganese and iron are high on first round of monitoring.
- The average values of the metals, it is found that the ratio of the metals in roadside dust in various locations are more or less similar .
- In terms of total metals present at road side dust the maximum metals were found at Dhaula Kuan and minimum at CPCB Office.
- The data of maximum and minimum metals reported at various locations, indicate the lowest value of chromium at Anand Vihar while maximum value at Singhu Border. Copper was highest at ISBT and lowest at Singhu Border. Iron was highest maximum at Anand Vihar and lowest at ITO. Manganese is maximum at Singhu Border and minimum at CPCB. Lead is maximum at Singhu Border and minimum at Anand Vihar.

7.6 Trace Metal characterization of waste water and sludge generated from CETP's using Inductively Coupled Plasma- Optical Emission Spectrometer (ICP-OES).

In order to assess the quality of waste water and sludge generated from CETP's have benn determined by ICP-OES .ICP-OES is relatively simple, accurate, and versatile and free from interferences..'' During the project study on Trace metal characteristics of water waste and Sludge generated from CETPs .Samples from Inlet, Outlet & Sludge samples of Three CETP's located at Sonipat Haryana were collected and analysed for 13 metals i.e. As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Sb, Se,V & Zn and Presented in fig 7.8 to 7.10in comparision to other trace metals analysis technique such as colorimetry , polarography ,atomic absorption spectrophotometric .

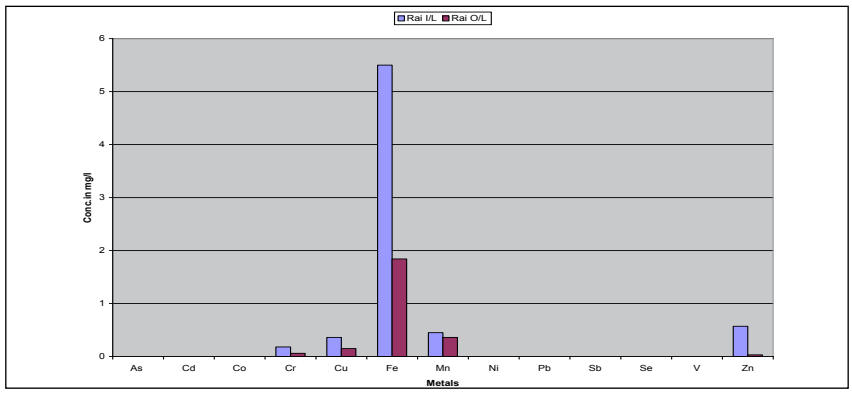


Figure : 7.8 Trace metals in Inlet and Outlet of CETP`s located in Rai Sonipat Haryana

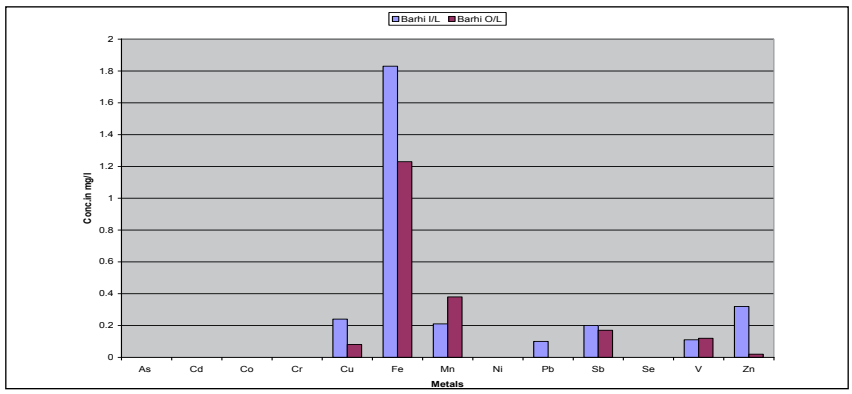


Figure: 7.9 Trace Metals in Inlet and Outlet of CETP`s located in Barhi Sonipat Haryana

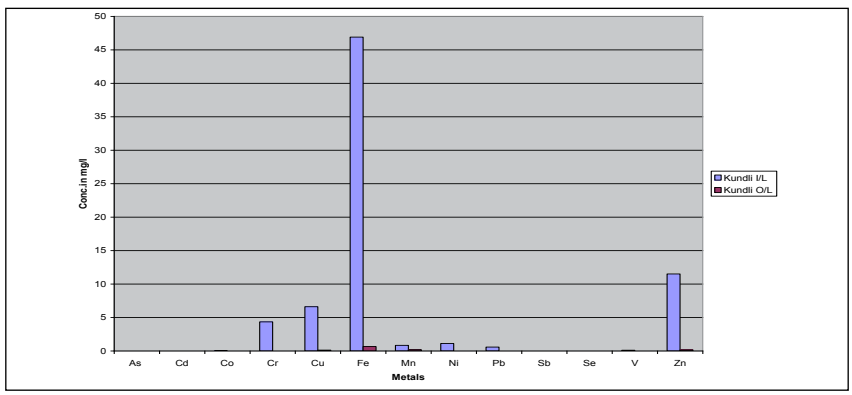


Figure: 7.10 Trace metals in Inlet and Outlet of CETP`s located in Kundli Sonipat Haryana

The most abundantly found metals were Cr, Cu, Fe, Mn and Zn whereas Co, Ni, Sb, Pb and V were found in traces. As, Cd and Se were found below detection limit in waste water of all the locations of three CETP`s. As and Se were found below detection limit in sludge Samples

7.7 DEMONSTRATION/PILOT PROJECT 'IN-SITU TREATMENT OF SEWAGE THROUGH BIOREMEDIATION OF BAKARGANJ NALLAH AT PATNA, BIHAR' UNDER NATIONAL GANGA RIVER BASIN AUTHORITY (NGRBA)

Central Pollution Control Board had assigned a Project to M/s U S Environ (P) Ltd., New Delhi for Remediation of Bakarganj Nallah of Patna, Bihar by using 'In situ treatment' based on Eco-Bio-Block (EBB) technology.

To assess the progress on the remediation/treatment of Bakarganj Nallah, undertaken site inspection and Monitoring .

Salient observations:

- The Bakarganj Nallah (2.5 Km) is in the Central Zone of Patna city and originated near Uma Cinema and after travelling through dense and congested slum areas of Shalimpur, Hazzamtoli Gali, Sai Mandir area, IMA Hall area, Baripath, Regent Cinema area, Mona Cinema area, Ashok Rajpath/Kargil Chowk, Vegetable Market ultimately meets river Ganga at Anta Ghat. The Nallah width ranges from 1.5 to 6.5 m; whereas the depth varies from 0.1 – 0.6 m.
- The Nallah receives both storm water and natural drainage from catchement area and the flow is un-uniform and anoxic conditions prvialed at different stretches.
- The Eco Biological Block (EBBs) were seen only placed from Hazzamtoli Gali (Sai Mandir) to Vegetable Market on the nallah.
- The stretch From Ashok Rajpath / Kargil Chowk to vegetables markets is about 300 m and 140 EBBs were placed.In the 2nd Phase, about 450 - 460 EBBs had been placed upstream of nallah from Kargil Chowk to Sai Mandir area (Kargil Chowk – Mona Cinema Public Toilet – Regent Cinema – Baripath – IMA Hall – Sai Mandir).The number of Blocks (EBBs) and design/orientation of placement per unit length of nallah have been found random. The location wies characteristics of drain water is presented below :

Table 7.3 : Flow & Drain water characteristics of Bakarganj Nallah/ Drain.

Location/ Parameters	Uma Cinema	Sai Mandir (Hazzamtoli Gali No 3)	Ashok Rajpath/ Kargil Chowk,	Vegetable Market	Anta Ghat
Latitude	250 36.552'N	250 36.830' N	250 37.123' N	25037.235'N	250 37.327N
Longitude	850 08.827' E	850 08.893' E	850 08.971' E	850 08.999E	850 09.021E
Flow m^3/hr	Stagnant	396	1620	1908	1829
Flow MLD	Water	9.5	38.88	45.79	43.90
pH	7.1	7.0	7.1	7.2	7.1
EC, µs/cm	1205	1180	1144	1104	1020
TDS, mg/L	652	580	602	580	520
TSS, mg/L	122	1098	112	246	200
COD, mg/L	213	790	233	364	253
BOD, mg/L	68	138	48	70	96
NO_3 –N, mg/L	0.03	0.02	0.02	0.006	0.008

Location/ Parameters	Uma Cinema	Sai Mandir (Hazzamtoli Gali No 3)	Ashok Rajpath/ Kargil Chowk,	Vegetable Market	Anta Ghat
NO_2 –N, mg/L	0.01	0.02	0.01	0.009	0.009
NH3 –N, mg/L	10	29	22	21	20
TKN, mg/L	41	55	32	38	34
Chloride,mg/L	77	77	83	77	64

- The characteristics of drain/nallah has been found variable to a very little extent depending on the activities and discharge frequencies of solid and/or liquid wastes.
- No visible or appreciable improvement of water quality of the nallah/drain with this EBB technology could be noticed during the monitoring.
- Careful observation of data dictates that characteristics of drain from Sai Mandir downstream appear to be more or less same with very little variations probably that too due to instant local effects.
- The minor improvement in the drain water characteristics observed from Sai Mandir to Anta Ghat, may be due to Natural Purification of the System.
- The drain characteristics at final discharge point of Anta Ghat, point to Ganga, after In Situ Treatment System, was not found meeting with discharge norms. The BOD was mg/L with Suspended Solid Concentration 200 mg/L.
- Thorough cleaning/de-silting of the nallah from Origin to Sink (Anta Ghat) and then installation/ commissioning of EBBs could have been a better options
- Bar Screens with periodic cleanings to remove solid waste may improve the condition.
- De-silting of the nallah at regular intervals, to be ensured first by Patna Nagar Nigam, for proper and better performance of EBBs installed.

Fig 7.10 Bakarganj Nallah at Shalimpur

Fig 7.11 Bakarganj Nallah at Sai Mandir with EBB Installed

7.8 Optimisation of Chrome Tanning operations

R&D activities aimed at Optimisation of Chrome Tanning operations through Chemical and Process benchmarking. The work was undertaken on pilot basis with tanning process infrastructure support extended by a unit at Tanneries, Jajmau, Kanpur.

Fig 7.11 chrome tanning Process optimization at a unit at Jajmau, Kanpur

The R&D Activities were focused on:

a. Optimization absorption of chromium in tanning process through Process and Chemical interventions.

b. Restricted Operations from De-liming to Chrome tanning stage comprising different process stages including washing before de-liming, de-limiming, pickling, basification and chrome tanning.

c. Process and Chemical optimization in all the operations undertaken by observing following steps:

- Execution of Conventional process with no chemical/process intervention.
- Process wherein, conventional de-liming agents (ammonia salts) are substituted and other chemical interventions are incorporated but without improvisation in tanning drum and their configuration.
- improvisation in tanning drum and their configuration.

The Study included analysis of process specific wastewater for pH, COD, TDS, alkalinity, chloride and total Chromium and physico-chemical properties in tanned hide/side. Wastewater samples is undertaken at CPCB ZO Lucknow laboratory, while characterization of processed hides undertaken at the tannery.

The findings have revealed that percentage uptake of chromium by the hides is subjected to process optimization which could phenomenally increase to approx. 87 % against the generally achieved level of 40-50%.

7.9 Remediation of hazardous waste contaminated sites in Uttarpradesh

The consultancy project for Preparation of DPR and providing remediation of contaminated sites assigned to ERM,Gurgaon is being executed at two identified locations in U.P (Deva Road, Lucknow and Rania, Kanpur). Deva Road is contaminated with chlorinated pesticides by and Rania area is contaminated with Cr (VI). A summarised status of work for the sites referred above is appended as under :

A Pesticide contaminated area Remediation:

- The preliminary investigation, detailed investigation and Risk Assessment pesticide contaminated areas have been carried out near pesticides unit and Deva Road
- Groundwater flow direction has been assessed based on groundwater level measurements in existing dug-wells, The overall groundwater flow direction at pesticides unit reported from the northwest to southeast direction for IPL site and from the northwest to southeast direction for Deva Road site.
- Both Deva road and pesticides UNIT sites are confirmed pesticide contaminated areas.
- There are 07 areas of potential concerns (AoPC) identified in the study areas. Five AoPCs are identified around pesticides Site whereas, two AoPCs are identified at Five Deva Road site.
- Benzene Hexachloride (γ -BHC/ γ-HCH) have been found Sin soil samples in concentrations greater than screening values at shallow (<=1.5 m) and deep (>1.5m) intervals.
- Comprehensive analysis indicates numerous organic compounds (potential CoCs) exceeding the screening values and exceeding the background values.
- Concentration values of Chlorobenzenes, Monochlorophenols, Dichlorophenols, Trichlorophenols, BTEX ,Trichloroethene in soils and sediment exceed Canadian screening values.

B. Hexavalent Chromium contaminated area at Remediations

- The preliminary, detailed investigation have been undertaken and Risk Assessment investigation in and around hexavalent chromium contaminated areas at Rania, Kanpur Dehat (UP)
- Groundwater flow direction has been assessed for the Primary and Extended Study areas based on groundwater level measurements carried out in existing dug-wells, the overall groundwater flow direction is reported towards south and south-west.
- Primary Study area and Extended study areas are confirmed Chromium Hexavalent contaminated areas.
- There have been identified , five (historical) sources of chromium contamination due to past storage / processing of chromium based chemicals / sludge. Additionally there are five areas identified as areas of potential concerns (AoPc)
- Preliminary investigations confirm chromium in waste samples, soil samples and groundwater samples in concentrations greater than screening values.

- Comprehensive analysis indicates Chromium hexavalent (potential CoCs) exceeding the screening values and exceeding the background values.
- Based on Screening of samples exceedances were recorded in Total Chromium , Hexavalent Chromium in soil and gound water and Arsenic in Soil .
- Detailed Risk Assessment has also carried out and report submitted to Techcial Expert committee finalized . Site Specific Target levels for Risk Assesement contaminated site . Implementation of NABL laboratory Accredited system at central laboratory as per ISO 17025.
- Implementation of NABL laboratory Accreditation System as per ISO 17025:
- The Central laboratory of central Pollution Board at central laborities HQs Delhi has carried out necessary documentation and quality control activities related to analysis of fresh water, wastewater ,soil & hazardous waste, for implementation of laboratory Accreditation System as per ISO 17025. The internal as well as external audit of constitutent laboratories have been understatus for its NABL scope parameters for analysis of water, wastewater, soils & solid waste samples .

CHAPTER – VIII

ENVIRONMENTAL TRAINING

During the year 2015-16, CPCB has organized 24 training programmes through reputed training/R&D/ Professional institutes in various priority areas related to environment. The details of the training programmes is as under:

❖ **Environmental Planning and Management**

- Air Quality Management – Plans using decision support system UrbAir India
- Environmental Impact Assessment – Methods and Procedures
- Recent Trends in Environmental Monitoring & Control Strategies in Petroleum & Petrochemical Industries, References

❖ **Environmental Monitoring and Assessment**

- Ambient Air and Stack Monitoring Technique – Hands-on-Training
- Monitoring of PM 2.5 and other notified Air Pollutants as per revised NAAQS
- Monitoring Techniques of Organic Pollutants (PAH and VOC)
- National Ambient Noise Monitoring Network – Design, Implementation and Control Technique
- Source Emission Monitoring for Notified Parameters
- Water Quality Monitoring, Network Design, Sampling, Analysis and Quality Assurance.

❖ **Hazardous Substances/Solid Waste/Bio-Medical Waste Management**

- Batteries and Electronic Waste Management – Rules and Practical Aspects
- Bio-Medical Waste Management in Healthcare and Common Bio-Medical Waste Treatment Facilities
- Collection, Storage, Handling and Disposal of Plastic Wastes.
- Investigation, Remediation and Management of Soil and Groundwater Contaminated Sites

- Municipal Solid Waste Management – Collection, Transportation and Disposal

❖ **Laboratory Management, Analysis and Quality System**

- Calibration of Instrument/Equipment and Measurement of Traceability/ Uncertainty of Chemical and Biological Parameters
- Laboratory Quality System, Management and Internal Audit as per ISO/IEC 17025: 2005.

❖ **Pollution Control (Waste Management, Clean Technologies)**

- Clean Development Mechanism (CDM): CDM Project Implementation for Industrial Sector, Wasteland Sector, Mining Sector and Carbon Trading

- Design, Operation and Maintenance of STP, CETP, CBMWTFs
- Environmental Monitoring, Control and Implementation of Pollution Control (Distilleries, Textiles, Sugar, Cement, Thermal Power Plant, Iron & Steel, Aluminium, Lead, Copper and Zinc Smelting Units)
- Four R's – Reduce, Reuse, Recycle and Recover – Case Studies

❖ **Environmental Policy, Law Education and Economics**

- Environmental Legislations, Interpretation, Enforcement, Legal and Statutory Requirements – Case Studies

❖ **Environmental Information**

- Vehicular Emission and Exhaust Monitoring (Receptor and Dispersion Modelling)

❖ **Environmental Health Impact**

- Impact of Ozone and Other Pollutants on Crops
- Occupational Health & Safety Management System (OHSAS) 18001: 2007.

- Four hundred sixty personnel from CPCB, State Pollution Control Boards/Committees/Universities and other Government Agencies benefited from the training programmes conducted by CPCB.
- ETU also organized the five training programmes related to administrative aspects for the officials of admin & allied cadre. More than eighty personnel from CPCB Head Office as well as Zonal Offices are attending the following training programme:
  - RTI Act and its Impact on Governance & Vigilance
  - Noting & Drafting, Filing System and Record Management
  - Computer Training on Basics viz. MS Office Suite, etc.
  - Roster Preparation and Reservation in Services Government Policy for SCs/STs, OBCs and Physically Handicapped & Recruitment Rules
  - Organizational Behaviour and Attitude
- Nineteen CPCB officials participated in training programmes organized by other organizations viz. CSE, Delhi, MoUD, DST etc.
- Twelve CPCB officials participated in international training programmes/workshop/ seminars etc. during 2015-16 sponsored by the other organizations.
- As a yearly routine process, college students were trained through their internship period on their specialized subjects during their winter and summer vacations.

CHAPTER – IX

ENVIRONMENTAL AWARENESS AND PUBLIC PARTICIPATION

9.1 LIST OF PUBLICATIONS PRINTED DURING THE YEAR 2015-16:

1. Status Report of the Fluorescent Lighting Sector: CUPS/83/2014-15.
2. Inventorization of Sewage Treatment Plants CUPS/84/2015-16.
3. Atmospheric Boundary layer over Delhi and an Assessment on Dispersion of Air Pollutants: LATS/21/2015-16.
4. Studies on Impact of Air Pollution on Corrosion of Metallic and Non Metallic Materials: IMPACTS/20/2015-16.
5. Status of Ambient Noise Pollution during Deepawali in India: NANM/1/2015-16.
6. River Stretches for Restoration of water quality: MINARS/37/2014-15.
7. National Ambient Quality Status and Trends 2012: NAAQMS/38/2014-15.
8. National Ambient Quality Status and Trends 2011: NAAQMS/39/2013-14.
9. Water Quality of River at Inter State IRBM/1/2015.
10. Water Quality Assessment of Religious water Bodies in Mathura SCS/1/2015-16.
11. System Procedure for Compliance to Emission Limits for Petrol and Kerosene run Generator sets upto 19kW PCLS/10/2014-15.
12. System Procedure for Compliance to Emission Limits for Diesel Engines (up to Gross Mechanical Power 800kWm) for Genset Applications PCLS/11/2014-15.
13. Annual Report 2014-15 (Hindi).

9.2 EXHIBITIONS:

During the year 2015-16, CPCB participated in following exhibitions:

1. Government Achievements & Schemes Expo-2015 during 29th to 31st July, 2015 at Pragati Maidan, New Delhi.
2. "Banaras International Trade Fair 2015 from 16th August - 23rd August 2015 at Benai Bagh, Varanasi, Uttar Pradesh.
3. India International Science Festival (IISF) during 04th to 08th December 2015 at IIT-Delhi
4. India International Trade Fair (IITF) 2015 during 14th – 27th November, 2015 at Pragati Maidan.
5. International Exhibition and Conference on Water, Waste water treatment, Solid Waste Management & Pollution Control organized by Messe Frankfurt India during 29th - 30th September 2015 at Le Meridien, New Delhi.
6. 103rd Indian Science Congress: Pride of India Expo to be held at University of Mysore Karnataka from 3rd January to 7th January 2016-reg.

9.3 Activities of NGO Cell (2015-16):

An NGO Cell was set up in CPCB in the year 1992 to coordinate the following tasks:

- Enlist environmental NGOs involved in activities related to pollution control with CPCB;
- Establish NGO network in consultation with State Pollution Control Boards/Zonal Offices;
- Provide training to the NGOs and equip them with facilities, like water testing kits, analytical instruments, books, literature etc. in order to enhance their capabilities in the field of pollution control; and
- Organise mass awareness programmes and pollution control activities through NGOs.

During 2015-2016, 13 NGOs were additionally enlisted with CPCB subject to concurrence of concerned CPCB Zonal Offices apart from 776 NGOs enlisted during the previous years. A rebate @ 50% is extended for the purchase of CPCB publications, to NGOs enlisted with CPCB and several NGOs have availed this facility during 2015-2016.

Financial Assistance of Rs. 10,000/- each have been provided to 9 NGO's for organizing Mass Awareness Programme on abatement of pollution during the year 2015 - 2016.

9.4 CPCB Web Site:

Website management & updation is continued activity to disseminate information/data among public through Internet. CPCB is in the process of upgrading existing website with the following broad features/ technologies:

- Confirming to Guidelines for Indian Government Website (GOIGW)
- Standard Testing Quality Certification (STQC)
- Cyber Security Clearance from CERT in Empaneled Security Auditor
- Inbuilt Content Management Solution (CMS) in PHP or JSP Technology
- Bilingual Website (Hindi & English)

Activities undertaken during the financialyear 2015-16:

- Automatic updation of Air Quality Index (AQI) Bulletin every day.
- New webpages in existing website to upload directions issued under online monitoring of industrial emission and effluent
- Regular updation of data and information on critically polluted areas, air quality, water quality, SOPs, status of compliance, etc.
- Redesigning of present Website.

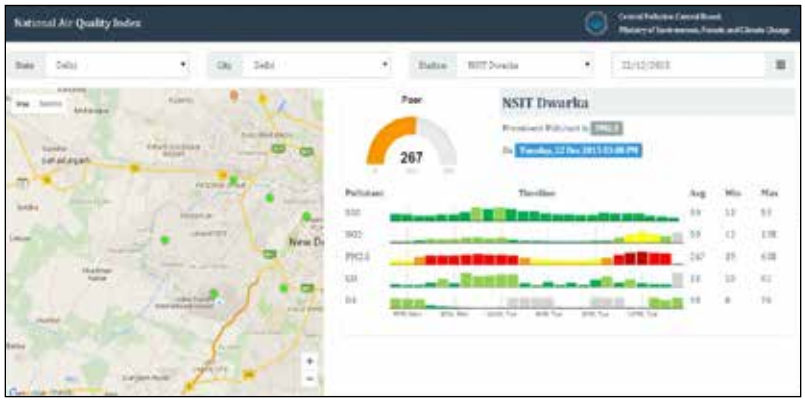
CPCB's Website contains huge data and rich information. The users' response/access to CPCB site has been very good. During the period from 1st April, 2015 to 20th 31 March, 2016, number of hits were more than 6.88 crore, out of which 94.44% hits were successful. In total, 25,19,061 visits were made to the site, 42.74% of these visits were by the international users. The average duration of visit lasted more than 9 minutes.

Integrated Data transmission from Real-time Systems to CPCB Continuous Ambient Air Quality Monitoring (CAAQM)

CPCB, SPCBs and PCCs monitor ambient air quality of different cities and publish real-time data in public domain for taking corrective measures in time. About 51 Continuous Ambient Air Quality Monitoring

stations (CAAQMS) are operating in the country in this sector. CPCB has been relentlessly working on continuous operation and connecting data of these CAAQM stations on a network. The project is being executed to bring in data from all the operational stations.

In the beginning of the year, CPCB network had data connected from 27 stations in 10 cities spread in 6 States. A National Air Quality Index, which combines the effect of all air quality parameters and generates a single number, has been developed by CPCB. The National AQI communicates air quality in simple terms of one number and one colour for general public. Air Quality Index (AQI), inaugurated by the Hon'ble Prime Minister of India, is being continuously published on a web portal of CPCB, updated on hourly basis. The AQI software fetches the ambient air quality data from the CAAQM stations and publishes the values of AQI for each parameter at each station.



There is no human interference in the process of fetching the data and publishing it. This application has become very popular and has created awareness in the field of environment. Media has also started reporting the air quality in the country on day-to-day basis, especially in Delhi city. Now this network has been expanded to include 51 stations located in 33 cities of 12 States.

AQI Bulletin containing the data for each city is published every day at 4:00 pm for further easy understanding of the citizens. The entire process of generating AQI values, publishing every hour, preparation of bulletin and uploading it on CPCB website are automated.

State-wise Status:

Following is the list of CAAQM stations installed at different states and data of these stations is being used to display the AQI by CPCB:

S. No.	State	Cities	No. of CAAQM stations
1	Andhra Pradesh	Visakhpatnam, Tirupati	02
2	Bihar	Muzzafarpur, Patna, Gaya	03
3	Delhi	Delhi	07
4	Gujarat	Ahmedabad	01
5	Haryana	Faridabad, Gurgaon, Panchkula , Rohtak	04
6	Karnataka	Bengaluru	05
7	Maharashtra	Aurangabad, Chandrapur, Mumbai, Navi Mumbai, Pune, Solapur, Nagpur, Nashik, Thane	10
8	Rajasthan	Jaipur, Jodhpur	02
9	Tamil Nadu	Chennai	03
10	Telangana	Hyderabad	03

S. No.	State	Cities	No. of CAAQM stations
11	Uttar Pradesh	Agra, Kanpur, Lucknow, Varanasi	06
12	West Bengal	Durgapur, Haldia, Howrah, Kolkatta	05

Implementing organizations along with details of responsibilities:

1. **SPCBs/PCCs:** Installation and O& M of the CAAQM stations.
2. **CPCB:** Installation and O&M of CAAQM stations and integration of data from all the CAAQMS stations installed by different organizations on a single platform and generation of AQI.

Integrated Data transmission from Real-time Systems to CPCB Industrial Emission and Effluent Monitoring Network

In view of advancements made in technology of pollution monitoring, automation in instrumentation/ equipment and e-Governance measures for effective action, CPCB has planned to bring in data of online measurements from industrial units for emissions and effluents discharged into the environment. This activity is started with highly polluting industries in 17 Categories of Industries and Grossly Polluting Industries located on the banks of River Ganga.

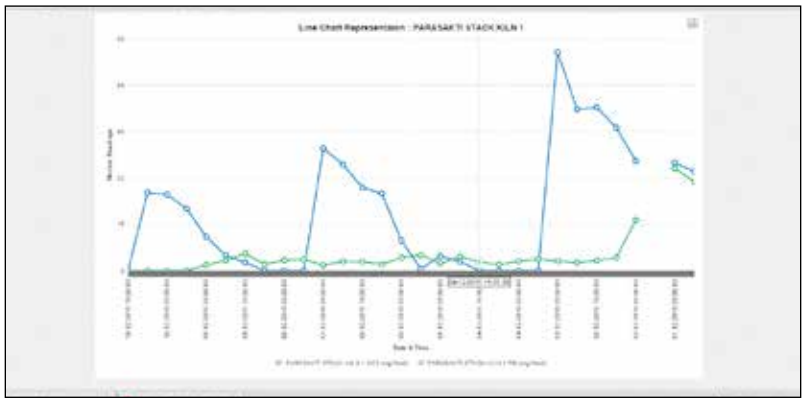
At present CPCB is getting information and data from 53 instruments' manufacturers and suppliers. As the protocols and technologies in this field of measurement vary, it is decided to accept the data from individual firms through the cloud servers. In order to ensure a tamper-proof mechanism, efforts are being made to see that a comprehensive database is generated, wherein information is available on health of the instruments and calibration status. If required, the regulatory authorities could remotely audit the online system to know its functional efficiency.

During the year CPCB made it mandatory to all 17 Categories of Industries and GPIs to install real-time emission and effluent monitoring systems, so that consistent information flows to all of its stake holders like SPCBs/PCCs, CPCB and industrial units. This work is being done with the help of various Instrument Suppliers as most of these instruments are imported with their own central software through which data could be continuously made available at a central location. More than 53 Instrument Suppliers are involved in this activity in the country assisting industries to install, operate and transmit data on regular basis (24X7) to CPCB & SPCBs/PCCs, which has become a tool of the day.

The system is heterogeneous as each industry installs instruments as per their requirement, availability and understanding. Presently 1297 industries have installed Emission Monitoring Systems and Effluent Monitoring Systems and data is being transmitted continuously to CPCB and various SPCBs. The online data is being scrutinized and alerts are generated for respective industrial Unit Heads, officials looking after the specific sector/ category of industries at CPCB and SPCBs/PCCs. These alerts act as useful and timely information to act immediately to stop the identified pollution source within shortest possible time.

Map View

Latest data availability



Report

State-wise Status: Following is the state-wise list of total number of industries, 1297 whose data is being transmitted to CPCB.

S.No.	State	No. of Industry
1.	Andhra Pradesh	60
2.	Assam	09
3.	Bihar	09
4.	Chhattisgarh	37
5.	Daman & Diu	01

6.	Delhi	13
7.	Goa	05
8.	Gujarat	111
9.	Haryana	64
10.	Himachal Pradesh	14
11.	Jammu and Kashmir	04
12.	Jharkhand	32
13.	Karnataka	59
14.	Kerala	11
15.	Madhya Pradesh	55
16.	Maharashtra	129
17.	Meghalaya	09
18.	Orissa	53
19.	Puducherry	03
20.	Punjab	62
21.	Rajasthan	79
22.	Sikkim	01
23.	Tamil Nadu	101
24.	Telangana	50
25.	Tripura	02
26.	Uttar Pradesh	220
27.	Uttarakhand	42
28.	West Bengal	62

Implementing organizations along with details of responsibilities:

1. **Industries:** All 17 categories of industries and Common Effluent Treatment Plants (CETP) should install online real-time monitoring systems and the real-time data has to be transmitted to CPCB.
2. **SPCBs/PCCs and CPCB:** Continuous monitoring of the data received from Industries and to control the pollution through generation of SMS alerts and e-mail alerts to the Industries who are violating the pollution standards prescribed by SPCB and CPCB.

9.5 Deepawali awareness campaign

Deepavali awareness campaign was promoted among the public and letter were addressed to various departments, regulatory authorities, universities, education institutions, schools and colleges in Southern Zone requesting them to create awareness among public and students to avoid bursting of crackers as a social responsibility. Each staff in this office was assigned to forward the soft copy of the letter to minimum 10 people with a request to forward it to at least 10 others, thereby an awareness chain was created and reached large number of people. Zonal office, Bengaluru conducted Deepavali awareness programme at Don-Bosco School and pre-university college, Chitradurga on November 9, 2015 to promote the awareness on need of celebration of Eco-Diwali involving more than 500 students. In public interest advertisement was released in colour format in four leading newspaper on Sunday, 8th November, 2015 in Southern zone to observe environmentally friendly deepavali.

9.6 Ganesha festival awareness campaign

Ganesha festival awareness was created to avoid the use of PoP idols by showing short video, power points and also circulated among staff, public and students to encourage the celebration of Ganesha festival using clay Ganesha.

9.7 केन्द्रीय बोर्ड में राजभाषा नीति का कार्यान्वयनः

केंद्रीय प्रदूषण नियंत्रण बोर्ड अपने मुख्य कार्यालय और आंचलिक कार्यालयों में भारत सरकार की राजभाषा नीति लागू कर रहा है। हिन्दी अनुभाग द्वारा भारत के संविधान में निहित संघ की नीति के अनुसार राजभाषा अधिनियम और राजभाषा (संघ के शासकीय प्रयोजनों के लिए प्रयोग) नियमों के साथ ही इस संबंध में भारत सरकार द्वारा समय–समय पर जारी किए आदेशों के अनुसार राजभाषा का अनुपालन सुनिश्चित किया जाता है।

वर्ष 2015 –2016 के दौरान केंद्रीय प्रदूषण नियंत्रण बोर्ड ने अपने अधिकारियों/कर्मचारियों को राजभाषा के प्रति संवेदनशील बनाने के लिए चार हिन्दी कार्यशालाओं का आयोजन किया। इन कार्यशालाओं में केन्द्रीय बोर्ड के 100 अधिकारियों और कर्मचारियों ने भाग लिया।

गत वर्षों की भांति इस वर्ष भी केन्द्रीय प्रदूषण नियंत्रण बोर्ड में 14 सितंबर, 2015 को श्री जे एस कम्योत्रा, निदेशक, केन्द्रीय प्रदूषण नियंत्रण बोर्ड की अध्यक्षता में हिन्दी दिवस समारोह का आयोजन किया गया। इस अवसर पर आयोजित विभिन्न प्रतियोगिताओं में केन्द्रीय बोर्ड के कर्मचारियों ने सक्रिय रूप से भाग लिया। सभी प्रतियोगिताओं के विजेताओं को नकद पुरस्कार से सम्मानित किया गया। हिन्दी दिवस कार्यक्रम की शोभा तब और अधिक बढ़ गई जब हिन्दी के सुप्रसिद्ध हास्य कवि श्री राजेन्द्र राजन और श्री गुनवीर सिंह राणा ने अपनी हास्य कविताओं से उपस्थित अधिकारियों/कर्मचारियों को आनंदित किया। निदेशक और विशेष अतिथि श्री राजेन्द्र राजन और श्री गुनवीर सिंह राणा द्वारा एक हिन्दी पुस्तक **'मथुरा में धार्मिक जल स्रोतों की जल गुणवत्ता का मूल्यांकन'** का लोकार्पण किया गया।

निदेशक एवं मुख्य अतिथि पुस्तक का लोकार्पण करते हुए

वंदे मातरम के समय उपस्थित मंचासीन अधिकारी

समारोह में उपस्थित अधिकारी एवं कर्मचारी

आचंलिक कार्यालयों एवं परियोजना कार्यालय आगरा में हिन्दी संबंधी गतिविधियां

केन्द्रीय बोर्ड के मुख्यालय की भांति सभी छः आचंलिक कार्यालयों व परियोजना कार्यालय आगरा में भी वर्ष 2015–16 के दौरान राजभाषा अधिनियमों का अनुपालन सुनिश्चित किया गया। इस क्रम में सभी आंचलिक कार्यालयों में विभागीय राजभाषा कार्यान्वयन समिति की नियमित बैठकें आयोजित की गई और कर्मचारियों एवं अधिकारियों को अपना सरकारी काम–काज हिन्दी में करते समय आने वाली कठिनाई व झिझक को दूर करने के लिए 04 कार्यशालाएं आयोजित की गई। इसके साथ ही सितंबर माह में हिन्दी दिवस के दौरान विभिन्न प्रतियोगिताएं जैसे हिन्दी टंकण प्रतियोगिता, टिप्पण आलेखन प्रतियोगिता, लिखित प्रतियोगिता एवं श्रुतलेख का आयोजन किया गया, जिसमें सभी अधिकारियों एवं कर्मचारियों ने सक्रिय रूप से भाग लिया।

To promote the use of Rajbhasha Hindi, Hindi Diwas was celebrated at CPCB Zonal Office, Bengaluru. During the occasion Hindi noting and drafting, debate and Kavitha recitation competitions were conducted. Hindi quarterly progress report has been prepared and submitted to department of official language, Bengaluru and Town official language implementation Committee, Bengaluru.

The jurisdiction of Zonal Office, Bhopal covers Madhya Pradesh, Chhattisgarh and Rajasthan states which are under “Ka” Kshetra. In compliance of the Rajbhasha Rules most of the correspondence and office work is being done in Hindi only. Zonal Office, Bhopal is also notified under Rule 10(4) of Rajbhasha Act 1976. Sincere efforts are being made for continuous implementation of Rajbhasha in office. As per the Rajbhasha rules quarterly meeting and workshop have been organised in association with local office of Department of Official Language. Several events and competition like Hindi quiz, Shabdavali, Unicode typing and Shrutilekh have been organised during 31 August to 14 September, 2015 in celebration of Hindi Fortnight. Office has also published Hindi e-patrika ‘Paryabhash’ which comprises various articles related to current environmental issues. Zonal Office also awarded with Second Prize of “Regional Rajbhasha Award for 2014-15”.

In commemoration of Hindi Diwas (14th September) CPCB Zonal Office, Lucknow observed Hindi Fortnight during 14.09.2015 to 24.09.2015. During the period various in-house events organized at the Zonal Office included, essay writing competition, noting-drafting competition, poetry competition for the staff and officers of the Zonal Office.

9.8 World Environment Day:

Zonal Office, Bengaluru:

World Environment Day was observed on June 5, 2015 at Zonal Office, Bengaluru to promote awareness and to instil sense of responsibility among all staff. WED is a "Festival of theEnvironment" which is a symbolic celebration to save our planet. Technical presentation and video on theme were also arranged during the occasion. Message was conveyed to adopt the best management practices to reduce the negative impact on the globe. Sh. N. K. Verma, Ex-Addl Director, CPCB was invited a s special guest on occasion. He shared his experience and few case studies regarding hazardous waste management.

Project office-Agra

World Environment Day-2015 was celebrated in Agra city on 5th June.2015. The distribution of pamphlets, stickers at various locations including Tajmahal, Etmad-ud-daulah, Rambagh, Dholpur House and other places were carried out by CPCB Staff on the World Environment Day.

Participated in world environment day program organized by the Institution of Engineers (India) in Agra which included discussion on environmental issues of Agra, pollution control measures and mass awareness activities in Agra. Saplings were also distributed to participants for plantation.

Zonal Office, Bhopal:

World Environment day is celebrated every year on 5th June all over the world to stimulate awareness as well as to enhance public attention and action on the issues related to environment. On this occasion a series of awareness programmes was organised during 01 June to 5 June, 2015. Zonal Office, Bhopal has

organized one week programme on WED-2015 in the series of event plantation, mass awareness regarding ill effect of plastic, talk shows, free vehicle monitoring camp and environmental quiz among the school children have been organized to give message of Environment protection. All the programme of WED is based on the theme "Seven Billion Dreams. One Planet. Consume With Care" given by UNEP.

Zonal Office, Vadodara

The Western Zonal Office organized event of drawing competition for the primary school kids as a part of mass awareness programme to celebrate World Environment Day on 5th June, 2015 at Community Science Center, Vadodara. The Zonal Office also supported seminar organized by Department of Environmental Studies of the M.S. University of Baroda to celebrate World Environment Day.

Participants for Drawing Competition

Zonal office –Lucknow:

World Environment Day 2015 was celebrated by Central Pollution Control Board, Zonal Office (North), Lucknow, with the objective to raise awareness on environment & to mobilize action by all stakeholders.

Following awareness activities were carried out by the CPCB Zonal Office, Lucknow:

1. Banner display at PICUP Bhawan
2. In-house Plantation within the PICUP Bhawan premises
3. Conference
4. 'VrikshBhandara' free distribution of 200 saplings in association with NGO Haryali
5. Pamphlet distribution
6. Issue of press note & awareness message in newspaper

9.9 Trainings and Resource Development:

Students from various universities/ colleges were imparted training on ambient air quality monitoring time to time as per their requests. Specific requirements for an ambient air quality monitoring were described and demonstrated during their trainings/visits. The training provided to the officials from SPCB / students/ officials from organizations during year 2015-16 are as follows.

(i) Training to officials of Arunachal SPCB was provided wherein Comprehensive training programme comprising theory and practical on 'Ambient Air Quality Monitoring' was organised during March 10-19, 2015.

(ii) Students of B.Sc (Env. Science) of Pachhunga University College (Mizoram University) and their faculty members visited CPCB's laboratories on December 11, 2015.

(iii) Students of K.V.Tagore garden, New Delhi and their faculty members visited CPCB's laboratories.

Lecture delivered to students of K.V. Tagore garden, New Delhi

Group photograph of students of K.V.Tagore garden, New Delhi

(iv) Students of ARSD College, University of Delhi, Dhaula Kuan, New Delhi and their faculty members visited CPCB's laboratories.

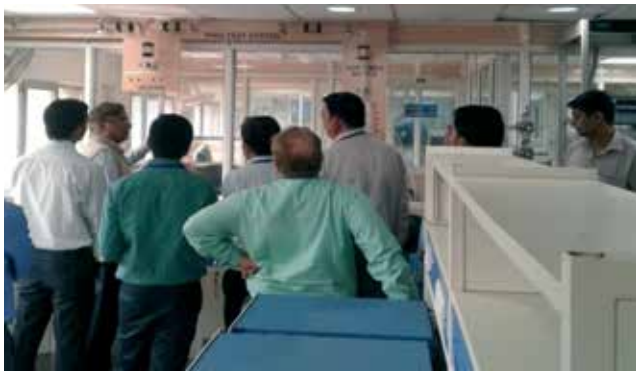
Lecture delivered to students of ARSD College ,University of Delhi

(v) Students of P.G Environmental Science, University of Kashmir Srinagar and their faculty members visited CPCB's laboratories.

Laboratry & experimental demonstration to Students of P.G Environment Science, University of Kashmir Srinagar

(vi) Demonstrations of laboratory activities to IFS officers

(vii) Air Lab demonstrated the facility of QA/QC (Ring Test System) & Primary Calibration System (Static Injection) to the delegates of ONGC and Environmental Consultants during their visit in CPCB on March 04, 2016.



(viii) "Gaps in the Source Emission Monitoring and specification of Instruments have been worked out and presented at various occasions.

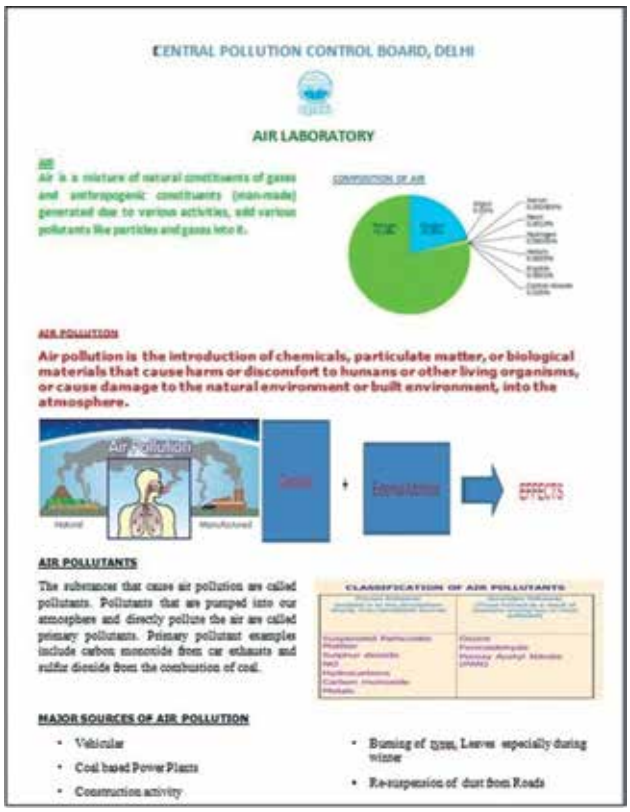
(ix) Organized comprehensive (divided in 7 level) in-house training on "Combustion, air pollution, monitoring and QA/QC in emission monitoring" for own technical personnel as human resource development activities.

(x) Training cum Practical Demonstration on QA/QC (Ring Test System) & Primary Calibration System (Static Injection) was organised for the officials of CPCB ZOs (Lucknow, Bengaluru, Kolkata & Vadodara) from February 18-19, 2016.

9.10 Leaflets for Visitors:

CPCB, Air Laboratory has prepared different Leaflets and pamphlets related to First-aid, Work descriptions and equipment present in Laboratory, Industrial health & security management system, Disaster management and students specific information of Air pollution standards & measuring methods and display of data, etc., for the visitors and trainee from SPCBs and students of different Universities, Colleges and Schools.

Browsers and pamphlets are shown below:



CENTRAL POLLUTION CONTROL BOARD, DELHI

AIR LABORATORY

AIR

Air is a mixture of natural constituents of gases and anthropogenic constituents (man-made) generated due to various activities, add various pollutants like particles and gases into it.

COMPOSITION OF AIR

AIR POLLUTION

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere.

Air Pollution

Natural

Manufactured

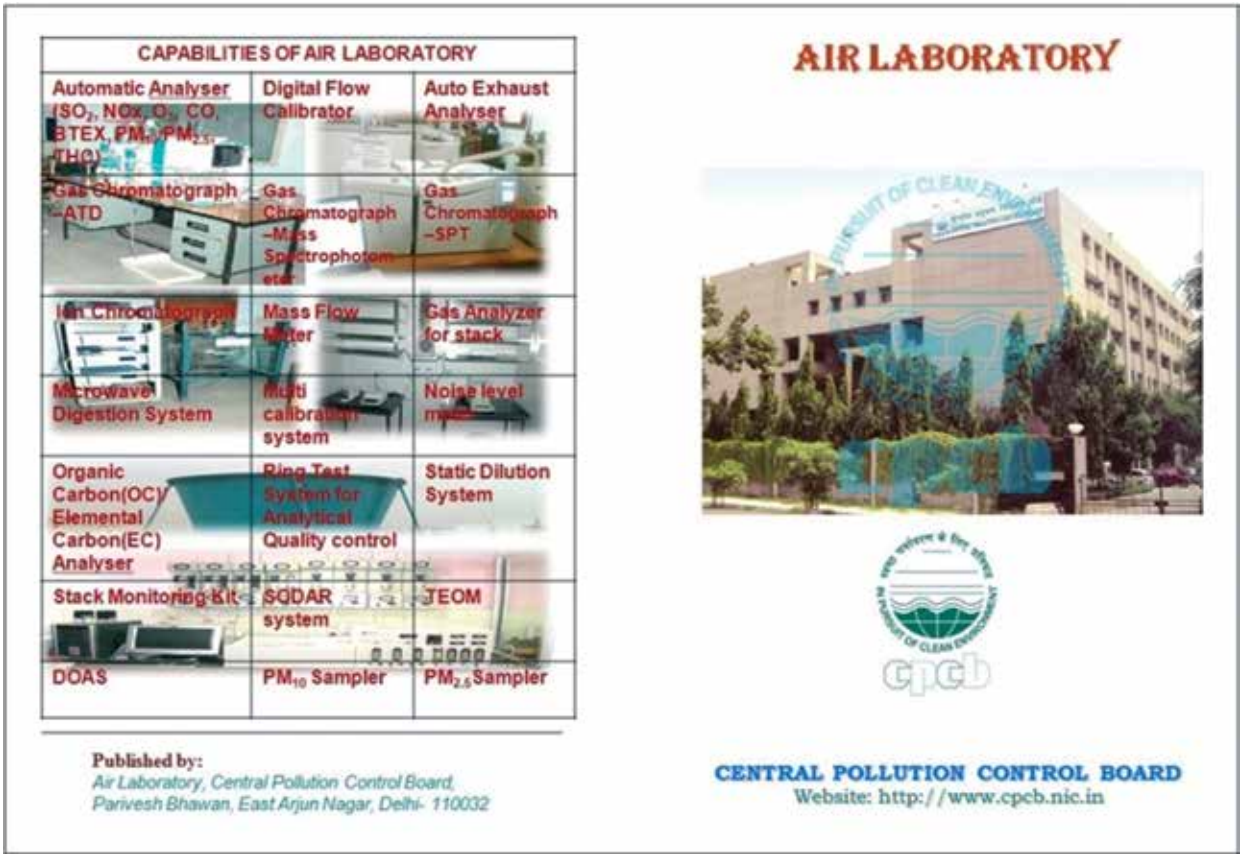
AIR POLLUTANTS

The substances that cause air pollution are called pollutants. Pollutants that are pumped into our atmosphere and directly pollute the air are called primary pollutants. Primary pollutant examples include carbon monoxide from car exhausts and sulfur dioxide from the combustion of coal.

CLASSIFICATION OF AIR POLLUTANTS

MAJOR SOURCES OF AIR POLLUTION

- Vehicular
- Coal based Power Plants
- Construction activity
- Burning of tyres, Leaves especially during winter
- Re-suspension of dust from Roads



CAPABILITIES OF AIR LABORATORY

Automatic Analyser (SO_2, NOx, O_3, CO, BTEX, PM_{10}, $PM_{2.5}$, THC)	Digital Flow Calibrator	Auto Exhaust Analyser
Gas Chromatograph –ATD	Gas Chromatograph –Mass Spectrophotometer	Gas Chromatograph –SPT
Ion Chromatograph	Mass Flow Meter	Gas Analyzer for stack
Microwave Digestion System	Multi calibration system	Noise level meter
Organic Carbon(OC)/ Elemental Carbon(EC) Analyser	Ring Test System for Analytical Quality control	Static Dilution System
Stack Monitoring Kit	SODAR system	TEOM
DOAS	PM_{10} Sampler	$PM_{2.5}$ Sampler

Published by:
Air Laboratory, Central Pollution Control Board,
Parivesh Bhawan, East Arjun Nagar, Delhi- 110032

AIR LABORATORY

CENTRAL POLLUTION CONTROL BOARD
Website: http://www.cpcb.nic.in

आपातकालीन दूरभाष

आपातकालीन नियंत्रण कक्ष : 43102030, 43102485
(ऑफिस समय 09.30 से 06.00 बजे शाम)
43102486 (ऑफिस समय के बाद)

प्रशासन : 22306281, 9873005711
भवन प्रभाग : 22301122, 9873010853
सुरक्षा : 43102486/43102485
दूरभाष आपरेटर : 43102030
पुलिस: 100, 22159871
दमकल:101, 22417747
एम्बुलैंस: 102, 1099
हेडगेवार अस्पताल: 22382686

प्रबंधन प्रतिनिधि : 9717166653
सदस्य सचिव : 9911110236

असेम्बली पाइंट

1. मुख्य दवार के पास
2. डी.जी. सेटो के पीछे पार्क में

संदर्भ दस्तावेज: आपातकालीन मुस्तैदी योजना
(दस्तावेज संख्या सी.पी.सी.बी. : ई.पी.पी. : 01)

आपातकालीन प्रबंधन प्रक्रिया

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
भारत सरकार
वेबसाईट: www.cpcb.nic.in

व्यावसायिक स्वास्थ्य और सुरक्षा नीति

केन्द्रीय प्रदूषण नियंत्रण बोर्ड देश में पर्यावरणीय प्रदूषकों और प्रदूषण नियंत्रण के प्रबोधन के क्षेत्र में एक अधिदेश प्राप्त शीर्ष निकाय है और यह पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय का वैज्ञानिक एवं तकनीकी सलाहकार होने के नाते, इस संगठन के अभिन्न भाग के रूप में निम्नलिखित द्वारा सभी वैज्ञानिक कर्मचारियों को सुरक्षित और स्वस्थ कार्य की स्थिति को बनाये रखने के लिए प्रतिबद्ध है:

- लागू व्यावसायिक स्वास्थ्य और सुरक्षा नीति, नियमों और संबंधित अन्य आवश्यकताओं को लागू करने के लिए प्रतिबद्धता
- नमूने लेने और प्रयोगशाला में परीक्षण के दौरान परिसंकटों पर नियंत्रण
- व्यावसायिक और सुरक्षा परिसंकटों की वजह से खतरों पर नियंत्रण/खतरों को कम करना/उनके विलोपन के लिए उद्देश्यों और लक्ष्यों को निर्धारित करना
- व्यावसायिक स्वास्थ्य और सुरक्षा (ओ.एच एण्ड एस) की संभावनाओं पर वैज्ञानिक कर्मचारियों के उपयुक्त प्रशिक्षण की संरचना
- इसके व्यावसायिक स्वास्थ्य और सुरक्षा निष्पादन में निरन्तर सुधार के लिए प्रतिबद्धता
- इसकी सतत सार्थकता, पर्याप्तता और प्रभाविकता को सुनिश्चित करने के लिए व्यावसायिक स्वास्थ्य और सुरक्षा प्रबंधन सिस्टम की आवधिक समीक्षा
- सभी वैज्ञानिक कर्मचारियों और संबंधित पार्टियों को व्यावसायिक स्वास्थ्य और सुरक्षा नीति के बारे में सूचित करना

15 अगस्त, 2014 अध्यक्ष
पंक्ति : 01
संशोधन : 00

संदर्भ दस्तावेज: आपातकालीन मुस्तैदी योजना
(दस्तावेज संख्या सी.पी.सी.बी. : ई.पी.पी. : 01)

व्यावसायिक स्वास्थ्य और सुरक्षा प्रबंधन सिस्टम

(आई.एस. 18001:2007/2012)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
भारत सरकार
वेबसाईट: www.cpcb.nic.in

सीपीसीबी में प्रशिक्षित प्राथमिक चिकित्सा सहायक

नाम	प्रभाग	मोबाईल नंबर
श्री संजय कुमार	एन आर टी ओ एल	9911867604
श्री श्री एस.के.शर्मा	भवन प्रभाग	9891349445
श्री जी.के आहूजा	जल प्रयोगशाला	9891093535
श्री पी कृष्णमूर्ति	वायु प्रयोगशाला	9968667028
सुश्री नमिता मिश्रा	उपकरण प्रयोगशाला	9811129041
श्री अभिजीत पाठक	वायु प्रयोगशाला	9971566700
डॉ योगिता खरायत	जैव विज्ञान प्रयोगशाला	9811109564
श्री सतीश कुमार	वायु प्रयोगशाला	9873421062
श्री पी.के. सक्सेना	भवन प्रभाग	9868830031
श्री वी.एन. मूर्ति	आई टी प्रभाग	9868283503
श्री आर.एस. राय	भवन प्रभाग	9810762847

नोट: प्राथमिक चिकित्सा सुविधा बॉक्स प्रत्येक प्रयोगशाला और रिशेप्सन पर उपलब्ध है।

संदर्भ दस्तावेज: आपातकालीन मुस्तैदी योजना
(दस्तावेज संख्या सी.पी.सी.बी : ई.पी.पी. : 01)

प्राथमिक चिकित्सा

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
भारत सरकार
वेबसाईट: www.cpcb.nic.in

CHAPTER – X

ENVIRONMENTAL STANDARDS INCLUDING SCHEDULE FOR THEIR ENFORCEMENT

10.1 Notification of Environmental standards

During last year, drafted 20 environmental standards, out of which 6 standards namely Thermal Power Plan, Common Effluent Treatment Plant, Sugar Industry, Diesel generating sets operated with LPG/NG, Diesel generating sets operated with petrol & kerosene, Diesel generating sets operated with diesel, have been notified in 2015-16 .

Central Pollution Control Board developed standards by technological consideration and placed in Peer and Core Meeting. The standards thus ratified by the Peer and Core Expert committee are placed in the Central Board's meeting for the consent. On the consent of Board, the standards are forwarded to the Government (Ministry of Environment & Forests) for notification under E (P) Act.

The proposed standard is presented before Hon'ble Minster of Environment and Forest with co benefits on environment and comparison with existing standards.

The approved standard is placed in Website for public comments and forwarded to concern Ministry for comment also. The draft notification of standard is placed before the Expert committee of MoEF & CC for finalisation for notification.

The final environmental standard is prescribed by SPCBs/PCCs in consent to operate (CTO) order of industry.

(1) Revision of environmental Standards for thermal power plants:

Existing emission limit for particulate matter was notified in November,1986. However, time to time emission limit of particulate matter was made stringent (from 350 to 150 mg/Nm^3). Based on the recommendations made in CREP, 2003, , particulate emission limit of 100 & 50 mg/Nm^3 for new/expansion plants is being prescribed since the year 2005 onwards while granting Environmental Clearance. There is no emission limit of SO_2 & NO_x as of now. In order to minimize the impact of same on air quality, taller stack height criteria is adopted.

It is expected that present installed capacity of 260 GW would be about 500 GW by the year 2032 (end of 15^{th} plan). Coal/lignite based power generation will play major role in achieving the target under Power for All. The share of coal/lignite based thermal power plants would be about 60% of total capacity. The pollution load w.r.t emission of particulate matter, sulphurdioxide & oxides of nitrogen will also increase by many folds due to rapid growth in power sector in coming years. Considering growth and pollution load from , the sector, the existing emission norms were revised. Further to conserve water usages in the sector, water consumption limit has also been also stipulated.

A: Emission Limit

Category of Thermal Power Plants (Units)	Existing Limit		Limit notified as on December 07, 2015			
	Particulate Matter	Stack Height Regulations	Particulate Matter	Sulphurdioxide (SO_2)	Oxides of Nitrogen (NO_x)	Mercury (Hg)
TPPs (units) installed before December 31 2003 (1)	150 mg/Nm^3	>500 MW : 275 m >210 MW : 220m <210 MW : based on formula H= $14(Q)^{0.3}$	100 mg/Nm^3	600 mg/Nm^3 (Units Smaller than 500MW capacity units 200 mg/Nm^3 (for units having capacity of 500MW and above)	600 mg/Nm^3	_ 0.03 mg/ Nm^3
TPPs (units) installed after 2003 to December 31, 2016 (1)	150 mg/Nm^3	-do-	50 mg/Nm^3	200 mg/Nm^3 (for units having capacity of 500MW and above)	300 mg/Nm^3	0.03 mg/ Nm^3
TPPs (units) to be installed from January 1, 2017 (2)	150 mg/Nm^3	-do-	30 mg/Nm^3	100 mg/Nm^3	100 mg/Nm^3	0.03 mg/ Nm^3

(1)- TPPs (Units) shall meet the limits within two years from date of the notification.

(2)- Includes all the TPPs (units) which have been accorded Environmental Clearance and are under construction.

B: Water consumption limit

	Existing	Proposed Limit notified in 2015
Water Consumption	No limit for water consumption however concentration based limit for discharge of pollutants have been notified earlier for ash pond effluent, cooling water discharge and Boiler Blow Down.	I. All plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption max. $4m^3$/MWh within 2 years period from the date of notification. II. All existing CT-based plants shall reduce specific water consumption upto maximum of 3.5m^3 /MWh within 2 years period from the date of notification. III. New plants to be installed after January 01, 2017 shall meet specific water consumption maximum of 2.5m^3 /MWh and achieve zero liquid discharge.

Likely Environmental benefits

1. Proposed emission will lead to reduction in emission of PM_{10} (0.98 kg/MWh) , sulhurdioxde (7.3 Kg/MWh) and Oxide of nitrogen (4.8 kg/MWh) which will in turn help in improvement in AAQ in and around thermal power plants.
2. Coal based power plants have also been identified as one of the source of mercury emission. The technology employed for the control of the proposed limit of SO_2 & NO_x will also help in control of mercury emission (at about 70-90%) as co-benefit.
3. Limiting the use of water in thermal power plant will lead to water conservation (about 1.5 M3/MWh) as thermal power plant is one of the water intense categories. This will also lead in reduction in energy requirement for drawl of water.

Protocol for sampling, analysis of coal and reporting of compliance in respect of implementation of the Gazette notification on use & supply of beneficiated coal in thermal power plants:

The protocol for sampling, analysis of coal and reporting of compliance on quarterly basis with respect to ash content in coal to be supplied and used by the thermal power plants covered under the provisions of the Gazette notification GSR 02 (E) dated January 02, 2014 on supply and use of beneficiated coal in thermal power plants was prepared. The objective is to ensure compliance of the quality of coal with respect to ash content, supplied and used by thermal power plants. The data generated shall help in evaluation of compliance level of the notification

Utilization of flyash

There are 164 thermal power plants with installed capacity of about 186242.88 MW as on May 31, 2016. Among these 39 plants new plants commissioned during 2014-15 or at the in the 4rth quarter of 2013-14. Fly Ash generation & utilization data has been received from 119 Coal/Lignite based Thermal Power Stations for Year 2015-2016 (April 2015 – March 2016). A short brief of analysed data is given in table below:

Period	2015 – 2016	2014-15
No. of Thermal Power Stations	119 (164)	145
Installed Capacity	133843.50 (185992.88)MW	1,38,915.80MW
Coal consumed	508.86266 Million Tonnes	549.72 Million Tonnes
Fly Ash Generation	158.84027 Million Tonnes	184.14 Million Tonnes
Fly Ash Utilization	97.43653 Million Tonnes	102.54 Million Tonnes
Percentage Utilization	61.34 %	55.69

State wise Status of compliance of notification dated 03.11.2009

Sl. No.	Name of State	No. of TPP's	Installed Capacity (MW)	Percentage Utilization %	No. of TPP's Achieved targeted Fly Ash Utilization	No. of TPP's NOT Achieved targeted Fly Ash Utilization
1.	Andhra Pradesh	04	7410	80.34	00	04
2.	Bihar	03	3820	34.28	00	03
3.	Chhattisgarh	13	12290	32.25	04	09
4.	Delhi	01	705	130.45	01	00
5.	Gujarat	11	14932	96.91	08	03
6.	Haryana	05	5988	110.52	03	02
7.	Jharkhand	06	4365.5	91.45	03	03
8.	Karnataka	03	3760	58.02	01	02
9.	Madhya Pradesh	07	14000	26.68	01	06
10.	Maharashtra	16	16470	68.18	05	11
11.	Orissa	05	7330	48.00	01	04
12.	Punjab	04	4620	85.04	01	03
13.	Rajasthan	07	7590	91.81	03	04
14.	Tamilnadu	09	6650	111.84	06	03
15.	Telangana	02	2820	36.09	00	02

16.	Uttar Pradesh	14	12658	47.90	09	05
17.	West Bengal	09	8375	86.40	06	03
	Total	**119**	**133843.50**	**61.34%**	**52**	**67**

Andhra Pradesh (80.34%), Bihar (34.28%), Chhattisgarh (32.25), ***Delhi (130.45), Gujarat (96.91%), Haryana (110.52%), Jharkhand (91.45%)***, Karnataka (58.02%), Madhya Pradesh (26.68%), Maharashtra (68.18%), Orissa (48.00%), Punjab (85.04%), ***Rajasthan (91.81%), Tamilnadu (111.84%),*** Telangana (36.09%), Uttar Pradesh (47.90%), and West Bengal (86.40%).

It can be observed from the above that during 2015 – 2016

1. Delhi, Haryana and Tamilnadu successfully achieved more than 100% Fly Ash utilization.
2. Andhra Pradesh, Gujarat, Jharkhand, Punjab, Rajasthan and West Bengal achieved more than 80% Fly Ash utilization.

Modes/Sectors of Fly Ash Utilization by Thermal Power Stations during Year 2015 - 2016

The Fly Ash Utilization different sectors/areas is given as under:

Sl. No.	Sectors of Utilization	Quantity of Fly Ash Utilized (T)	Percentage Utilization
1.	Cement Industry	35105035	36.03%
2.	Land Fill & Back filling of Mines	20102514	20.63%
3.	Building Products (Bricks, Tiles etc.)	15807020	16.22%
4.	Ash Pond Dyke Raising	13024582.12	13.37%
5.	Road & Flyover Embankments	3820505.44	3.92%
6.	Ready Mix Concrete	1102960	1.13%
7.	Asbestos	449863.37	0.46%
8.	Agriculture	402366	0.41%
9.	Others	7621682	7.82%
	Total Fly Ash Utilization	**97.436528 MT**	**100.00%**

It can be seen that during 2015-16 Cement Industry utilised maximum Fly Ash and contributed to 36.03% of total Fly Ash Utilization whereas flyash utilisation in Land fill & Back filling of Mines, Building Products like Bricks, Tiles etc., and Ash Pond dyke raising was 20.63%, 16.22%, & 13.37%) respectively.

(2) Effluent standards for Common Effluent Treatment Plants

Effluent standards for Common Effluent Treatment Plants were revised and the revised standards were published vide MoEF&CC notification dated 01.01.2016

The proposal for revision of emission standards for Brick Kilns was finalized and the draft revised standards for Brick Kilns were published by MoEF&CC during 2015-16.

(3) Revised effluent standards for tanneries

The proposal for revision of effluent standards for tanneries was finalized and forwarded to MoEF&CC during 2015-16

(4) Revised standards for Textile

Revised Textile Standards were notified vide Gazette Notification dated 10.10.2016.

(5) Development of Environmental Standards and Comprehensive Industry Documents (COINDS) for Pickling Industries.

Pickling is a process of chemically removing oxides and scales from the surface of hot rolled steel by the action of inorganic acids. Depending on the type of product being processed, various acid such as Sulphuric acid Hydrochloric acid Nitric acid, Hydrofluoric acid and Phosphoric acid are utilized either alone or in combination in both batch and continuous processes. Spent acid is discarded which forms a wastewater stream, commonly referred to as 'waste pickle liquor'. The pickled steel is rinsed with water by sequential immersion in rinse tanks to remove acid. Acid fumes emit from pickling tank also.

Three major sectors where pickling process is predominant,

- Stainless Steel Utensil manufacturing Sector
- Steel re rolling sector
- MS Wire drawing sector

Pickling Industries are highly polluting in nature. In pickling operations, all three types of pollution takes place namely generation of solid and hazardous waste, waste water, air emissions. Noise pollution is also a concern to some extent. Since most of the industries in SMEs, the concerns towards issues related to the environment are of low priority. It is important to mention that most of the industries are in cluster and spread over throughout the country and generate huge quantity of waste particularly waste water and hazardous waste. It may be noted that in most of the places, the scientific disposal facilities towards hazardous waste do not exist including the National Capital Delhi. Further, at present there are no specific standards for this sector. The generic standards are applied for taking care of environmental issues. In view of above, Central Pollution Control Board (CPCB) has taken up a project to prepare a comprehensive industry document to assess the issues related to the environment concerned and recommend appropriate standards keeping in mind the techno-economic viability, affordability towards the implementation of the standards.

Proposed Standards

pH – 7.0 to 9.5,

TSS – 100 mg/L,

Chromium – 1.5 mg/L,

Iron – 2 mg/L, and

nickel – 1.0 mg/L irrespective of the mode of discharge.

GUIDELINES

The water consumption for the pickling units should be limited to 1 m^3/ T and it shall be restricted the acid usage to 25 L/T of the production.

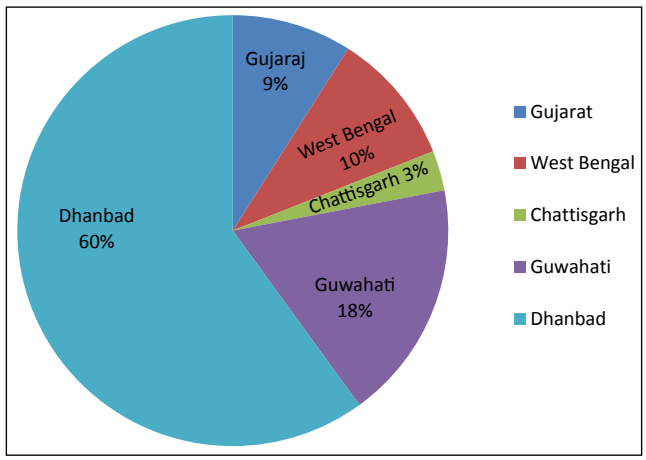
In most of the units, the gaseous pollutants level were high due to non-existence of extraction-cum-scrubbing system or inadequate extraction and followed by inappropriate scrubbing system. In view of this, it is proposed that it should be made mandatory to install adequate extraction-cum-scrubbing system with a condition that gaseous pollutant present at shop floor will make the ambient air quality standards.

High levels of noise have been monitored in the pickling industry specially in the cold rolling area. Due to the nature of the work, it is difficult to contain the noise levels in the industry. However, noise level in most the industries near the walls of the premises were within the limits. Hence, it is proposed that the existing noise levels in the industry shall be relaxed to 75 dB at night and 80 dB at day with the condition that the workers shall be provided with ear mufflers in the plant.

The generation of sludge is proposed in the limit of 100 kg/T of steel pickled. However, keeping in view the large number of small scale industries which lacks the skill required to handle the generation of waste water and its treatment carefully and also involvement of CETP, though it is desirable to limit the sludge quantity but may not be practically feasible.

(6) Environmental management in Bee-hive Coke Oven Plants.

There are about 205 Bee-hive Coke Oven plants in the country. In the coke-making process, bituminous coal is fed into a series of ovens, which are sealed and subsequently burnt at high temperature of about 12000C in an Oxygen (O_2) deficit atmosphere, for 24 to 36 hours. Coke is a solid carbonaceous material.



Coke production process and sources of pollution

The process of manufacturing of coke involves two steps.

- Coal washing/beneficiation and
- Coke manufacturing.

Coal Washing is a process of separation, mainly based on difference in specific gravity of coal and associated impurities like shale, sand and stones etc so that relatively pure marketable coal is obtained with add on calorific value.

Washed coal is crushed to about 3mm size using hammer mills and conveyed by trolleys into an oven. Coal is converted to coke by destructive distillation of a blend of selected Bituminous coals (called Coking coal or Metallurgical coal) in the absence of oxygen at 900-1100oC until volatile matter is driven off and coke is formed. The beneficiation and coking process along with sources/areas of pollution generation is shown in the process flow diagram.

Primarily following Environmental Issues prevails in the Bee-hive Coke Oven Plants:

Air Pollution

- Emissions from Coal Crushing Unit (Particulate matter PM emissions)
- Fugitive Emissions while charging the Pulverized Coal to Ovens;

  (Particulate matter, CO_2, CO, SO_2 and NO_x)
- Gaseous emission from Coke Ovens

  (PM, polycyclic chromatic organic matter from coal tar pitch volatiles, beta-naphthylamine, benzene, toluene, xylene, arsenic, beryllium, cadmium, chromate, lead, nickel subsulfide, nitric oxide and sulfur dioxide);

Water pollution

- Water used for quenching of Coke is recycled and reused.

To address this and to prepare Comprehensive Documents with fixation of Environmental Standards, National Productivity Council (NPC) had carried out the in-depth study of selected units and had prepared the report, which will be submitted shortly.

Existing Environmental Standards

The beehive coke oven plants in India are regulated for stack emissions and ambient air quality. The stack emission standards are given in following table. It is reported all SPCB's have asked coke oven units to comply with new unit standards.

Air Emission Standards for Beehive Hard Coke Ovens			
1	Particulate Matter (PM) (corrected to 6% CO_2)	mg/ Nm^3	New Units – 150 Existing Units – 350
2	Hydrocarbons	ppm	New Units – 25 Existing Units – na

Note: For control of emissions & proper dispensation of pollutants the following guidelines shall be followed:

i. Unit setup after publication of this notification shall be treated as "New Unit".

ii. A minimum stack height of 20m shall be provided by each unit.

iii. Emissions from coke ovens shall be channelized through a tunnel and finally omitted through a stack. Damper adjustment techniques shall be used to have optimum heat utilization and also to control the emission of un-burnt carbon particles & combustible flue gases.

iv. Wet scrubbing system or waste heat utilization for power generation or byproduct recovery systems should be installed preferably to achieve the prescribed standards.

v. After four years from the date of this notification, all the units shall comply with the standards prescribed for the new units.

(7) Proposed Standards for Coal crushers and coke screening units :

Coal crushers and coke screening units provided with dust extraction system fitted with suitable air pollution control units like bag filter can attain particulate matter concentration level of 50 mg/ Nm^3. Accordingly, a standard of 50 mg/ Nm^3 is proposed at outlet of coal crusher and coke screen dust control system with a minimum stack height of 20 meters.

It is observed and also reported in large scale units when CO_2 levels of around 10% is maintained in the stack optimum level of draft is generated and dust levels are in the limits prescribed by CPCB. Considering this a standard of 150 mg/ Nm^3 for dust corrected to 6% CO_2 levels is proposed for all oven stacks with a minimum stack height of 30 meters.

The coal washeries shall maintain zero effluent discharge by operating in closed circuit. Storm water shall not be allowed to overflow after getting it mixed with quenching wastewater. Coke quenching water carries coke particles along with them. These are settled in a settling tank and the water is recycled back. The sludge is sold locally. Till it is sold the sludge is kept in the premises. Considering the analysis indicated presence of heavy metals a technical committee may be constituted to study the feasibility of its use under Rule 11 of Hazardous Waste (Management Handling & Transboundary Movement) Rules 2008.

Guidelines:

Guidelines for controlling Dust:

- Water sprinkling by using fine atomizer nozzles arrangement shall be provided on the coal heaps, around the crushers/ pulverisers. Water shall be sprayed/sprinkled at all coal transfer points such as loading/ unloading points.
- All belt conveyors shall be provided with enclosures.
- Workers working in coal charging, coke pushing area should be provided with suitable dust cum gas masks.
- Area in and around the unit shall have pucca asphalted or concreted floor.
- Green belt shall be developed around the boundary line of the unit.
- Vehicles movement in coal washery area shall be regulated effectively to avoid dust generation. High pressure horns shall be prohibited.

Guidelines for noise control

- Workers should be provided with ear plugs in high noise areas like crushers, screeners.
- Noise levels can be controlled by installing a resilient impact pad on the chute wall and/or in the chute bottom.
- During screening noise generation can be controlled by providing resilient linings for the screen feedbox, screen decking, side wing liners, or on the side-tensioned rails or by screen discharge lip.
- In cone crusher noise can be controlled by using resilient liners for a surge type feed hopper, feed cone hopper shell and the feed cone, by a resilient feed plate or pad for the mantle hold-down cap or by a barrier curtain around the exterior of the crusher main frame.

(8) Project on Development of COINDS for Steel Re-rolling Mills.

There are about 2100 Steel Re-rolling Mills in the country. The process of Steel Re-rolling Mills involves hot rolling & cold rolling of different sizes of inguts and billets to prepare desirable different sizes of stainless steel sheets. Air, water, noise and solid waste are the major environmental issues related to re-rolling mills in India. The Air Pollution is caused by furnace which is fired with either pulverized coal, furnace oil producer gas produced in coal gasifier. Water is used in the process for cooling process which is recycled and reused. Based on in-depth study Final Report is prepared which includes process details, monitoring data of various sources of waste water generation ,air emission , waste minimization options, cleaner Technologies for control of pollution and safety guidelines. Final report has been put up in Peer & Core Committee Meeting for finalization of proposed standards.

PROPOSED STANDARDS AND GUIDELINES

The proposed standards will be applicable to new as well as all existing re-rolling units. All existing units shall install effective pollution control system within six months after publication of this notification to conform to the standard.

Stack Emission Standards

Particulate matter (PM): 150 mg/Nm^3 (Coal based)

75 mg/Nm^3 (Furnace Oil or Gas based)

The stack height should be calculated for proper dispersion of SO_2 (with the formula of H= 14Q 0.3. Where Q= emission of SO_2 in kg/h) as per emission regulations Part III of CPCB. Stack attached to furnace shall

have minimum height of 30 meter. Sulphur percentage shall be the percentage of sulphur in fuel. Sampling Portholes/Platforms/comfortable approach to the monitoring platform at stack should be provided.

It is proposed that lump coal based furnace may be phased out within 3 years from the date of notification and to have following preference of fuel for re-heating furnace by re-rollers :

Coal Gas > Furnace Oil > Pulverised Coal

Fugitive Emission Standards

The fugitive emissions of Respirable Suspended Particulate Matter (RSPM) should not exceed 2000 µg/m^3 at a distance of 10 m (approx.) from the sources, where ever fugitive dust emissions are anticipated. The measurement should be done preferably on 8-hour basis with high volume sampler. However, depending upon the prevalent conditions at the site, the period of measurement can be reduced.

Effluent Discharge Standards

In case of maintenance/ cleaning of the re-circulation tanks water should be treated suitably to conform to the following standards in case of discharge:

pH	-	Between 5.5 to 9.0
Total Suspended Solids (TSS)	-	100 mg/l
Oil and Grease (O&G)	-	10 mg/l

Noise levels standards

Noise level at plant boundary should met the following standards:

Noise level (at plant boundary)	Leq 75 dB (A) Leq 70 dB (A)

GENERAL SAFETY GUIDELINES

- Workers engaged in rolling activity should be provided adequate protection for protecting their legs and hands from hot rolled material during rolling.
- Safety glasses with side shields should be mandatory for everybody in furnace/rolling areas at all times.
- Appropriate safety equipment (i.e., Helmet, Gloves, ear protection, aprons etc.) should be used by all workers provided by mill owner while working in the area.
- Loose clothing, long hair, personal stereo wires and jewelry can become entangled in any equipment leading to serious injury or death. Such articles are removed or securely fastened to avoid entanglement.
- Persons wearing open toe shoes or high-heeled shoes should not be allowed in the work area. Proper safety shoe should be provided to all workers in the shop.
- First-aid kits should be available at centrally located point within the shop areas for minor injuries.
- There should be an emergency telephone/cell phone provided in the shop area to take care of any injury needing prompt medical attention.

8. Project on Development of COINDS for Hot Mix Plants.

The process of Hot Mix plant involves preparation of mixture of aggregates and asphalt, which are heated and the mixed in measured quantities

The process of Hot Mix Plant results in air Pollution as it involves the handling and processing of large quantities of aggregate with bitumen. The major sources of fugitive emission/particulate in Hot Mix Plant

are as follows:

a. Material handling and its storage;

b. Bitumin storage and its heating; and

c. Particulate and gaseous emission from Dryer unit.

Hot Mix Plant with APCD

Proposed Standards

PM - 150 mg/Nm^3

Stack Height 8 to 25 m

So2 concentration batch type hot mix plant- 169mg/Nm^3

Type hot mix plant-182 mg/Nm^3

(low sulphur fuel such as LDO diesel or LNG should be used)

GUIDELINES:

Hot mix plant design and operation should ensure that fugitive dust emissions are minimized.

It is recommended to keep all fine material/aggregates with high fines content in silos or in covered storage for day-to-day use.

Conveyor belts shall be fully covered from top and sides.

Considering predominant wind direction, green belt/wind breaking wall should be developed.

All roads/ vehicle movement areas at the site of hot mix plant should be paved/tiled/stabilized.

(9) Emission Standards for Cement Plants with co-processing of wastes

CPCB evolved draft emission standards for PM, SO_2, NO_x, HCl, HF, TOC, total dioxins and furans, heavy metals for cement plants co-processing the wastes & submitted to MoEFCC for notification. The MoEFCC placed the draft standards on the web site for public comments. The comments received were examined

and placed before the Expert Committee on Env. Standards (constituted by MoEFCC) in 9th meeting held on 15th October, 2015 at MoEFCC. The Emission standards for cement plants with co-processing of wastes were finalized in the meeting.

(10) Deveplment of National Guidelines on Odour monitoring and management in Urban Municipal Solid waste Landfill Site

Odour emissions are considered to be the main cause of disturbance noticed by the citizens living near some facilities. Odour emissions affect quality of life leading to psychological stress and symptoms such as insomnia, loss of appetite and irrational behaviour. Prolonged exposure to environmental odours can generate undesirable reactions in people such as unease, irritation, discomfort, anger, depression, nausea, headaches or vomiting. Offensive odours are also represent a significant contribution to photochemical smog formation and particulate secondary contaminant emission. Odours have become a priority concern for Industrialist, urban local bodies, regulatory bodies & environment departments that deal with waste and industrial treatment plants.

The most common offensive odour in public domain is caused by the anaerobic decay of organic matter i.e. (Municipal Solid Waste). Hence a project has been initiated by CPCB “Development of National Guidelines on Odour Monitoring and Management in Urban Municpal Solid Waste Landfill Site. Ghazipur Municipal Solid waste dump site has been identified for project execution because of peculiar nature of waste being dumped on the site and this site is one of the oldest waste dumpsite in the NCR region.

(11) Proposednoise standards forExisting Busy Airports & other Existing Airports and Upcoming/ New Airports

Under the NGT matter, development of noise standards for airports has been taken up by CPCB. Inline with the concerned matter, CPCB has proposed noise standards forExisting Busy Airports & other Existing Airports and Upcoming/New Airports and has submitted it to MoEF & CC for notification.

(12) System & Procedure for variable speed Genset engines

Existing system and procedure for Genset diesel engines is for constant speed (1500 rpm). With the development of technology and the need for more power at the same time to save fuel concept of variable speed Genset engines. Emerged. This type of Genset engines run as per load.

CPCB has developed System and Procedure for this (variable speed Genset Diesel engines).

LPG and CNG driven Generator sets

Emission and noise limit for Genset run on dedicated Natural Gas (NG) or Liquefied Petroleum Gas (LPG); Petrol or Natural Gas (NG)/Liquefied Petroleum Gas (LPG); and Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG) has been notified under GSR 281(E) dated 7th March 2016. System and Procedure for implementation of GSR 281(E) has been finalised. There was a demand from the industry for marketing strategy as well as implementation of previous Genset engine rules. This notification is expected to curb sell of illegal uncertified Gensets in the name of Gas Gensets.

Safety code of Practice for use of CNG/LPG/PNG driven Generator sets

Safety code of Practice for use of CNG/LPG/PNG fuel system is necessary for compliance of noise limit of LPG and CNG driven generator sets. Final Safety code of Practice document is under final stage of preparation as per opinion of PESO.

(13) Revision of environmental standards for integrated iron & steel plants and sponge iron units

Environmental standards for integrated iron & steel plants and sponge iron sector were revised through an in-house projectconsidering levels already achieved by about half of the plants for which data were

available, international standards, enforceability and relevance.

The process units for which environmental standards have been revised areraw material handling area, sinter plant, blast furnace, basic oxygen furnace, refractory material plant, arc/induction furnace, coke oven and rolling mills operating within integrated steel plant. Also, standard for sponge iron plants was revised.

After detailed consultation with stakeholders including Ministry of Steel, proposed standards were forwarded to MoEF & CC for notification.

(14) Standards for Pulp & Paper:

– CPCB has revised the standards for pulp & paper sector in consultation with IIT, CPPRI, SPCB, and pulp & paper mills. The new standards have been proposed for effluent, emission and freshwater consumption and effluent generation. The new proposed standards are more stringent than the old standards.

– The proposed norms for parameters namely, specific fresh water consumption & effluent generation, BOD, COD, TSS, TDS, Colour, and SAR, are about 50-80% stringent than the corresponding present / existing norms notified under the Environment (Protection) Rules, 1986.

(15) Standards for Coffee:

CPCB revised the standards for Coffee Estates and the revised standard is placed at MoEF&CC site for public comments.

(16) Development of Comprehensive Industrial Document for Automobile Industries in India

The Automobile Sector generates pollution not only through tail-pipe emissions during the On - Road uses of the vehicles but also during production process of the automotive. So far in India the sector specific standards for Automobile Manufacturing Industries have not been developed. The CPCB therefore has taken up the study on “preparation of COINDS for Automobile manufacturing industries. The study aims at in-depth study of Indian automobile sector for identification of various sources of pollution from these industries, Identification of technologies appropriate for the control of water pollution, air pollution and fugitive emissions under Indian conditions & development of environmental standards for the automobile industry.. The study was executed along with The Energy & Resource Institute (TERI), N. Delhi. The final report of the study has been prepared & the same will be presented before the Peer & Core Committee for the finalization of the Environmental standards for Automobile Industries in India.

(17) Inventorization of Railway Sidings and guidelines for their Environmental Management”

There are frequent complaints by public regarding pollution due to loading and unloading industrial materials at railway sidings. In general the environmental problems arise due to improper storage, collection, transportation and disposal of waste generated, noise pollution, air pollution (dust particles, fugitive emission), untimely operation etc. CPCB has taken-up a project on “Inventorization of Railway Sidings and guidelines for their Environmental Management”. . The study aims at Inventorization of major railway sidings of the country & development of Guidelines for Environmental Management of Railway sidings handling industrial materials. The final report of the study has been prepared. The guidelines have been shared with Railways, Industries & other concerned stakeholders for the implementation of the same.

CHAPTER – XI

PROSECUTIONS LAUNCHED, CONVICTION SECURED AND DIRECTIONS GIVEN FOR CLOSURE OF POLLUTING INDUSTRIES

10.1 Compliance status of online monitoring system

CPCB issued directions to all highly polluting industries on the month of July and August 2015.In order to sensitize the issues among SPCBs/PCCs, CPCB also highlighted the status of compliance of setting up online monitoring system in the conference of Chairman and Member Secretaries (held on February 21-22, 2014 at Bangalore and April 08,2015) at Delhi.

CPCB has organized five interaction meets on 06/8/2014, 19/09/2014, 29/09/2014, 8/10/2014 and 16/10/2014 respectively to have an interaction with SPCBs, representative of industries, industrial associations and instrument suppliers on online monitoring system .CPCB has already published a guidelines for online continuous monitoring system for effluents on 07.11.2014.

On June 16th, 2015 a Consultative meeting was held with representatives of Industry Association of 17 categories and SPCBs to discuss the status of installation of online monitoring system and issues involved for compliance of directions. Industries took steps to install effluent and emissions monitoring devices.

Repeated reminders issued to the industries including publishing names of 178 units in Ganga basin area and 815 Units in regional as well as National News Papers in the country on January 07, 2016 . Two press conference has been organized on line monitoring system have been conducted on June 30, 2015 and March 07,2016 respectively by the Hon'ble Minster of Environment and Forest.

Out of 3141 industry, so far 1529 of 17 category industries have already installed online monitoring system and 780 industries are under process of installation on 31.03.2016

10.2 Categorization of Industrial Sectors under Red, Orange, Green and White:

The Ministry of Environment, Forest and Climate Change (MoEFCC) had brought out notifications in 1989, with the purpose of prohibition/ restriction of operations of certain industries to protect ecologically sensitive Doon Valley. The notification introduced the concept of categorization of industries as " Red", "Orange "and "Green" with the purpose of facilitating decisions related to location of these industries. Subsequently, the application of this concept was extended in other parts of the country not only for the purpose of location of industries, but also for the purpose of Consent management and formulation of norms related to surveillance / inspection of industries.

The concept of categorization of industries continued to evolve and as different State Pollution Control Boards interpreted it differently, a need arose to bring about necessary uniformity in its application across the country. In order to harmonize the 'Criteria of categorization', Directions were issued by CPCB under Section 18(1)(b) of the Water (Prevention & Control of Pollution) , Act, 1974 to all SPCBs/PCCs to maintain uniformity in categorization of industries as red, green and orange as per list finalized by CPCB, which identified 85 types of industrial sectors as 'Red', 73 industrial sectors as 'Orange' and 86 sectors as 'Green'.

The process of categorization thus far was primarily based on the size of the industries and consumption of resources. The pollution due to discharge of emissions & effluents and its likely impact on health was not considered as primary criteria. There was demand from the SPCBs / PCCs and industrial associations for categorization of the industrial sectors in a more transparent manner. Accordingly, the issue was discussed thoroughly during the national level conference of the Environment Ministers of the States, held in New

Delhi during April 06-07, 2015 and a 'Working Group' comprising of the members from CPCB, APPCB, TNPCB, WBPCB, PPCB, MPPCB and Maharashtra PCB is constituted to revisit the criteria of categorization of industries and recommend measures for making the system transparent and rational.

The Working Group has developed the criteria of categorization of industrial sectors based on the Pollution Index which is a function of the emissions (air pollutants), effluents (water pollutants), hazardous wastes generated and consumption of resources. For this purpose the references are taken from the the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003, Standards so far prescribed for various pollutants under Environment (Protection) Act , 1986 and Doon Valley Notification, 1989 issued by MoEFCC. The Pollution Index PI of any industrial sector is a number from 0 to 100 and the increasing value of PI denotes the increasing degree of pollution load from the industrial sector. Based on the series of brain storming sessions among CPCB, SPCBs and MoEFCC , the following criteria on 'Range of Pollution Index 'for the purpose of categorization of industrial sectors is finalized.

- Industrial Sectors having Pollution Index score of 60 and above – Red category
- Industrial Sectors having Pollution Index score of 41 to 59 – Orange category
- Industrial Sectors having Pollution Index score of 21 to 40 – Green category
- Industrial Sectors having Pollution Index score incl.& upto 20 – White category

The newly introduced White category of industries pertains to those industrial sectors which are practically non-polluting such as Biscuit trays etc. from rolled PVC sheet (using automatic vacuum forming machines), Cotton and woollen hosiers making (Dry process only without any dying/washing operation), Electric lamp (bulb) and CFL manufacturing by assembling only, Scientific and mathematical instrument manufacturing, Solar power generation through photovoltaic cell, wind power and mini hydel power (less than 25 MW).

The salient features of the 'Re-categorization' Exercise are as follows :

- Due importance has been given to relative pollution potential of the industrial sectors based on scientific criteria . Further, wherever possible, splitting of the industrial sectors is also considered based on the use of raw materials, manufacturing process adopted and in-turn pollutants expected to be generated.
- The Red category of industrial sectors would be 60.
- The Orange category of industrial sectors would be 83.
- The Green category of industrial sectors would be 63.
- Newly introduced White category contains 36 industrial sectors which are practically non-polluting.
- There shall be no necessity of obtaining the Consent to Operate'' for White category of industries. An intimation to concerned SPCB / PCC shall suffice.
- No Red category of industries shall normally be permitted in the ecologically fragile area / protected area.

The Summary of the 'Re-categorization' is presented in Table G1. Accordingly, Directions have been issued by CPCB to all the SPCBs / PCCs on 07.03.2016 with the effect to adopt the revised criteria of categorization based on Pollution Index and prepare the revised inventory of Red ,Orange, Green and White categories of industrial sectors. Responses have also been received . Copy of these 'Directions' is attached as Annexure 1.

The purpose of categorization is to ensure that the industry is established in a manner which is consistent with the environmental objectives. The new criteria will prompt industrial sectors willing to adopt cleaner technologies, ultimately resulting in generation of fewer pollutants. Another feature of the new categorization system lies in facilitating self-assessment by industries as the subjectivity of earlier assessment has been eliminated. This 'Re-categorization' is a part of the efforts, policies and objective of

CPCB and SPCBs/PCCs to create a clean & transparent working environment in the country and promote the Ease of Doing Business.

Other similar efforts include installation of Continuous Online Emissions/ Effluent Monitoring Systems in the polluting industries, Revisiting of the CEPI (Comprehensive Environment Pollution Index) concept for assessment of polluted industrial clusters, Revision of existing industrial Emission/Effluent discharge standards, initiation of special drive on pollution control activities in Ganga River basin and many more in coming future.

Table G-1: Final Summary Table Red , Orange, Green and White Categories of Industries

Sl. No.	Original Categorization	Initial Nos.	Addition by Splitting into further classes	Deletion / Shifting to foot-note due to vague term / Merger / other reasons	Re-categorization to Red	Re-categorization to Orange	Re-categorization to Green	Re-categorization to White	Check
		1	2	3	4	5	6	7	(1+2) = (3 to 7)
1	Red	85	11	7	60	26	3	Nil	96=96
2	Orange	73	2	3	Nil	51	19	2	75=75
3	Green	86	Nil	3+2=5	Nil	6	41	34	86=86
Final Categorization		244	13	15	60 (Red)	83 (Orange)	63 (Green)	36 (White)	257 =257 (Total categories including in footnote)

10.3 Revised Concept of Comprehensive Environmental Pollution Index [CEPI]

The concept of Comprehensive Environmental Pollution Index (CEPI) was evolved by Central Pollution Control Board (CPCB) during 2009-10 as a tool for comprehensive environmental assessment of prominent industrial clusters and formulation of remedial Action Plans for the identified critically polluted areas.

Subsequently, Ministry of Environment & Forests, Government of India had imposed temporary moratorium on 13.01.2010 on consideration of new projects /expansion of existing projects for environmental clearance in Critically Polluted Areas having CEPI score over & above certain threshold limit.

It is observed that the present methodology on evaluation of CEPI score had been a matter of discussion at various occasions. This is because some of the components of the existing CEPI concept require reliable health impact studies on human-being , flora and fauna which require huge funds, time consuming as well as complex due to difficulty in finding truly representative data. Also , the existing system didn't include any early warning mechanism so as to prevent further environmental degradation. Further, the existing criteria of assigning values is based on news reports, magazines, journals, NGO studies and published literature which is subjective.

Proposals were received from the SPCBs, State Governments, Industrial Associations and concerned Stake-holders for revisiting the criteria of assessment under CEPI concept.

After careful examination and consideration of the suggestions of concerned stake-holders , it was decided to prepare the revised concept of CEPI by eliminating the subjective factors but retaining the factors which can be measured precisely. The concepts decided to be adopted are as follows :

- ✓ To develop the Revised Comprehensive Environmental Pollution Index (CEPI) retaining the existing algorithm of Source, Pathway and Receptor
- ✓ To develop the Revised CEPI based on Sources of pollution , real time observed values of the pollutants in the ambient air, surface water & ground water of the industrial cluster and health related statistics. The concept is based on the selection of 3 criteria pollutants for each of the environment components i.e. air , surface water and ground water which together indicate the well being of ambient environment.
- ✓ For health related statistics, health data available from major hospitals in the area will be considered.

Accordingly, the 'Draft Document on Revised CEPI Version' had been prepared and circulated among the SPCBs, PCCs, concerned State /UT Governments, Ministries, IITs , Academic Institutions , CSE and other stake-holders for their observations & comments. The 'Draft Document' was uploaded on the website of CPCB also for information & comments of one & all.

Issues raised by different stake-holders were addressed appropriately and final document on 'Revised CEPI Version 2016' has been evolved. Attempts have been made to make the concept simple so as to facilitate the common citizen evaluate the CEPI score with little efforts .

- Revised CEPI is comprised of the following components:

Component A	Scale of Industrial Activity	20 marks
Component B	Status of Ambient Env. Quality (Air/SW/GW)	50 marks
Component C	Health related statistics	10 marks
Component D	Compliance status of industries	20 marks

- Air EPI, Surface Water EPI and Ground Water EPI i.e i1, i2 and i3 , will be calculated separately on a scale of 0-100 by the formula – i1 or i2 or i3 = A+B+C+D.
- Overall CEPI will be evaluated using the existing formula, i.e.,
  CEPI = i-max + [(100 – i-max) × (i2/100) × (i3/100)]

  Where, i-max – maximum index (which may be either Air EPI or SW EPI or GW EPI); and i2, and i3 are indices for other media.

  Decision regarding selection of criteria pollutants shall be taken as advance and shall be the most relevant in the context of specific CPAs and should be communicated to CPCB.
- The concept can be applied to locations also other than industrial clusters

Thereafter, in exercise of the powers conferred under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974, and 18 (1) (b) of the Air (Prevention & Control of Pollution) Act, 1981 and ensure prevention, control and abatement of pollution in critically polluted industrial clusters and keeping in view strengthening of the monitoring mechanism for effective compliance through self regulatory mechanism, following directions have been issued to the concerned SPCBs / PCC for compliance:

Part A: Environmental quality monitoring in all CPAs

1. That the SPCB/PCC shall undertake environmental quality monitoring in the critically polluted area falling under their jurisdiction through an outside third party agency (laboratory) recognised under Environment (Protection) Act, 1986 and accredited under NABL. The frequency of the monitoring shall be twice in a year i.e. Post-monsoon season and Pre-monsoon season).
2. That the SPCB/PCC shall ensure that the existing sampling locations where monitoring was undertaken in 2013 are retained and additional monitoring locations, if any required, can be included in the monitoring programme in consultation with concerned Zonal Offices of CPCB and (or) Head Office, CPCB.

3. That the SPCB/PCC shall ensure that the sampling stations are provided at strategic locations across the industrial clusters so as to obtain a truly representative environmental quality of the critically polluted area. Moreover, the concerned SPCBs /PCC shall ensure that there is at least one Ambient Air Quality monitoring station each in the predominant upwind and downwind directions at each of the CPA.

4. That the SPCBs/PCC shall collect 3 samples with a gap of one or two days at each location during each round of monitoring in all the CPAs.

5. That at each of the CPA, 24 hourly ambient air quality monitoring shall be carried out for parameters as detailed in Annexure-2. Also, representative samples for surface water quality and ground water quality shall be collected from prominent surface and ground water bodies located in and around the CPAs. List of water quality parameters is presented in Annexure-2.

Part B : Installation of Continuous Ambient Air Quality Monitoring Stations:-

6. That the SPCB/PCC shall coordinate with the 'Association(s) or any appropriate agency of the Industries of the concerned CPAs and direct them for installation of Continuous Ambient Air Quality Monitoring Stations (CAAQMS) at strategic locations of identified Critically Polluted Areas. For this purpose, 'Polluter Pays Principle' shall be applied and the data so acquired be displayed on the website of State Board for transparency in law-enforcement.

7. That in those Critically Polluted Areas, where no CAAQMS is so far installed, at-least 2 CAAQMS be installed to start with, one each in the windward and leeward direction within a year;

8. That the existing network of continuous ambient air quality monitoring stations (CAAQMS) in CPAs established by 17 Category of highly polluting industries, shall be redesigned if necessary, by shifting/ relocating some stations to cover the entire city/area. This will reduce duplicity in monitoring and ensure optimum utilization of the available monitoring facilities and resources.

9. That the existing manual monitoring under NAMP, will be continued. In case, there is no NAMP station in the area, then manual monitoring will also be conducted atleast once in a month on 24 hourly basis.

Part C : Installation of Continuous Water Quality Monitoring Stations :-

10. That the SPCBs / PCC shall ensure installation of Real Time Water Quality Monitoring Stations at various locations of identified Critically Polluted Areas in conformity with the CPCB guidelines for water quality monitoring (MINARS/27/2007-08). The SPCBs / PCC shall adopt 'Polluter Pays Principle' for achieving these objects.

11. That in those Critically Polluted Areas, where no CWQMS are yet installed, at-least 2 CWQMS be installed to start with, one each in the upstream and downstream locations of the major receiving water body of the area within a year.

12. That the existing manual monitoring under MINAR (Monitoring of Indian National Aquatic Resources) programme will also be continued. In case, there is no MINAR station in the area, then manual monitoring will also be conducted atleast once in a month. Ground Water Quality Monitoring should be carried out at existing locations (i.e. bore-wells, tube wells, deep hand pumps etc) and as per national monitoring protocol. Monitoring of heavy metals, VOCs and Pesticides should also be undertaken in addition to regular parameters of MINAR programme.

Part D : Application of revised CEPI version 2016

13. That since 'Revised CEPI 2016' has been evolved, henceforth, all future CEPI score evaluations shall be made on the basis of revised formula.

14. That all the polluting sources identified in the area shall be notified and brought in the public domain

through respective websites alongwith the details of their pollution control compliance status.

15. That the environmental quality data including CEPI score of the industrial area as per revised concept shall also be placed in public domain through website and also to be published by the State Government periodically.

16. That the concerned State Government shall notify the area on a properly scaled map and also issue public advisories that such an area will be exclusively meant for industrialization as per the State land.

17. That the revised CEPI shall be used by the State Governments, SPCBs and others concerned to understand the severity of pollution existing in the area and formulate appropriate action plan. Further, sufficient time shall be given for effective implementation of the action plan before imposition of moratorium. Thus, the revised concept shall be an early warning tool to ensure the successful implementation of Action Plan.

18. That the CEPI shall not be used by the Bankers / Money Lending Institutions for financial decisions.

19. That any moratorium on expansion on setting up of new industries shall be imposed on a particular CPA only after a notice period of one year from the initial announcement of CEPI assessment. However, decision on any directions already in force in a CPA shall be taken as per correct practice in vogue. High CEPI score shall also be used as early warning tool to require preparation of pollution management plans to reduce pollution levels before it reaches critical levels.

20. That for any industry in a critically polluted area, the changes which make it less polluting shall be permitted. These changes may include expansion of production capacity / change of product / change of raw materials / change of manufacturing process or a combination of these changes and shall be examined and assed by respective SPCBs/PCC.

Part E : Action Plan and Monitoring

21. That the SPCBs/PCC shall also continue the regular exercise of water and air quality monitoring work at different locations including those stations currently in operation under NAMP and MINAR.

22. That the SPCB/ PCC shall take necessary measures to ensure regular maintenance and operation of the online systems with tamper proof mechanism including having facilities for online calibration;

23. That the SPCBs / PCC shall install the necessary software and hardware in their headquarter for centralized data collection, analysis and corrective action.

24. That the SPCBs/PCC shall take necessary measures to connect and upload the online air quality and water quality monitoring data on the Servers of respective SPCB/PCC and CPCB in a time bound manner but not later by June 30, 2016;

25. That the SPCBs/PCC shall upload on its websites the consent conditions of all industrial units along-with their compliance status (updated half-yearly) with respect to prescribed norms.

26. That the action plan categorized into short, medium and long term basis shall be brought into public domain and the progress of implementation shall be reviewed by District and State level through Monitoring Committees.

The purpose of revisiting the CEPI Concept is to promote industrial development consistent with the environmental objectives.

10.4 Ensuring compliance of standards by tanneries on Ganga

Directions u/s 18 (1) (b) of Water Act 1974 issued to UPPCB on 28.10.2014 regarding CETPs in Kanpur, Banthar and Unnao

1. To direct tanneries and the CETP to submit a time bound action plan within three months for –
   i) up gradation and proper operation of CETPs within one year to attain compliance of surface water disposal norms in final effluent, including TDS, and
   ii) up gradation and proper operation of PETPs within six months to attain compliance of primary standards
2. To direct closure of tanneries if satisfactory compliance of above not observed within three month.
3. To develop a mechanism to keep under close watch all tanneries for ensuring regular compliance of i) prescribed primary treatment standards / CETP's design inlet parameters and ii) wastewater generation standards / permitted wastewater capacity

UPPCB's issued directions to CETPs 25.11.2014/1.1.2015 to submit plans to implement ZLD in 1 yr:

– Submit a time bound action plan within three month to attain compliance of primary standards and up gradation and proper operation of CETP within one year to attain compliance of surface water disposal norms in final effluent, including TDS
– Submit a time bound proposal for installation of Online Monitoring System within three month.
– Submit a time bound proposal for upgradating and achieving Zero Liquid Discharge from CETP within three months.

Directions u/s 18 (1) (b) of Water Act 1974 issued to UPPCB on 22.4.2015 to expedite SPVs formation and ZLD schedules submission:

a) To revoke Consents of tanneries who do not participate in formation of SPVs by 15.5.2015
b) To revoke Consents of tanneries if CETPs do not submit plans/schedules by 30.6.2015

In follow up above directions to UPPCB Show cause Notices issued to 400 tanneries in Jajmau, 23 tanneries in Banthar and 14 tanneries in Unnao on 31.3.2016

In order to address the issues of discharge of effluent by tanneries in excess of permitted quantity, CPCB issued Directions u/s 18 (1) (b) of Water Act 1974 to UPPCB on 7.7.2015 to ensure installation of E/M flow meters by 31.7.2015:

1. To verify installation of E/M flow meters (for water and effluent) in two weeks and take action for closure of tanneries in Kanpur and Unnao region not having installed E/M flow meters, and the unauthorized tanneries if any, immediately
2. To provide information on i) permitted production capacity and effluent discharge of tanneries in Kanpur and Unnao region, ii) the status of installation of E/M flow meters (for water and effluent), and iii) action taken against tanneries not having installed E/M flow meters(for water and effluent) and unauthorized tanneries by 31.7.2015
3. To collect and compile monthly water consumption and effluent generation data of tanneries by 15th day of every next month, from July 2015 onwards, and take action against tanneries discharging more than the permitted effluent quantity or exceeding the specific effluent generation norms

Implementation of Online / real time Continuous/ (24x7) Monitoring Systems in Tanneries

Directions u/s 18 (1) (b) of Water Act 1974 were issued to SPCBs regarding 119 tanneries in the country covered under 17 category of highly polluting industries regarding installation of online/real time continuous (24x7) effluent monitoring systems in Feb 2014.

Directions u/s 18 (1) (b) of Water Act 1974 were also issued to SPCBs regarding 456 tanneries on Ganga (39 units common under 17 category) regarding installation of online/real time continuous (24x7) effluent

monitoring systems in Feb 2014.

In follow up of the directions to SPCBs, Directions cum Show cause notices u/s 5 of Environment (Protection) Act 1986 have been issued to above mentioned 119 tanneries under 17 categories and 456 tanneries on Ganga (39 units common under 17 category) in July 2015.

The units which did not reply to the direction have been issued closure direction - 23 tanneries under 17 categories and 79 tanneries on Ganga (8 units common under 17 category) have been closed.

10.5 Online Monitoring System for Food & Beverages Sector

There are 44 nos. of units in Food & Beverages Sector in Ganga Basin. In first phase directions dated 30.07.2015 issued to 21 nos. of units for installation of Online Continuous Effluent Monitoring System (OCEMS). Out of 21 units eleven no. of units has installed OCEMS and nine of them has already connected their data with CPCB server. One unit is closed and one unit is repeated. 8 units are under installation. Closure Direction dated 22.07.2016 and 25.07.2016 issued to eight units under process of installation and dated 16.08.2016 issued to one unit which has installed OCEMS but not connected to CPCB server, however one revoke direction dated 24.08.2016 issued to one unit as the unit was not under Ganga basin as confirmed by NGRBA Division and also not under GPI list.

10.6 Online Monitoring System for Slaughter Houses Sector

There are total 22 nos. of units in Slaughter House Sector in Ganga Basin. In first phase directions were issued to 12 nos. of units for installation of Online Continuous Effluent Monitoring System(OCEMS). Out of 12 units five no. of units has already installed OCMS and connected their data with CPCB server. Installation of OCEMS is in progress in one unit. Six units are closed. Closure direction dated 22.07.2016 issued to one unit which is in the process of under installation.

New standards are in the final stage of notification. Already approved by Expert Committee of MoEF&CC.

10.7 Online Monitoring System for Sugar Sector

There are total 602 units in the country. Out of which 67 are falling on main stem of River Ganga.

Directions u/s 5 of E(P)A, 1986 dated 24.07.2015 were issued to 602 units for installation of OCEMS. Thereafter, total 340 units were issued closure directions for not complying with directions regarding installation of OCEMS. As on date 280 units have installed OCEMS and provided connectivity with CPCB server.

Out of 67 units on main Ganga stem only 57 are operational. All are using treated effluent for irrigation thus reducing the load on Rivers and ground water. On monitoring of these units during 31.12.2015 & 2.01.2016; 17 were found non-complying with prescribed standards to whom Show Cause Notice under Section 5 of E(P)A, 1986 was issued. 10 industries has been served closure notice to remain closed till the installation of online monitoring systems.

Revised Sugar standards were notified vide Notification dated 14.01.2016. These standards are inclusive of waste water discharge standards and irrigation protocol. Standards notified are placed at Annexure 1.

10.8 Online Monitoring System for Textile Sector

There are 63 textile units on main Ganga stem as per GPI list. Directions u/s 5 of E(P)A, 1986 were issued to all textile units for installation of OCEMS. Out of 63 units only 07 have installed OCEMS; 05 are exempted from installation of OCEMS as they are having dry process. 02 units are going for ZLD hence time extension granted till Dec, 2016. Closure directions u/s 5 of E(P)A were issued to 50 units.

About 17 nos. of textile, dyeing and bleaching units were inspected, mainly under the NGRBA programme and 04 units were issued Show cause Notice u/s 5 of E(P)A, 1986 for non-compliance.

Progress regarding ZLD in Textile cluster:

In 5 clusters in UP, (Mathura, Roomapur, Farrukkabad, Bhadohi and Pilkhuwa) work order for diagnostic + DPR awarded by NMCG. In Haryana, DPR completed for Panipat cluster. 10 review meetings were conducted (5 by CPCB and 5 along with NMCG). Also sectorial meetings conducted twice with associations and stake holders.

Revised Textile Standards were notified vide Gazette Notification dated 10.10.2016. Standards notified are placed at Annexure 2.

10.9 Implementation of the 'Charter for water recycling and pollution prevention in pulp & paper industries in Ganga River Basin' (2015-2016)

CPCB issued directions on 24/02/2015 under section 18(1)(b) of the Water Act to SPCBs of the nine Ganga River Basin States for issuance of directions under section 33 (A) of the Water Act to pulp & paper industries operating in their respective States for implementation of the 'Charter for Water Recycling & Pollution Prevention in Pulp & Paper Industry (Specific to Ganga River Basin States)' (hereinafter referred to as 'the Charter').

The Charter takes a holistic approach for pollution prevention by emphasizing on process technology up-gradation, adoption of best practices, besides quantum improvement in effluent treatment to reduce fresh water requirement followed by improved effluent quality and optimum water recycling.

The Charter prescribes fresh water consumption, effluent generation and treated effluent discharge quality norms for compliance by various categories of mills. The treated effluent discharge norms prescribed under the Charter have to be achieved within one year (March 31, 2016), and fresh water norms & effluent generation norms have to be achieved within one year (short term objective: March 31, 2016) & two years (long term objectives: March 31, 2017).

Major action points in the Charter:

- Commissioning of chemical recovery plants (CRPs) individual/ common for black liquor management in wood/ agro based pulp & paper mills manufacturing chemical pulp.
- Dismantling & removal of chemical pulping facilities namely digesters, etc from Pulp & paper Mills not having CRPs.
- Regular and proper operation & maintenance of CRPs by mills and surveillance by SPCBs.
- Preparation of Action Plans by individual Pulp & Paper Mills to achieve the prescribed fresh water consumption, effluent generation & effluent discharge quality norms under the Charter through up gradation of process technology, ETP and adoption of best practices.
- Augmentation and up-gradation of ETP upto tertiary treatment level by March 31, 2016.

Achievements:

(i) Action Plan for Individual Mills:

There are 151 Pulp & Paper Mills which are operational in Ganga River Basin States of Uttarakhand (34), Uttar Pradesh (91) and West Bengal (26). Action Plans have been prepared by all 151 mills for up-gradation of their process technology, ETP system and adoption of best practices as per the Charter to achieve the prescribed norms.

Out of 67 GPIs (pulp & paper mills) identified in Ganga main stem, 30 are in Uttarakhand, 33 in Uttar Pradesh, 1 in Bihar and 3 in West Bengal. 57 mills have installed online effluent monitoring system as well as prepared their action plans, 10 mills are closed. Only 10 mills are wood/ agro based and remaining mills are RCF based mills.

(ii) Zero Black Liquor Discharge:

Agro/ wood based pulp & paper mills having chemical pulping facilities have commissioned chemical recovery plants (CRPs) for their black liquor management. No mill is allowed to manufacture chemical pulp without having CRP facility. CRP does not only help in recovery of energy and chemicals from (biomass) through incineration but also reduce pollution load due to zero black liquor discharge. This has lead to improved environmental compliance. 16 Wood /Agro based mills having CRP facilities (12 nos.) are operational in Uttar Pradesh. Similarly, 08 Wood/Agro based mills have CRP facilities (5 nos.) are operational in Uttarakhand. CPCB along with concerned State Boards have ensured dismantling & removal of chemical pulping digesters (about 100 nos.) from 30 mills in Uttar Pradesh and from 3 mills in Uttarakhand. These actions have resulted in achievement of zero black liquor discharge in five Ganga River Basin States.

It is estimated that before the closure of agro based units without CRP, there was potential of discharge of around 550 tpd COD in the river Ganga, which has been stopped. It has been estimated that due to implementation of the chemical recovery plants, the overall Chemical Oxygen Demand (COD) discharge into the respective river system has been reduced by an order of 40-50% from the levels reported prior to implementation of the Charter.

(iii) Reduction in fresh water consumption and effluent generation:

The upgradation of process technology, optimization of process operations, installation of fiber recovery units, augmentation & upgradadtion of ETP system including adoption of diffused aeration & tertiary treatment, creation of facilities for regular ETP monitoring, chemical recovery for agro based mills, etc under Charter have resulted in significant reduction in fresh water consumption and overall waste water discharge from Pulp & Paper mills.

Significant reduction in effluent discharge has been observed for various categories of Pulp & paper industries viz., from 100 cum/MT to 50 Cum/MT in case of wood/ agro based writing & printing category, from 90 cum/MT to 30 Cum/MT in case of agro based kraft category, from 50 cum/MT to 15 Cum/MT in case of RCF based writing & printing category, and from 40 cum/MT to 10 Cum/MT in case of RCF based kraft category, besides quantum improvement in effluent quality with BOD < 20 mg/l & SS < 30 mg/l, which ultimately leads to reduction in overall pollution load being discharged into the recipient rivers. Estimated reduction in fresh water consumption and effluent generation are about 45%-50% as compared to the pollution level estimated in 2012, inspite of expansion in production capacity.

Most of the mills operating in Uttarakhand and Uttar Pradesh have achieved the short term norms of fresh water consumption, effluent generation and treated effluent quality discharge norms as prescribed under the Charter by March 31, 2016. About eight RCF based kraft paper mills have claimed Zero Liquid Discharge. Mills have upgraded their manufacturing process and ETP technologies by commissioning of green technologies, namely, efficient fibre recovery system, diffused aeration system, mechanical sludge handling system, advance anaerobic bio-methanation system, MBBR technology, tertiary treatment systems and environmental labs.

Installation Of On-Line Monitoring Systems-Pulp & Paper Sector

- Across India, 164 Pulp & Paper mills have installed online effluent monitoring system.
- All the 125 pulp & paper mills in Uttar Pradesh & Uttrakhand, which are operational, have installed online effluent monitoring system/web cameras in their plant.

10.10 Online emission & effluent monitoring system by Aluminium, copper and zinc units:

With the purpose to inculcate the habit of self-monitoring mechanism within the industries for complying with the prescribed environmental standards, show cause notices under Section-5 of the Environment (Protection) Act, 1986, were issued to all the primary Aluminium (14 units), Copper (3 units) & Zinc (4 units) industries for the closure of the units if the units have not complied fully with the directions to install the online emission & effluent monitoring system by June 30, 2015. Due to continuous follow-up with the industries, 12 aluminium units, 1 copper unit & 3 zinc units have installed the online monitoring systems and most of them have provided the connectivity with CPCB for submission of online 24x7 monitoring data. Two Al industries & one Zn industry are currently closed and directions were issued to ensure that they reopen only after installation of online monitoring equipment.

10.11 Installation of Online emission & effluent monitoring system by Cement Plants

CPCB has issued Notice under section 5 of E(P)A, 1986, to 330 cement plants to show-cause as to why the unit should not be closed down, if the unit has not complied fully with the directions issued by SPCBs to cement units w.r.t. installation of online emission monitoring system. Subsequent to follow ups and lots of efforts, now 196 cement units have installed online monitoring system. The closure directions to 106 cement units had been issued for non compliance w.r.t. installation of online monitoring systems, rest 28 cement plants had requested for exemption. These cases are being evaluated and processed.

10.12 Legal Matters:

- **O.A.No.245/2015 , M.R.Proofing Industries Vs. UPPCB**

  The matter is related to Dyeing Industry. Matter disposed of on 19.10.2015, Rs. 5 Lakhs imposed on the industry as environmental compensation for causing pollution in the past. Amount shall be paid in the ratio of 50:50 to CPCB and UPPCB and will be utilized for correcting the environmental degradation.

- **O.A.No.61/2012 Bhupesh Sehgal Vs. DDA & Ors.**

  The matter is related to mobile towers installed on the terrace of the residential buildings was prohibited.

- **O.A.No.35/2015 DSM Sugar Distillery Division, Asmoli Vs. Shailesh Singh & Ors.**

  The matter is related to discharging the poisonous smoke in the atmosphere both inside and outside of the premises of the Industry. The industry is liable to be paid Environmental Compensation of Rs. 1 Crore.

- **O.A.No.486/2014 Gauri Maulekhi Vs. U.O.I. & Ors.**

  The matter is related to Pulp and Paper Industry. The Industry M/s Century Pulp & Paper Ltd. was liable to pay an amount of Rs. 30 Lakhs as Environmental Compensation.

- **O.A.No.184/2013 Gurpreet Singh Bagga Vs. MoEF & Ors.**

  The matter is related to the river bed mining. Industry is liable to pay the Environmental Compensation of Rs. 50 Crores.

- **O.A.NO.204/2014 Krishan Kant Singh Vs. M/S Deoria Paper Mills Ltd. & Ors.**

  The matter is related to Pulp & Paper Industry. The Industry was liable to pay and was imposed upon Environmental Compensation of Rs. 5 Lakhs for operating without the consent of the Board, for discharging the effluents in excess of the prescribed parameters and withdrawing ground water without NOC from CGWA. The compensation would be paid to UPPCB and CPCB in equal shares and the amount would be utilized for control of environmental degradation in that area.

During this financial year 20105-16 counter affidavit filed for 73 cases in NGT, Chennai, 2 cases in High Court of Karnataka and 2 case in High Court of Kerala. As per direction of NGT, Chennai 12 nos. of monitoring such as industrial, BMW, river etc. were carried out and report filed. As per the Supreme court order monitoring of River Palar, 26 tanneries and 8 CETPs was carried out and report sent to Delhi for filing.

10.13

In the matter of: Writ Petition (C) 110 of 2006 People Rights & Social Research Centre (PRASAR) & Ors VS Union of India & Ors before the Hon'ble Supreme Court of India. The Central Pollution Control Board is directed to file an affidavit as to the action taken on the suggestions made in the Report of the Committee on spreading of Silicosis and Pneumoconiosis disease due to pollution from Quartz Industries located in Godhra, Gujarat. Central Pollution Control Board (CPCB) carried out inspection cum monitoring in quartz processing units located in Godhra, Gujarat. Fugitive emission monitoring as well as source emission (stack emission) monitoring was carried-out by the teams.

Considering the major observations and findings made by the inspecting teams, following recommendations are made for enforcement/implementation by all the units in a time bound manner through regular surveillance of GPCB.

i. Adequate provision of dust extraction system at potential sources such as jaw crusher hopper, transfer points of materials from conveyer belt, disintegrator, transfer points of materials from bucket elevators to other plant equipment, rotary screens, magnetic separators and vibratory screens. The dust extraction system of such potential sources should be routed through APCD. The unit should meet the stipulated norms for fugitive emission prescribed by GPCB.

ii. APCDs provided by the units required to be repaired and maintained from time to time. Stacks attached to APCDs are to be equipped with adequate monitoring facility as per CPCB Emission Regulation, Part-III.

iii. The height of stack is to be maintained minimum 2 meter above the roof level as prescribed by GPCB.

iv. Sheds provided for plant process machineries are to be closed properly and provision of Closed Circuit Television (CCTV) camera should be made rather than keeping small openings in shed for frequent observations.

v. Metalled internal roads with systematic cleaning and wetting mechanism.

vi. Provision of green belt along the periphery of the individual unit.

vii. Establishment of systematic water sprinkling and maintenance of records of water utilization by individual units.

viii. The loading of products from silos to bags/carriers required some automation to minimize manual intervention and exposure. Chute system with automatic filling is one such example of this.

ix. Provision of Personal Protective Equipments (dust mask, helmet, safety shoes, goggles, ear plugs) and utilization by all the workers during operation to be ensured by all the units.

x. Prominent display regarding the effect of silicosis inside the premises for awareness of workers and other concern to be ensured by all the units.

xi. Units to provide designated storage for dust collected from APCDs and fugitive emissions. The dust should be disposed in the manner prescribed by GPCB. Maintenance of records of dust disposal to be established and maintained by all the units. The unit should remove the collected dust at regular interval.

xii. All the units should ensure environmental monitoring and submission of reports to GPCB at regular intervals.

xiii. All the units should also ensure the compliance of provisions of aspects related with health, safety and labour laws enforced by concerned Govt. agencies.

xiv. Regular & intensive health check-up of workers directly by Director of Industrial Safety & Health (DISH) is very much useful to abate silicosis.

xv. The GPCB is required to redesign the CC&A with uniform conditions and parameters for all the units considering similarities in processes.

xvi. CPCB should issue a direction u/s 18(1)(b) of the Air (Prevention and Control of Pollution) Act, 1981 to Gujarat SPCB for closure of the non complying quartz grinding units / GPCB is required to enforce all the necessary modifications/upgradation required in the units in a time bound manner to comply these recommendations.

The Affidavit was submitted to the Hon'ble Court in time. Hon'ble Supreme Court directed State Pollution Control Board of Rajasthan, Madhya Pradesh, Delhi, Pondicherry, Haryana and Jharkhand to implement the recommendation of CPCB.

CHAPTER – XII

FINANCE AND ACCOUNT

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INDEPENDENT AUDITORS REPORT TO THE MEMBERS OF CENTRAL POLLUTION CONTROL BOARD-DELHI

1. We have audited the accompanying Financial Statements of **CENTRAL POLLUTION CONTROL BOARD, (Ministry of Environment Forests & Climate Change, Govt. of India), its Zonal Offices and sponsored projects which** comprise the Balance Sheet as at **31st March 2016** and Income & Expenditure Account and Statement of Receipts & Payments of the Board for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

2. Management of the Board is responsible for the preparation of these Financial Statements that give a true and fair view of the financial position, financial performance and Receipts & Payments of the Board in accordance with accounting principles generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.
3. The Balance Sheet, Income & Expenditure Account and Statement of Receipts & Payments have been prepared in accordance with **'Form of Financial Statements for the Central Autonomous Bodies'** circulated by **Controller General of Accounts, Ministry of Finance.**

Auditor's Responsibility

4. Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

5. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected

depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Board's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

6. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Basis for Qualified Opinion

7. Depreciation is charged on Assets on SLM basis as per rates prescribed by Income Tax Act 1961. Depreciation has been charged on full year basis irrespective of date of purchase of Assets. Further depreciation has not been charged on individual asset basis instead of charged on gross block basis which has resulted into excess charging of depreciation As such depreciation has not been charged as per Accounting Standard 6 (AS-6) issued by the Institute of Chartered Accountants of India.

8. Earmarked funds for capital assets received as grant in aid has been taken in Income & Expenditure account is not in accordance with the requirement of Accounting Standard 12.

9. Liability on account of LTC has neither been ascertained nor provided for. Accounting Standard 15 – "Accounts for Retirement Benefits – Revised" issued by the Institute of Chartered Accountants of India has not been complied with.

Emphasis of matters

10. We draw attention to the following points:

I). Reconciliation & Confirmation of various accounts

The balance under various accounts amounting to Rs. 1.45 crores in liabilities side, and advance of Rs. 61.02 crores in assets side of the Balance Sheet (refer note no. 4 in Schedule 26 – notes to accounts) are subject to confirmation and reconciliation thereof. Further, most of the advances are pending for adjustment of long time and financial impact are not ascertainable and this may have material effect on Balance Sheet, the Income & Expenditure, and Receipts & Payment Account of the Board.

II). Loans and advances include following accounts /balances which are being carried forward since long time. It appears that expenditure against these payments has already been incurred but advances have not been adjusted and as such realisability/adjustability of the same cannot be commented upon.

a) Publication Advance : Rs. 0.26 lacs.

b) Purchase and other Advance : Rs. 23.88 lacs.

c) Advance to State Boards : Rs. 56.22 lacs.

d) Advance of Rs 6.21 lacs to Telco and Rs 14.00 lac to GTZ for fabrication of van under the project Orissa Board fabrication of mobile Van

e). Loans and Advance include Rs.1,24,862/- shown as imprest balance with an employee of the Board and is outstanding for adjustment for a longtime. It has been noticed /explained that no such imprest /cash balance is available.

III). Fixed Assets Register

a). It has been observed that fixed asset register has not been properly maintained at Head office and its Zonal Office, with respect to depreciation charged, location and identification number, Further Fixed Asset register has not been reconciled with financial records and discrepancies if any has not been ascertained. Physical verification of fixed assets conducted, has not been matched with fixed assets register to identify short/excess.

b). Capital work in progress include Rs. 20.11 lacs being advance given to suppliers (Delhi Zone) since long and have not been adjusted/transferred to fixed asset Account. In absence of details, we are unable to comment on adjustability/ realisability of the same.

IV). Current Liabilities

Above account include a sum of Rs. 91.46 lacs under the head Deposit (work) which represent surplus fund to be refunded to various agencies after completion of project but have not been refunded and is being carried forward as liability since long time. In our opinion, an appropriate policy in this regard should be framed and should be accounted for accordingly.

V). Internal Audit System

There is no internal audit system in the Board and further the internal control system need to be significantly strengthened to make it commensurate with the size and nature of activities of the Board, particularly in respect of obtaining utilization certificates.

Prakash Jain & Co. * New Delhi F.R.N-007405N M.No. 087739 * Chartered Accountants *

VI). System of monitoring of projects assisted by the Board, obtaining utilization certificate and its adjustment needs to be strengthened.

VII). Central Pollution Control Board has created **Contributory Provident Fund (CPCB) under guidelines called The Central Board for the Prevention & Control of Water Pollution Employee's contributory Provident Fund since 1977-78** and the employee contribution is deducted from the salary of the employee and transferred to CPF Fund. **The accounts of CPF Fund are audited up to 31st March, 2007 only.** The shortfall in PF liability to be borne by Board, if any has not been ascertained.

Opinion

In our opinion and to the best of our information and according the explanations given to us the Balance sheet, Income & Expenditure Account and Statement of Receipts & Payments read together with the Accounting policies and notes to Accounts thereon, and subject to remarks Para 7 to 10 monetary impact of which is not ascertainable, give the information required by Law, in the manner so required and give true and fair view in conformity with the accounting principles generally accepted in India:

- In the case of Balance Sheet of the state of Affairs of the Board as at 31st March 2016.
- In the case of Income & Expenditure Account of the excess of Expenditure over income for the year ended on that date,
- In the case of Statement of Receipts & Payments of the Receipts & Payments for the year ended on that date.

FOR PRAKASH JAIN & CO.
CHARTERED ACCOUNTANTS
FIRM REGN. NO 007405N

(Rajendra Prasad)
PARTNER (M. NO. 87739)
Place: New Delhi
Date:13/07/2017

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

BALANCE SHEET AS AT 31ST MARCH 2016

CORPUS/CAPITAL FUND AND LIABILITIES	SCHD.	CURRENT YEAR (AMOUNT IN Rs.)	PREVIOUS YEAR (AMOUNT IN Rs.)
CORPUS/CAPITAL FUND	1	(278,46,846)	843,34,029
RESERVE AND SURPLUS	2	-	-
EARMARKED/ ENDOWMENT FUND	3	5906,23,008	8997,78,424
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	4868,99,471	4405,47,771
TOTAL		10496,75,633	14246,60,224
ASSETS			
FIXED ASSETS	8	1600,75,563	2203,03,930
INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS	9	-	-
INVESTMENTS-OTHERS	10	-	-
CURRENT ASSETS, LOANS, ADVANCES ETC	11	8896,00,070	12043,56,294
MISCELLANEOUS EXPENDITURE		-	-
(to the extent not written off or adjusted)			
TOTAL		10496,75,633	14246,60,224

Schedules 1 to 26 forming part of accounts are annexed

As per our report of even date

For Prakash Jain & Co.

Chartered Accountants

Firm Reg. No. 007405N

(Rajendra Prasad)

M.NO. 087739

Partner

Place: Delhi

Date: 13.07.2017

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

For Central Pollution Control Board

(S. P. Singh Parihar, IAS)
Chairman

(A.B. Akolkar)
Member Secretary

(Mohan Kapur)
Accounts Officer

(Virendra Bansal)
Assistant Accounts Officer

CENTRAL POLLUTION CONTROL BOARD

INCOME AND EXPENDITURE ACCOUNT

FOR THE YEAR ENDED 31ST MARCH 2016

INCOME	SCHD.	CURRENT YEAR (AMOUNT IN Rs.)	PREVIOUS YEAR (AMOUNT IN Rs.)
INCOME FROM SALES/ SERVICES	12	-	-
GRANTS/SUBSIDIES	13	6400,00,000	6010,00,000
FEES/ SUBSCRIPTIONS	14	-	-
INCOME FROM INVESTMENTS	15	-	-
(income on investments from earmarked/endowment funds		-	-
transferred to Funds)		-	-
INCOME FROM ROYALTY, PUBLICATIONS ETC.	16	1,44,520	2,92,597
INTEREST EARNED	17	7,03,366	10,90,232
OTHER INCOME	18	20,99,685	38,97,281
INCREASE/ DECREASE IN STOCK OF Consumables, Stores/ Spares	19	(30,79,373)	31,40,668
TOTAL(A)		6398,68,198	6094,20,778
EXPENDITURE			
ESTABLISHMENT EXPENSES	20	4484,22,868	3908,89,681
OTHER ADMINISTRATIVE EXPENSES ETC	21	1245,79,013	1176,69,754
EXPENDITURE ON GRANTS, SUBSIDIES ETC	22	-	-
INTEREST	23	23,606	21,331
MONITORING EXPENSES	24	928,20,134	1352,96,426
DEPRECIATION	8	822,09,586	838,55,963
TOTAL(B)		7480,55,206	7277,33,155
BALANCE BEING EXCESS OF INCOME OVER EXPENDITURE (A-B)		(1081,87,008)	(1183,12,376)
TRANSFERRED TO SPECIAL RESERVE		-	-
TRANSFERRED TO /FROM GENERAL RESERVE		-	-
PRIOR PERIOD EXPS.		39,93,867	42,76,230
BALANCE BEING SURPLUS/ DEFICIT CARRIED TO CORPUS / CAPITAL FUND		(1121,80,875)	(1225,88,606)

Schedules 1 to 26 forming part of accounts are annexed

As per our report of even date
For Prakash Jain & Co.
Chartered Accountants
Firm Reg. No. 007405N

(Rajendra Prasad)
M.NO. 087739
Partner
Place: Delhi
Date: 13.07.2017

Prakash Jain & Co. New Delhi F.R.N-007405N M.No. 087739 Chartered Accountants

For Central Pollution Control Board

(S. P. Singh Parihar, IAS)
Chairman

(A.B. Akolkar)
Member Secretary

(Mohan Kapur)
Accounts Officer

(Virendra Bansal)
Assistant Accounts Officer

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2016

		-		
SCHEDULE 1 - CORPUS / CAPITAL FUND	CURRENT YEAR		PREVIOUS YEAR	
	(AMOUNT IN Rs.)		(AMOUNT IN Rs.)	
BALANCE AS AT BEGINNIG OF THE YEAR	843,34,029		2069,22,636	
Less:- DUE TO RECTIFICATION OF FIXED ASSETS	-		-	
LESS : REFUND OF CAPITAL	-		-	
Add:- OPENING BALANCE OF INCOME AND EXPENDITURE				
Add/LESS:- EXCESS OF INCOME OVER EXPENDITURE/ EXCESS OF	(1121,80,875)	(278,46,846)	(1225,88,606)	843,34,029
EXPENDITURE OVER INCOME				
BALANCE AS AT YEAR END		-278,46,846		843,34,029
		-		
SCHEDULE 2 - RESERVE & SURPLUS	CURRENT YEAR		PREVIOUS YEAR	
1. CAPITAL RESERVE		-		
AS PER LAST ACCOUNT	-	-	-	-
ADDITION DURING THE YEAR	-	-	-	-
Less:- DEDUCTION DURING THE YEAR	-	-	-	-
2. REVALUATION RESERVE		-		
AS PER LAST ACCOUNT	-	-	-	-
ADDITION DURING THE YEAR	-	-	-	-
Less:- DEDUCTION DURING THE YEAR	-	-	-	-
3. SPECIAL RESERVE		-		
AS PER LAST ACCOUNT	-	-	-	-
ADDITION DURING THE YEAR	-	-	-	-
Less:- DEDUCTION DURING THE YEAR	-	-	-	-
4. GENERAL RESERVE		-		
AS PER LAST ACCOUNT	-	-	-	-
ADDITION DURING THE YEAR	-	-	-	-
Less:- DEDUCTION DURING THE YEAR	-	-	-	-
		-		

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CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 3 - EARMARKED / ENDOWMENT FUNDS	FUND WISE BREAKUP				TOTAL	
	SPONSORED PROJECTS	FUND XX	FUND YY	FUND ZZ	CUURENT YEAR (AMOUNT IN Rs.)	PREVIOUS YEAR (AMOUNT IN Rs.)
a) OPENING BALANCE OF THE FUND	8997,78,424	-	-	-	8997,78,424	8737,52,993
Add : Prior Period adjustment	-	-	-	-	-	4,14,016
b) ADDITION TO THE FUNDS	-	-	-	-	-	-
I. DONATION / GRANTS (NET OF REFUND)	430,80,616	-	-	-	430,80,616	1171,03,288
II. INCOME FROM INVESTMENTS MADE ON ACCOUNT OF FUNDS	211,07,058	-	-	-	211,07,058	162,71,013
III. OTHER ADDITIONS (SPECIFY NATURE)	54,53,166	-	-	-	54,53,166	55,55,929
					-	-
TOTAL (A+B)	9694,19,264	-	-	-	9694,19,264	10130,97,239
c) UTILISATION / EXPENDITURE TOWARDS OBJECTIVES OF FUND	-	-	-	-	-	-
I. CAPITAL EXPENDITURE	-	-	-	-	-	-
- FIXED ASSETS (Including Prior Period Adjustment)	-	-	-	-	-	-
- OTHERS	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-
II. REVENUE EXPENDITURE						
- SALARIES, WAGES AND ALLOWANCES ETC.	631,62,023	-	-	-	631,62,023	275,64,522
- RENT	-	-	-	-	-	-
- OTHER ADMINSTRATIVE EXPENSES	2673,28,191	-	-	-	2673,28,191	658,52,259
TOTAL	3304,90,214	-	-	-	3304,90,214	934,16,781
TOTA (C)	3304,90,214	-	-	-	3304,90,214	934,16,781
D.) Refund to MoEF	483,06,042	-	-	-	483,06,042	199,02,034
NET BALANCE AS AT THE YEAR END (A+B-C-D)	5906,23,008	-	-	-	5906,23,008	8997,78,424

Prakash Jain & Co. Chartered Accountants New Delhi F.R.N.-007405N M.No 037739

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

	(AMOUNT IN Rs.)			
SCHEDULE 4 -SECURED LOANS AND BORROWINGS	**CURRENT YEAR**		**PREVIOUS YEAR**	
1.CENTRAL GOVERNMENT		-		-
2.STATE GOVERNMENT (Specify)		-		-
3.FINANCIAL INSTITUTION				
a) Term Loans	-		-	
b) Interest accrued and due	-	-	-	-
4.BANKS:				
a) Term Loans				
-Interest accrued and due	-		-	
b) Other Loans (specify)				
-Interest accrued and due	-	-	-	-
5.OTHER INSTITUTION AND AGENCIES		-		-
6.DEBENTURES AND BONDS		-		-
7.OTHERS (Specify)		-		-
Total		-		-
Note: Amounts due within one year				

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 5 -UNSECURED LOANS AND BORROWINGS	(AMOUNT IN Rs.) CURRENT YEAR		PREVIOUS YEAR	
1.CENTRAL GOVERNMENT		-		-
2.STATE GOVERNMENT (Specify)		-		-
3.FINANCIAL INSTITUTION		-		-
4.BANKS:				
a) Term Loans	-		-	
b) Other Loans (specify)	-	-	-	-
5.OTHER INSTITUTION AND AGENCIES	-	-	-	-
6.DEBENTURES AND BONDS		-		-
7. FIXED DEPOSITS		-		-
8.OTHERS (Specify)		-		-
TOTAL		-		-
Note: Amounts due within one year				

SCHEDULE 6 -DEFERRED CREDIT LIABILITIES	(AMOUNT IN Rs.) CURRENT YEAR	PREVIOUS YEAR
a) Acceptence secured by hypothecation of capital equipment and other assets	-	-
b) Others	-	-
	-	-

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

	(AMOUNT IN Rs.)			
SCHEDULE 7 - CURRENT LIABILITIES AND PROVISIONS	**CURRENT YEAR**		**PREVIOUS YEAR**	
A. CURRENT LIABILITIES				
1. Acceptances		-		-
2. Sundry Creditors:				
a) For goods	-		-	
b) Others	307,90,154	307,90,154	140,23,476	140,23,476
3. Advances Received		135,29,053		114,74,496
4. Interest accrued but not due on:				
a) Secured Loans/borrowings	-		-	
b) Unsecured Loans/borrowings	-	-	-	-
5. Statutory Liabilities:	-		-	
a) Overdue	-		-	
b) Others	-	-	-	-
6. Other current Liabilities (Sponsored Projects)		134,70,410		190,67,097
TOTAL (A)		577,89,617		445,65,069
B. PROVISIONS				
1. For Taxation		-		-
2. Gratuity		2344,95,432		2245,54,495
3. Superannuation/Pension		-		-
4. Accumulated Leave Encashment		1946,14,422		1714,28,207
5. Trade Warranties/Claims		-		-
6. Others (Specify)		-		-
		-		-
TOTAL (B)		4291,09,854		3959,82,702
TOTAL (A+B)		4868,99,471		4405,47,771

Pra... Jain & Co. * Chartered Accountants * New Delhi F.R.N. 007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD , DELHI-110032

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

CHEDULE 8 -FIXED ASSETS												
ESCRIPTION		GROSS BLOCK				AMORTISATION/DEPRECIATION					NET BLOCK	
	DEP. RATE	Cost/valuation as at beginning of the Year(original cost)	Addition during the year	Deductions/Adjustments during the year	Cost/valuation at the year end(originl cost)	As at the beginning of the Year	Prior Period Dep.	During the Year	On Deductions during the Year	At the end of the year	As at the current Year -end	As at the Previous Year -end
IXED ASSETS:												
AND:												
) Freehold	-	-	-	-	-	-		-	-	-	-	-
) Leasehold	-	125,05,904	-	-	125,05,904	12,39,048	-	95,530	-	13,34,578	111,71,326	112,66,856
UILDINGS:												
) On Freehold Land		-	-	-	-	-		-	-	-	-	-
) On Leasehold Land	-	1187,78,416	-	-	1187,78,416	667,04,368	-	118,77,842	-	785,82,210	401,96,206	520,74,048
) Ownership Flats/Premises		-	-	-	-	-		-	-	-	-	-
) Superstructures on Land		-	-	-	-	-		-	-	-	-	-
ot belonging to the entity												
LANT, MACHINERY & EQUIPMENT	15%	4305,55,705	134,62,738	-	4440,18,443	2887,19,092	-	648,37,188	-	3535,56,280	904,62,163	1418,36,613
EHICLES	15%	79,54,785	58,93,152	99,189	137,48,748	50,52,653	-	19,90,143	36,990	70,05,806	67,42,942	29,02,132
URNITURE, FIXTURES,	10%	184,32,340	12,65,341	-	196,97,681	100,12,228	-	19,69,768	-	119,81,996	77,15,685	84,20,112
FFICE EQUIPMENT	15%	-	-	-	-	-		-	-	-	-	-
OMPUTER/PERIPHERALS	60%	262,37,552	13,54,151	-	275,91,703	248,48,356	-	13,63,762	-	262,12,118	13,79,585	13,89,196
LECTRIC INSTALLATIONS	15%	-	-	-	-	-		-	-	-	-	-
IBRARY BOOKS	15%	12,78,256	68,036	-	13,46,292	11,15,672	-	75,353	-	11,91,025	1,55,267	1,62,584
UBEWELLS & W.SUPPLY	15%	-	-	-	-	-		-	-	-	-	-
THER FIXED ASSETS	15%	-	-	-	-	-		-	-	-	-	-
OTAL OF CURRENT YEAR		6157,42,958	220,43,418	99,189	6376,87,187	3976,91,417	-	822,09,586	36,990	4798,64,013	1578,23,174	2180,51,541
APITAL WORK-IN PROGRESS		22,52,389	-	-	22,52,389	-	-	-	-	-	22,52,389	22,52,389
OTAL		6179,95,347	220,43,418	99,189	6399,39,576	3976,91,417	-	822,09,586	36,990	4798,64,013	1600,75,563	2203,03,930
		6179,95,347.00	220,43,418.00	99,189.00	6399,39,576.00	3976,91,417.00		822,09,586.00	36,990.00	4798,64,013.00	1600,75,563.00	2203,03,930.00
		-	-	-	-	-		-	-	-	-	-

Prakash Gupta & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 9 -INVESTMENTS FROM EARMARKED/ ENDOWMENT FUNDS

	(AMOUNT IN Rs.)			
	CURRENT YEAR		PREVIOUS YEAR	
1. IN GOVERNMENT SECURITIES		-		-
2. OTHER APPROVED SECURITIES		-		-
3. SHARES		-		-
4. DEBENTURES AND NONDS		-		-
5. SUBSIDIARIES AND JOINT VENTURES		-		-
6. OTEHRS(TO BE SPECIFIED)		-		-
		-		-
Total		-		-

SCHEDULE-10 INVESTMENTS OTHERS	(AMOUNT IN Rs.)			
	CURRENT YEAR		PREVIOUS YEAR	
1. IN GOVERNMENT SECURITIES		-		-
2. OTHER APPROVED SECURITIES		-		-
3. SHARES		-		-
4. DEBENTURES AND NONDS		-		-
5. SUBSIDIARIES AND JOINT VENTURES		-		
6. OTEHRS(TO BE SPECIFIED)		-		-
Total				

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 11- CURRENT ASSETS, LOANS, AND ADVANCES	(AMOUNT IN Rs.)			
	CURRENT YEAR		PREVIOUS YEAR	
A) CURRENT ASSETS				
1. INVENTORIES				
a) Stores , Spares and Consumables	-		-	
b) Loose Tools	-		-	
c) Stock-in- trade	-		-	
Finished Goods (Consumables, Stores/ Spares)	99,36,712		130,16,084	
Work -in- progress	-		-	
Raw materials	-	99,36,712	-	130,16,084
2. SUNDRY DEBTORS				
a) Debts outstanding for a period exceeding six months	-		-	
b) Others	-	-	-	-
3. Cash balances in hand (including cheques/drafts & imprest)		-		-
4.Bank Balances				
a)With scheduled banks				
-On current Accounts	1627,12,233		3257,03,866	
- On Deposits Accounts(including margine money)	515,02,691		1361,12,506	
- On saving Accounts	497,60,503	2639,75,427	1327,40,008	5945,56,380
b) with non- shceduled Banks				
-On current Accounts	-		-	
- On Deposits Accounts(including margine money)	-		-	
- On saving Accounts	-	-	-	-
5. Post office saving Accounts		-		-
TOTAL (A)		2739,12,139		6075,72,465

Prakash Jain & Co. Chartered Accountants New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 11- CURRENT ASSETS, LOANS, AND ADVANCES	(AMOUNT IN Rs.)			
	CURRENT YEAR		PREVIOUS YEAR	
B) LOANS, ADVANCES AND OTHER ASSETS				
1.LOANS & ADVANCES				
a) Staff	39,08,661		25,60,979	
b) other entities engaged in activities similar to that entity	2156,27,970		1988,53,273	
c) Other (Sponsored Projects Advances)	3906,10,946	6101,47,577	3903,23,342	5917,37,594
2.Advances and other amounts recoverable in cash or kind				
a) On capital account	-		-	
b) Prepayments	15,04,565		17,31,444	
c) Others	85,014	15,89,579	4,00,000	21,31,444
3. Income Accrued	-		-	
a) on investments from earmarked/endowment funds	15,51,325		15,51,325	
b) On investments (Sponsored Projects)	23,99,451		13,63,466	
c) On loans and advances	-		-	
d) Others	-	39,50,776	-	29,14,791
4. CLAIMS RECEIVABLE		-		-
TOTAL (B)		6156,87,931		5967,83,829
TOTAL (A+B)		8896,00,070		12043,56,294

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 12- INCOME FROM SALES/SERVICE	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
1.INCOME FROM SALES		
a) Sale of Finished goods	-	-
b) Sale of Raw material	-	-
c)Sale of Scrap		
2. INCOME FROM SERVICES		
a) Labour and processing charges	-	-
b) Professional/ consultancy service	-	-
c) Agency commission and Brokerage	-	-
d) Maintenance Services (Eqipment / property)	-	-
e) Others (specify)	-	-
TOTAL	-	-

SCHEDULE 13- GRANTS/ SUBSIDIES	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
1. Central Government	6400,00,000	6010,00,000
2. Fund Transfer to ZO'S	-	-
3. State Government	-	-
4. Government agencies	-	-
5. Institutions/ welfare Bodies	-	-
6. International Organisations	-	-
7. Others (specify)	-	-
TOTAL	6400,00,000	6010,00,000

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

			(AMOUNT IN Rs.)	
SCHEDULE 14- FEES/ SUBSCRIPTIONS			CURRENT YEAR	PREVIOUS YEAR
1. Entrance fees			-	-
2. Annual Fees/ Subscriptions			-	-
3. Seminar/ program Fees			-	-
4. Consultancy Fees			-	-
5. Others			-	-
			-	-

SCHEDULE 15- INCOME FROM INVESTMENTS			(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR	CURRENT YEAR	PREVIOUS YEAR
1. INTEREST				
A) ON GOVT. SECURITIES	-		-	
B) OTHER BONDS/ DEBENTURES	-	-	-	-
2. DIVIDENDS				
A) ON SHARES	-		-	
B) ON MUTUAL FUND SECURITIES	-	-	-	-
3. RENTS		-		-
4. OTHERS (SPECIFY)		-		-
TRANSFERRED TO EARMARKED/ ENDOWMENT FUNDS		-		-

SCHEDULE 16 - INCOME FROM ROYALTY, PUBLICATIONS etc.			(AMOUNT IN Rs.)	
			CURRENT YEAR	PREVIOUS YEAR
1. INCOME FROM ROYALTY			-	-
2. INCOME FROM PUBLICATIONS			1,44,520	2,92,597
3. OTHERS (specify)			-	-
TOTAL			1,44,520	2,92,597

Prakash Nath & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087789

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 17 - INTEREST EARNED	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
1. ON TERM DEPOSITS		
a) with scheduled Banks	1,61,988	9,00,052
b) with non scheduled Banks	-	-
c) with institution	-	-
d) others	-	-
2. ON SAVING ACCOUNTS	-	-
a) with scheduled Banks	-	-
b) with non scheduled Banks	-	-
c) with institution	-	-
d) others	-	-
3. ON LOANS	-	-
a) Employee/ staff - HBA	5,41,378	1,90,180
b) Others	-	-
4. INTEREST ON DEBTORS AND OTHERS RECEIVABLES	-	-
TOTAL	7,03,366	10,90,232

SCHEDULE 18- OTHER INCOME	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
1. PROFIT ON SALE/ DISPOSAL OF ASSETS		
a) Owned assets	91,299	-
b) Assets acquired out of grants, or received free of cost	-	-
2.EXPORT INCENTIVES REALIZED	-	-
3. FEES FOR MISCELLANEOUS SERVICES	-	-
4. MISCELLANEOUS INCOME	20,08,386	38,97,281
TOTAL	20,99,685	38,97,281

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 19- INCREASE/DECREASE IN STOCK OF FINISHED GOODS & WORK-IN-PROGERESS			(AMOUNT IN Rs.)	
			CURRENT YEAR	PREVIOUS YEAR
A. CLOSING STOCK				
- Finished Goods (Consumables, Stores/ Spares)			99,36,712	130,16,084
- Work in progress			-	-
B. Less:- OPENING STOCK			-	-
- Finished Goods (Consumables, Stores/ Spares)			130,16,084	98,75,416
- Work in progress			-	-
NET INCREASE/ DECREASE (A-B)			(30,79,373)	31,40,668

SCHEDULE 20- ESTABLISHMENT EXPENSES			(AMOUNT IN Rs.)	
			CURRENT YEAR	PREVIOUS YEAR
1. SALARIES & WAGES			3554,90,599	3230,90,603
2. ALLOWANCES AND BONUS			146,68,450	168,64,989
3. CONTRIBUTION TO PROVIDENT FUND			156,24,636	148,69,388
4. CONTRIBUTION TO OTHER FUND - GIS			1,23,513	1,28,237
5. STAFF WELFARE EXPENSES			30,07,969	29,50,894
6. EXPENSES ON EMPLOYEE RETIREMENT & TERMINAL BENEFIT			594,72,536	329,88,365
7. OTHERS- WELFARE FUND			35,165	-2,795
TOTAL			4484,22,868	3908,89,681

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 21 - OTHER ADMINISTRATIVE EXPENSES			(AMOUNT IN Rs.)	
			CURRENT YEAR	PREVIOUS YEAR
ADVERTISEMENT AND PUBLICITY			35,66,624	5,23,679
AUDITORS REMUNERATION			-	-
CARTAGE AND CARIAGE INWARD			-	-
DISTRIBUTION EXPENSES			-	-
ELECTRICITY AND POWER			206,82,790	169,46,901
EXCISE DUTY			-	-
EXPENSES ON FEES			29,049	67,014
EXPENSES ON SEMINAR/WORKSHOP			100,93,301	84,53,360
FREIGHT AND FORWARDING EXPENSES			-	-
HOSPITALITY EXPENSES			11,759	10,810
INSURANCE			8,33,022	7,49,427
IRRECOVERABLE BALANCES WRITTEN OFF			-	-
LABOUR AND PROCESSING EXPENSES			-	-
OTHERS (specify)			128,16,132	123,18,847
PACKING CHARGES			-	-
POSTAGE, TELEPHONE AND COMMUNICATIONS			35,42,840	33,58,701
PRINTING AND STATIONARY			23,37,922	38,82,736
PROFESSIONAL CHARGES			28,15,300	20,32,959
PROVISION FOR BAD AND DOUBTFUL DEBTS			-	-
PURCHASES (Consumables, Stores/ Spares)			97,61,526	149,83,878
RENT, RATES AND TAXES			82,82,002	79,99,753
REPAIR AND MAINTENANCE			256,82,364	217,97,966
SUBSCRIPTION EXPENSES			-	-
TRAVELLING AND CONVEYANCE EXPENSES			164,01,448	156,78,100
VEHICLE RUNNING AND MAINTENANCE			54,92,314	53,89,087
WATER CHARGES			22,30,620	34,76,537
TOTAL			1245,79,013	1176,69,754

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2016

SCHEDULE 22- EXPENDITURE ON GRANTS, SUBSIDIES	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
GRANTS GIVEN TO INSTITUTIONS/ ORGANISATION	-	
SUBSIDIES GIVEN TO INSTITUTIONS/ ORGANISATION	-	
TOTAL	-	

SCHEDULE 23- INTEREST	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
ON FIXED LOANS	-	-
ON OTHER LOANS (including bank charges)	23,606	21,331
OTHERS (specify)	-	-
TOTAL	23,606	21,331

SCHEDULE 24- MONITORING EXPENSES	(AMOUNT IN Rs.)	
	CURRENT YEAR	PREVIOUS YEAR
AIR QUILITY MONITORING EXPENSES	707,50,469	545,20,764
WATER QUILITY MONITORING EXPENSES	48,685	20,027
ENVIRONMENT PROTECTION AND MONITORING EXP.	220,20,980	807,55,635
TOTAL	928,20,134	1352,96,426

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N. 007405N M.No. 087739

CENTRAL POLLUTION CONTROL BOARD, DELHI
RECEIPTS & PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2016

cpcb

(AMOUNT IN Rs.)

RECEIPTS	CURRENT YEAR	PREVIOUS YEAR	PAYMENTS	CURRENT YEAR	PREVIOUS YEAR
I. Opening Balance			I. Expenses		
a) Cash in hand	-	-	a) Establishment Expenses (corresponding to schedule 20)	3915,33,641	3636,87,425
b) Bank Balances	-	-	b) Administrative Expenses (corresponding to schedule 21 and 24)	1981,24,198	1945,29,314
i) In current accounts	3257,03,866	2820,52,219	c) Prior Period Exps	20,80,376	31,92,568
ii) In deposit accounts	1361,12,506	380,11,098	II. Payments made against funds for various projects	-	-
iii) Savings accounts	1327,40,008	2965,71,299	Project Exps	3304,90,214	962,52,825
II. Grants Received	-	-			-
a) From Government of India - Mains	6400,00,000	6010,00,000	III. Investments and deposits made		
b) From State Government	-	-	a) Out of Earmarked/Endowment funds	-	-
c) From Government of India - Projects	430,80,616	1171,03,288	b) Out of Own Funds (Investments-Others)	-	-
d) Others	50,89,880	55,55,929			
			IV. Expenditure on Fixed Assets &Capital Work in progress		
			a) Purchase of Fixed Assets-Own fund	159,50,117	154,05,832
III. Income on Investments from			b) Purchase of Fixed Assets- Earmarked/Endowment funds	-	-
a) Earmarked/Endow. Funds	211,07,058	162,71,013			
b) Own Funds	-	-	V. Refund of surplus money/Loans		
			a) To the Government of India	483,06,042	199,02,034
IV. Interest Received	-	-	b) To the State Government	-	-
a) On Bank deposits	-	-	c) To other providers of funds	-	-
b) Loans. Advances etc.	-	-	d) To the Government of India - Mains	-	-
			VI. Finance Charges (Interest & Bank charges Sch 23)	23,606	21,331
V. Other Income (Specify)					
a) Income from Royalty, Publications Etc.	1,44,520	3,66,797	VII. Other Payments (Specify)		
b) Other Income	27,46,838	42,44,621	a) Advances and other payments (Net) - Mains	1666,94,580	3031,65,187
c) Misc Income	-	-	b) Advances and other payments (Net) - Projects	63,410	432,96,475
VI. Amount Borrowed	-	-			
			VIII. Closing Balances		
VII. Any other receipts			a) Cash in hand	-	-
a) Other - Mains	1104,17,129	2727,59,325	b) Bank Balances	-	-
c) Sale of Fixed Assets	99,189	73,782	i) In current accounts	1627,12,233	3257,03,866
d)Advances and other payments (Net)-Mains	-	-	ii) In deposit accounts	515,02,691	1361,12,506
			iii) In Savings account	497,60,503	1327,40,008
Grand Total	14172,41,610	16340,09,371	Grand Total	14172,41,610	16340,09,371
				-	-

Schedules 1 to 26 forming part of accounts are annexed

As per our report of even date
For Prakash Jain & Co.
Chartered Accountants
Firm Reg. No. 007405N

(Rajendra Prasad)
M.NO. 087739
Partner
Place: Delhi
Date: 13.07.2017

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N. 007405N M.No. 087739

For Central Pollution Control Board

(S. P. Singh Parihar, IAS)
Chairman

(A.B. Akolkar)
Member Secretary

(Mohan Kapur)
Accounts Officer

(Virendra Bansal)
Assistant Accounts Officer

Schedule 'C'

CENTRAL POLLUTION CONTROL BOARD : DELHI - 110032

DEPOSITS RECEIVED FOR WORKS FROM OUTSIDE BODIES (OTHER SPONSORED PROJECTS) (2015-16)

(Amount in Rs.)

SL.NO.	NAME OF THE PROJECT	OPENING BALANCE	RECEIVED DURING THE YEAR						PAYMENT DURING THE YEAR					CLOSING BALANCE
			Grant Received	Grant- Others	Interest	Other Receipts	Adjusments	Total	Expenditure	Project Advance	Advances and other payment (Net)	Refund to MoEF	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9=4+5+6+7+8)	(10)	(11.)	(12)	(13)	(14=10+11+12+13)	(14=3+9-14)
1	AAQM UP (Agra) Project	-	-	-	-	-	-	-	-	-	-	-	-	-
2	DOD Project	50,588						-	896				896	49,692
3	DTS Project (Bangluru)	5,39,795						-	11				11	5,39,784
4	NRCD - Project (Lucknow)	-				-		-	-		-		-	-
5	NGRBA PIAS Project (Kolkata)	9,59,336	-	28,00,000	-	-	-	28,00,000	30,83,742	-	9,393	-	30,93,135	6,66,201
6	NGRBA PIAS Project (Lucknow)	92,566	-	90,00,000	-	-	-	90,00,000	81,56,297	-	64,614		82,20,911	8,71,655
7	NGRBA PIAS (Delhi HO)	268,74,996	-	-	8,04,668	10,060	-	8,14,728	136,17,565	118,00,000	1,99,082	-	256,16,647	20,73,077
8	CAEA - Phase II Project	55,086	-	-	2,231	-	-	2,231	-	-	-	-	-	57,317
9	CPCB Clean Technology Project	44,84,769						-	-				-	44,84,769
10	Bank Guarantee Project	273,56,445		50,89,880	12,61,672	-		63,51,552			10,35,985		10,35,985	326,72,012
11	HWMD Dump Site Project	998,40,777			62,89,320			62,89,320	535,33,137				535,33,137	525,96,960
12	HWMD Waste of UCIL Project	-				-		-	-			-	-	-
13	VTT Finland Project	35,798	-			360		360	112	-	-		112	36,046
14	ENVIS-MOEF Project	4,38,603	4,97,633					4,97,633	6,81,289	63,410	-		7,44,699	1,91,537
15	IARI (MPRNL) Project	3,79,377	8,00,000		50,149	3,14,986		11,65,135	7,96,362		-		7,96,362	7,48,150
16	ICAQIS (CESS) Project	41,311						-	113		-		113	41,198
17	Indo-Norweign Project	41,48,503	-					-	-		-	41,48,503	41,48,503	-
18	NSDI (DST) Project	15,63,255	-					-	3,90,321		20,000		4,10,321	11,52,934
19	Development of Monitoring Van-Orissa Boar	95,180						-					-	95,180
20	Paryavaran Darashan Project	270,91,352						-				-	-	270,91,352
21	Strengthening of NAQM Project	-						-				-	-	-
22	UNEP (MALE) Project	27,28,260				-		-	630				630	27,27,630
23	UNI DO Project	73,84,591			2,98,995			2,98,995	29				29	76,83,557
24	Workshop on BMW Project	-				-		-	-			-	-	-
25	Bakarganj Nala Patna Project	3,408			138			138	-				-	3,546
26	Budhanala Ludhiyana NRCP Project	9,20,727	252,63,329		47,184			253,10,513	239,19,728	-			239,19,728	23,11,512
27	Critically Polluted Areas - Cess Project	2,14,072			8,648	-		8,648	15				15	2,22,705
28	NAQMP Cess Project	178,59,523			6,83,600			6,83,600	15	-		185,43,108	185,43,123	-
29	WQMS Cess Project	690,00,000	-		25,71,603			25,71,603	689,31,789			-	689,31,789	26,39,814
30	NNMS Cess Project	44,73,958	-		1,00,275	-		1,00,275	2,069		44,00,000		44,02,069	1,72,164
31	Baseline Servey of Industires Project	357,21,501			11,77,941	-		11,77,941	25,71,225	-		256,14,431	281,85,656	87,13,786
32	Upgradation of Lab Project	1936,59,371		-	72,88,180	1,03,515		73,91,695	1548,04,869	-	24,383		1548,29,252	462,21,814
33	UNEP SAARC 2014-2015	2,35,836	6,22,904	-	11,711	-		6,34,615	-		8,70,451		8,70,451	-
34	CPCB-WQM WB Input cost of staff		158,96,750		5,10,743			164,07,493					-	164,07,493
	Total	5262,48,984	430,80,616	168,89,880	211,07,058	4,28,921	-	815,06,475	3304,90,214	118,63,410	66,23,908	483,06,042	3972,83,574	2104,71,885
									-	-	-			-

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

Annexure - 1 to Schedule C

CENTRAL POLLUTION CONTROL BOARD : DELHI - 110032

Closing Balance of capital fund - Other Sponsored Projects: (2015-16)

(Amount in Rs.)

SL.NO.	NAME OF THE PROJECT	Balance at Bank	Interest Accrued on Investments	Advances	Total	Less: Sundry Creditors	Closing Balance of captial fund
(1)	(2)	(3)	(4)	(5)	(6=3+4+5)	(7)	(8=6-7)
1	**AAQM UP (Agra) Project**	-	-	6,000	6,000		6,000
2	**DOD Project**	49,692	-	1,98,294	2,47,986	4,80,000	(2,32,014)
3	**DTS Project (Bangluru)**	5,39,784	-		5,39,784		5,39,784
4	**NRCD - Project (Lucknow)**	-	-	-	-	-	-
5	**NGRBA PIAS Project (Kolkata)**	6,66,201	-	11,505	6,77,706	-	6,77,706
6	**NGRBA PIAS Project (Lucknow)**	8,71,655	-		8,71,655	-	8,71,655
7	NGRBA PIAS (Delhi HO)	20,73,077	-	35,81,504	56,54,581	10,060	56,44,521
8	CAEA - Phase II Project	57,317	-		57,317		57,317
9	CPCB Clean Technology Project	44,84,769	-		44,84,769		44,84,769
10	Bank Guarantee Project	326,72,012	23,99,451	58,473	351,29,936	100,00,000	251,29,936
11	HWMD Dump Site Project	525,96,960	-		525,96,960		525,96,960
12	HWMD Waste of UCIL Project	-	-	6,782	6,782		6,782
13	VTT Finland Project	36,046	-	-	36,046		36,046
14	ENVIS-MOEF Project	1,91,537	-	69,975	2,61,512		2,61,512
15	IARI (MPRNL) Project	7,48,150	-	85,014	8,33,164		8,33,164
16	ICAQIS (CESS) Project	41,198	-	104,69,370	105,10,568		105,10,568
17	Indo-Norweign Project	-	-		-		-
18	NSDI (DST) Project	11,52,934	-	20,000	11,72,934		11,72,934
19	Development of Monitoring Van-Orissa Board Project	95,180	-	20,20,680	21,15,860		21,15,860
20	Paryavaran Darashan Project	270,91,352	-	1425,00,000	1695,91,352		1695,91,352
21	Strengthening of NAQM Project	-	-	435,52,310	435,52,310		435,52,310
22	UNEP (MALE) Project	27,27,630	-	22,976	27,50,606		27,50,606
23	UNI DO Project	76,83,557	-		76,83,557		76,83,557
24	Workshop on BMW Project	-	-	4,15,263	4,15,263		4,15,263
25	Bakarganj Nala Patna Project	3,546	-	56,00,000	56,03,546		56,03,546
26	Budhanala Ludhiyana NRCP Project	23,11,512	-	440,17,000	463,28,512		463,28,512
27	Critically Polluted Areas - Cess Project	2,22,705	-		2,22,705	6,00,000	(3,77,295)
28	NAQMP Cess Project	-	-	880,00,000	880,00,000		880,00,000
29	WQMS Cess Project	26,39,814	-		26,39,814		26,39,814
30	NNMS Cess Project	1,72,164	-	91,605	2,63,769	17,40,281	(14,76,512)
31	Baseline Servey of Industires Project	87,13,786	-	32,74,519	119,88,305	-	119,88,305
32	Upgradation of Lab Project	462,21,814	-	467,14,780	929,36,594	1,34,037	928,02,557
33	UNEP SAARC 2014-2015	-			-	-	-
34	CPCB-WQM WB Input cost of staff	164,07,493		-	164,07,493		164,07,493
	Total	**2104,71,885**	**23,99,451**	**3907,16,050**	**6035,87,386**	**129,64,378**	**5906,23,008**
					-		-
							-

T. Ramasubramaniam & Co. Chartered Accountants New Delhi F.R.N.-007405N M.No. 087739

SCHEDULES FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED 31st March 2016

SCHEDULE 25- SIGNIFICANT ACCOUNTING POLICIES

1. ACCOUNTING CONVENTION

The Financial Statements i.e., Balance Sheet, Income & Expenditure Account & Receipts and Payments Account are prepared on the basis of historical cost convention and on the basis of accrual method of Accounting unless stated otherwise. The Financial statements have been prepared as per 'Form of Financial Statement for the Central Autonomous Bodies' as per the directions of Ministry of Environment and Forest, Govt. of India vide their letter no.G25012/1/2010-CPW dated 10.02.10.as circulated by Controller General of Accounts, Ministry of Finance. The Financial Statement includes Financial Statement of Head Office Delhi and its six Regional Directorates located at Bangaluru, Bhopal, Kolkata, Lucknow, Shillong, and Vadodara and sponsored projects.

2. REVENUE RECONGNITION

2.1 Grants- in - Aid are accounted for on realization basis.
2.2 Interest on Bank Deposits is recognized on accrual basis.
2.3 Miscellaneous Receipts and other Incomes are recognized on receipts basis.

3. FIXED ASSETS

3.1 Fixed Assets are stated at cost of acquisition inclusive of freight inward, duties, taxes, incidental and other direct expenses related to acquisition.

3.2 Fixed Assets received by way of non-monetary grants, (other than towards the Corpus Fund), i.e., gifted assets are taken in the financial books at nominal value. The incidental expenses on such assets such as clearing & forwarding charges, duties & taxes and other incidental expenses are capitalized.

3.3. REGROUPING OF FIXED ASSETS

3.3.1 Laboratory Equipments & Scientific Equipments and other Project Equipments have been grouped under Plant, Machinery & Equipments.

4. DEPRECIATION

4.1. Depreciation during the year is provided on straight-line method as per rates given below. Lease hold land has been amortized over the lease period.

Akash Jain & Co. Chartered Accountants New Delhi F.R.N.-007405N M.No. 087739

Category of Assets	Rates (in %)
Free Hold Land	0
Building	10
Plant , Machinery & Equipments	15
Vehicles	15
Furniture & Fixtures	10
Computers	60
Library Books	15

4.2 In respect of additions to / deduction from the fixed assets during the year, depreciation is considered on full-year basis.

5. FOREIGN CURRENCY TRANSACTION

Transaction denominated in foreign currency is accounted for at the exchange rate prevailing at the date of transaction.

6. INVENTORY VALUATION

Stores and Spares including Chemicals, Glassware, Consumables & other Inventories have been valued at cost as at the close of the year.

7. RETIREMENT BENEFITS

The Board's contribution to Contributory Provident Fund is charged to Income & Expenditure Account. The Board also provides Gratuity benefits to its employees. Liability towards Gratuity payable on death/retirement is accrued at the year-end on the basis of actuarial valuation as at year end.

The Board has got actuarial valuation of provision for Gratuity as on 31 Mar. 2015 and 31 Mar, 2016. The increase in amount of actuarial valuation of provision made as on 31 Mar, 2016, as compared to actuarial valuation as on 31 Mar, 2015 (Rs. 23,44,95,432/- less Rs. 22,45,54,495/-) of Rs. 99,40,937/- has been charged to Income & Expenditure Account.

Provision for accumulated Leave Encashment benefit to employees is accrued and computed on the basis of actuarial valuation as at year end. The increase in amount of actuarial valuation of provision made for Leave Encashment as on 31 Mar-2016 as compared to actuarial valuation as on 31 Mar, 2015 (Rs. 19,46,14,422/- Less Rs. 17,14,28,207/-) of `Rs. 2,31,86,215 /- has been charged to Income & Expenditure Account.

8. EARMARKED FUNDS – SPONSORED PROJECTS

8.1. The Funds Received & utilized for Sponsored Projects have been identified as Earmarked Funds. The funds are utilized towards the objectives of the specific Projects. Income on account of bank interest is added to the Sponsored Projects and not treated as income of the Board.

8.2. The sponsored Project " WQM WB Input cost of staff " has been commenced during the current financial year.

SCHEDULE 26 - CONTINGENT LIABLITIES AND NOTES ON ACCOUNTS

S NO	PARTICULARS	CURRENT YEAR (Amount in Rs.)	PREVIOUS YEAR (Amount in Rs.)
1	**CONTINGENT LIABLITIES**		
1.1	Claims against the Entity not acknowledged as debts	NIL	NIL
1.2	In respect of		
	- Bank Guarantees given by/on behalf of Entity	NIL	NIL
	- Letter of Credit opened by Bank on behalf of the Entity	15,00,000	5,25,000
	- Bills Discounted with Banks	NIL	NIL
1.3	Disputed Demands in respect of		
	- Income Tax	NIL	NIL
	- Sales Tax	NIL	NIL
	- Municipal Tax	NIL	NIL
1.4	In respect of claims from parties for non-execution of orders, but contested by the entity	NIL	NIL
1.5	In respect of Court cases And Arbitration	1,06,430/-	1,06,430/-
2.	**CAPITAL COMMITMENTS**		
	Estimated value of contracts remaining to be executed on capital accounts and not provided for (net of advances)		
	(a) CESS Project - Upgradation and strengthening of lab.	NIL	3,65,63,091/-
	(b) Head office & Regional Directorates	NIL	NIL
3.	**LEASE OBLIGATIONS**		
	Future obligations for rentals under finance lease arrangements for plant and machinery	NIL	NIL

4. CURRENT ASSETS, LOANS AND ADVANCES

In the opinion of the Management, the current assets, loans and advances have a value on realisation in the ordinary course, equal to at least the aggregate amount shown in the Balance Sheet.

Particulars	Current Year (Rs. in lacs)	Previous Year (Rs. in lacs)
Staff Advances	29.31	17.75
Outside Projects Advances	82.07	46.48
State Pollution Control Board's Advances	56.22	56.22
Publications Advances	0.26	74.83
Purchase & other Advances	23.88	22.47
Advances for Capital Commitment	0.00	0.00
Other Advances – UC Required	1846.73	1581.06
Misc Advances	32.02	66.06
Total (A)	**2070.49**	**1864.87**
Advances made by Regional Directorates **(B)**	124.01	123.76
Project Advances **(C)**	3907.16	3903.23
Grand Total (A+B+C)	**6101.66**	**5891.86**

The Following credit balances are subject to confirmations:

Particulars	Current Year (Rs. in lacs)	Previous Year (Rs. in lacs)
Deposits (Work)	91.46	91.46
Earnest Money Deposit	31.73	39.87
Retention Money	0.73	0.73
Security Deposit	6.92	5.68
Others	14.59	15.37
Grand Total	**145.43**	**153.11**

5. **TAXATION**

In view of there being no taxable income under Income Tax Act 1961, no provision for Income tax has been considered necessary.

6. **FOREIGN CURRENCY TRANSACTIONS**

6.1 Value of Imports Calculated on C.I.F Basis:

	CURRENT YEAR (Rs.)	PREVIOUS YEAR (Rs.)
--Purchase of finished Goods	NIL	NIL
--Raw Materials & Components (Including in transit)	NIL	NIL
--Capital Goods, Stores, Spares and Consumables	NIL	2,72,288

6.2 Expenditure in foreign currency:

a) Travel	NIL	1,70,755
b) Remittances interest payment to Financial Institution/Banks in foreign Currency	NIL	NIL
c) Other expenditure:		
--Commission on Sales	NIL	NIL
--Legal and Professional Expenses	NIL	NIL
--Miscellaneous Expenses	NIL	NIL

6.3 Earnings:

Value of Exports on FOB basis	NIL	NIL

6.4 Remuneration to Auditors:

--As Auditors	1,09,250	1,08,300
--Taxation matters	NIL	NIL
--For Management services	NIL	NIL
--For certification	NIL	NIL
--Others	NIL	NIL

7. Corresponding figures for the previous year have been regrouped / rearranged, wherever necessary.

Pankaj & Co. * Chartered Accountants * New Delhi F.R.N. 007405N M.No. 087739

8.0 Fixed Assets Register

8.1 The Assets Registers have been maintained as per General Financial Rules (GFR) in respect of Laboratory Equipments, Instruments, Computers, Office Equipments and Furniture and Fixture on cost basis. However, the balance appears in the said registers may not tally with Financial Statement/Books of Accounts as depreciation is charged in the Financial Books of Accounts and no depreciation is charged in the fixed assets register as there is no column in fixed assets register for providing depreciation on fixed assets as per GFR.

8.2 The Physical Verification of assets of the board was carried out in the phased manner. However, the obsolete assets are to be disposed off / written off.

9.0 Outstanding Balances

9.1 The Balances under heading 'Deposit received for Works from Outside Bodies' & 'Amount due in Liability side' and 'Advances' in Assets side of the Balance Sheet are subject to reconciliation / confirmation. The old Balances appearing in advances / liabilities are in the process of Reconciliation, and the effect, if any, in the Books of Accounts will be given on reconciliation thereof.

10. There are unspent balances in Sponsored Projects, which are outstanding for a long time for want of necessary instructions from Sponsors

11. Contingent Liablity for Pension of CPCB employees:

CPCB employees recruited before 1.1.2004 are covered under Contributory Provident Fund (CPF) scheme. However the employees' union of CPCB is demanding coverage under Pension (Old) scheme and a court case is under progress in this regard. Contingent liability that may arise in the event of court's verdict goes in favour of employees' union demand, has neither been shown and nor been ascertained.

12. Current Liabilities include Rs. 5,29,718/- and Rs. 7,55,069/- under the head Misc Deposits- Stale Cheques and sundry Account respectively. Details are not available for the above two accounts and efforts are being made to reconcile these figures

13. During the year, out of the total expenditure of Rs. 330,490,214/- incurred in sponsored project, Rs.131,093,696/- has been incurred on procurement of fixed assets.

14. Earmarked Funds- Sponsored Projects

During the year 34 Nos. of projects were carried out by Central Pollution Control Board as per details given in schedule 'C' (attached).

15. Schedules 1 to 26 are annexed to and form integral parts of the Balance Sheet as at 31st March 2016 and the Income and Expenditure Account for the year ended on that date.

For Prakash Jain & Co.
Firm Reg. No. 007405N
Chartered Accountants

(Rajendra Prasad)
Partner
M.No. 087739

Place: Delhi
Date: 13.07.2017

(S. P. Singh Parihar, IAS)
Chairman

Prakash Jain & Co. * Chartered Accountants * New Delhi F.R.N.-007405N M.No. 087739

For Central Pollution Control Board

(A.B. Akolkar)
Member Secretary

(Mohan Kapur)
Accounts Officer

(Virendra Bansal)
Assistant Accounts Officer

CHAPTER – XIII

ANNUAL ACTION PLAN FOR THE YEAR 2015-16

The Central Pollution Control Board (CPCB) is coordinating with the State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) on execution of nation-wide programmes relating to abatement and control of pollution. The activities mandated to CPCB are diversified in nature which includes; monitoring of ambient environment, formulation of standards and guidelines and providing implementation status reports to the Ministry of Environment, Forest & Climate Change (MoEF&CC) on rules framed under the Environment (Protection) Act, 1986.

The functions of CPCB are specified under Section (16) of the Water (Prevention & Control of Pollution) Act, 1974 and the Air (Prevention & Control of Pollution) Act, 1981. CPCB is also coordinating important activities under the Water (Prevention & Control of Pollution) Cess Act, 1977 and various functions entrusted under the Environment (Protection) Act, 1986 and Rules made there under. Functions of CPCB are specified under Section 16(2) of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 and these are as under:

- Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air;
- Co-ordinate the activities of the State Boards and resolve disputes among them;
- Plan and organize training of persons engaged in programmes for the prevention, control or abatement of water and air pollution;
- Provide technical assistance and guidance to State Boards, Carry out and sponsor investigation and research relating to problems of water and air pollution and prevention, control or abatement of water and air pollution;
- Organize through mass media, a comprehensive mass awareness programme on prevention, control or abatement of water and air pollution;
- Collect, compile and publish technical and statistical data relating to water and air pollution and measures derived for their effective prevention, control or abatement, Prepare manuals, codes and guides relating to prevention, control or abatement of water and air pollution;
- Lay down, modify or annul, in consultation with State Governments, standards for stream and well and lay down standards for the quality of air;
- Plan and cause to be executed a nation-wide programme for the prevention and control or abatement of water and air pollution;
- Perform such other functions as and when prescribed by the Government of India;
- Central Board may establish or recognize a laboratory or laboratories to enable the Board to perform its functions efficiently including the analysis of water from any stream or well or of samples or ambient air or trade effluents and emissions;
- Central Board may delegate any of its functions under the Water and Air Act to such person or body of persons or Committees for proper discharge of its functions and generally for the purpose of carrying into effect the purposes of these Acts as Central Government may specify.

Central Pollution Control Board (CPCB) is focusing on strengthening of ambient air quality monitoring network for assessment of air quality at national, regional and local level. NAMP stations operated through State pollution control Boards needs further strengthening to monitor all notified parameters for ambient air, besides emphasis is being given for establishment of Continuous Ambient Air Quality Monitoring Stations (CAAQM) in all major cities.

The manual water quality monitoring network is being expanded further, realizing the need for establishment of a network of real time water quality monitoring stations on river Ganga to ensure that the water quality is maintained.

Efforts are being made for strengthening of the compliance mechanism, so that no untreated industrial effluent is discharged into the environment. Installation of online effluent and emission monitoring in polluting industry and data connectivity with SPCB/CPCB is a step towards self-monitoring and transparency.

Efforts are for improving the performance of existing sewage treatment plants (STPs) and adopting non-conventional technologies that are in synergy with the conventional methods for improving the water quality of river Ganga and its tributaries.

Initiatives are being taken for water conservation in Industries trough process modification and adoption of state of art technology. Zero liquid discharge concepts shall be applied wherever possible to conserve the water and protect the environment.

Problem of Municipal Solid Waste and domestic sewage would be given utmost attention.

13.1 Achievements of 2014-15

13.1.1 Assessment of Pollution:

- Operating (10) real-time water quality monitoring stations (RTWQMS) on river
- Ganga and Yamuna.
- Operating water quality monitoring (WQM) at 2500 stations covering 445 rivers, 154 lakes, 12 tanks, 78 ponds, 41 sea water, 45 drains, 10 water treatment plants and 807 wells.
- Operating 580 ambient air quality stations covering 244 cities/towns are in operation.
- Noise monitoring continued in 7 cities. 5 stations are operated in Delhi, Chennai, Mumbai, Lucknow, Bangalore, Hyderabad and Kolkata. The process of strengthening the noise monitoring network by incorporating additional 35 stations in process.
- Operating 15 CAAQMS in 4 cities, further, 25 CAAQMS have also been set-up in Million plus cities & State capitals on 50:50 cost sharing basis.
- Ambient Dioxin/Furan monitoring has been undertaken during Pre-Deepawali, Deepawali & Post-Deepawali at two locations in Delhi.
- Prepared status report of water quality in India-2011.

13.1.2 Industrial Pollution Control

- One emission standard for New Generator Sets (upto 19KW) Run on Petrol & Kerosene has been notified. Four (4) environmental standards have been finalised for notification by Ministry of Environment & Forests (MoEF).
- Twenty Five (25) industries have been inspected and action taken under Environment (Protection) Act, 1986.

13.1.3 Waste Management

- Trial run for disposal of union carbide waste is under progress at Pithampur (MP).
- CPCB is preparing Guidelines for management and handling of Phosphorus Waste.
- The study of Life Cycle Assessment of plastic products completed and report is under finalisation .
- Carried out inspections of TSDFs, CBMWTFs and SLF.
- Completed study on quantification and characterization of plastic waste in 60 major cities in India. Report is being finalised.
- Provided and presented the status report of Plastic Waste Management to Hon'ble Parliament (Winter Session-2014). Issued Direction U/s '5' of Environment (Protection) Act, 1986 to Chairmen SPCBs/ PCCs & Secretaries, Urban Development Department of the each State/UTs.
- The report on performance study of Plasma Pyrolysis Technology for disposal of plastic waste has been finalised.

13.1.4 Training, Mass Awareness and Environment Data Bank:

- Implementation of Raj-Bhasha (Hindi) in CPCB and organizing Hindi Diwas, Workshop and Training Programmes for CPCB officials.
- Published technical and scientific reports and mass awareness.
- Conducted national training programmes on various environmental pollution and prevention areas.

13.2 Thrust Areas for 2015-16

During the Central Pollution Control Board (CPCB) will focus on strengthening ambient air and water quality monitoring network. Emphasis would be given on establishing real time water quality monitoring stations on river Ganga and other major rivers to assess the water quality on real time basis. Efforts will be made for expansion of continuous ambient air quality monitoring network to cover million plus cities and state capitals. The compliance monitoring mechanism will be strengthen by directing by industries falling in 17 categories of highly polluting industries to install real time effluent and emission monitoring systems to ensure that emissions/ effluent meeting the prescribed norms are released/ discharged the water quality is maintained, besides strengthening the compliance mechanism, so that no untreated industrial effluent is discharged into the river improving the performance of existing sewage treatment plants (STPs) and adopting non-conventional technologies that is in synergy with the conventional methods for improving the water quality of river Ganga and its tributaries. Some of the major programmes proposed during FY 2015-16 are as under:

- Ambient air quality data be collated, compiled and processed for dissemination on quarterly basis.
- Identifying metropolitan cities for installation of CAAQMS (excluding those where systems have already been installed).
- Highly polluting industries to install real time effluent and emission monitoring system.
- Efforts will be made to monitor 12 notified parameters at all CAAQMS locations.
- Actions will be initiated for overall evaluation of water quality monitoring plan and efforts be made for improving water quality of rivers and other aquatic resources.
- A road map will be prepared for expanding water quality monitoring network. The expansion of monitoring network should cover all the aquatic resources.
- Facilities will be developed in CPCB as well as SPCBs for analysis of pesticides and metals. The analysis

of pesticides and toxic metals will be ensured on all the water quality monitoring locations.

- The water polluting industries discharging directly into river Ganga or its tributaries to install continuous effluent monitoring devices.
- All the identified polluted river stretches will be studied for preparation of action plan to improve the water quality.
- Central laboratories at Head Quarter and four Zonal Laboratories will be strengthened to have National Accreditation Board for Testing and Calibration Laboratory (NABL) accreditation, certification under OSHA 18001 and recognition as Environmental Laboratories under EPA.
- Laboratories will be equipped to analyse 48 parameters relating to liquid effluents, and 40 parameters with respect to gaseous emissions and ambient air.
- Standard development will consider best available cleaner technological options and be in line with National Environment Policy (NEP-2006).
- Standards will also be evolved for waste recycling industries and such wastes shall include; Hazardous waste, E-waste, Batteries, Plastics Waste etc.
- Monitoring of 43 critically polluted industrial clusters as well as taking stock of situation on implementation of action plans by the state agencies.
- CPCB will also interact with SPCBs and PCCs for carrying out health-based surveys in the critically polluted areas involving third party agency for monitoring through contribution from industries on polluter pays principle.
- Formulation of proposals for adoption of cleaner production technologies and technologies aiming for zero waste (Zero Liquid Discharge) and pollutant removal.
- Installation of CAAQMS in remaining 25 CPAs on cost sharing basis with SPCBs/PCCs.

13.3 Budget Allocation for 2015-16

The allocation made against each Project Head is summarized as under:

Budget Heads	Title of the Budget Head	Allocation (₹ in Lakh)		
		Head Office	Zonal Offices	Total
I	Pollution Assessment (Survey and Monitoring)	705.00	97.75	802.75
II	Scientific, Technical Activities and R&D Activities	395.75	273.50	669.25
III	Industrial Pollution Control (standards, enforcements and technologies):			
	Standard Development	175.00	-	175.00
	Enforcement	1725.05	1133.00	2858.05
	Technology	54.45	-	54.45
IV	Training and Awareness:			
	Training Programmes	73.00	17.00	90.00
	PR, Mass Awareness Programmes & Hindi	59.00	5.00	64.0
	Library	5.00	6.75	11.75
V	Information (Database) Management	98.00	28.00	126
VI	Waste Management and Urban Pollution Control (Plastic Waste, Hazardous Waste, Municipal Solid Waste, Bio-medical waste, E-waste & Vehicular Pollution)	130.00	18.75	148.75
	Total	3420.25	1579.75	5000.00

CHAPTER – XIV

OTHER IMPORTANT ACTIVITIES DEALT BY CENTRAL POLLUTION CONTROL BOARD

14.1 MUNICIPAL SOLID WASTE MANAGEMENT:

Central Pollution Control Board (CPCB) as mandated under the Solid Waste Management Rules, 2016 co-ordinates with the State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) regarding implementation of the Solid Wastes Management Rules. CPCB also followed up SPCBs/PCCs for timely submission of Annual Reports on implementation of the MSW Rules. The Consolidated Annual Review Report (CARR) for the year 2014-15 was submitted to the MoEF&CC. In compliance to order of Hon'ble NGT, CPCB submitted an interim Annual Report to the Hon'ble NGT in the matter of Almitra H. Patel Vs Union of India (199/2014) and subsequently submitted National Action Plan for solid waste management. During the year 2015-16, 12 Nos. public complaints were received from various states mostly related to site selection, burning of garbage and operation of MSW management facilities, which were disposed through the concerned SPCBs/PCCs. During this period, CPCB also provided information to 04 applicants under RTI Act, 2005 with regard to MSW data and guidelines. In addition, CPCB participated in other forums, conference and workshops on MSW management and provided valuable inputs for decision making; particularly, in drafting the Solid Waste Management Rules, 2016.

For implementation of Solid Wastes Management Rules (earlier SWM Rules, 2000), CPCB has taken the following actions;

(i) The Central Pollution Control Board (CPCB) issued directions under section 18(1)(b) of the Water Act, 1974 and the Air Act, 1981 to all State Pollution Control Board (MPCB) vide letter dated 10.11.2014 to issue directions to all municipal authorities for implementation of the Municipal Solid Wastes (Management and Handling) Rules, 2000 in the state. CPCB further followed up the directions and received action taken report.

(ii) CPCB communicated to Chief Secretaries of all states/UTs vide letter dated November 19, 2014 to prepare time bound action plan for implementation of MSW Rules, 2000 in the states/UTs.

(iii) The Central Pollution Control Board (CPCB) issued direction on 11.08.2015 under section 5 of Environment (Protection) Act, 1986 to the Commissioner, Municipal Corporation of Greater Mumbai (MCGM) for compliance with the MSW Rules, 2000 and to submit a time- targeted Action Plan for implementation of MSW Rules in Greater Mumbai.

(iv) Directions issued on 09.10.2015 under section 5 of EPA, 1986 to the Commissioners/CEOs of Municipal authorities of 46 Million plus cities, 20 State Capitals, 118 Cities/towns in Ganga Basins for implementation of MSW Rules, 2000.

14.1.1 DEMONSTRATION PROJECTS ON MSW MANAGEMENT

During the year 2004-05 and 2005-06, CPCB sponsored Model facility schemes through SPCBs/PCCs for implementation of the MSW Rules in 10 towns/cities Viz. Chandigarh, North Dum Dum & New barrackpore (West Bengal), Udumalpet (Tamil Nadu), Kohima (Nagaland), Mandi (Himachal Pradesh), Suryapet (Andhra Pradesh), Itanagar (Arunachal Pradesh), South & West Sikkim Districts (Sikkim), Jalna (Maharashtra) and Agartala (Tripura). The main objective of Model facility projects was to demonstrate the implementation of various technologies specified under the MSW rules. Implementation of these projects was delayed due

to many reasons. On constant persuasion and interactions, some of these projects have been completed during the current year (2014-16) at Mandi (HP), Agartala (Tripura), chandigarh, Kohima (Nagaland), North Dum Dum (WB) and Suryapet (AP). However, the projects are further followed up for making effective operational. The schemes at other 03 places (jalna, Sikkim and Udumalpet) are being followed up for early completion.

14.1.2 Municipal Solid Waste Management site in Belagavi city

The city is divided into 58 wards. The total waste generation in the city is around 200-230 MT/day from all 58 wards. The quantity of waste collected every day is 190-200 T/d. Out of 58 wards the waste from 43 wards is collected by outsourced agency (M/s Ramky Enviro Engineers Ltd.) and the wastes from remaining 15 wards are being collected by corporation.

The door to door collection is adapted in all 58 wards. The waste is collected through vehicles like auto tippers and push carts. The percentage of door to door collection is about 94%. The segregation of waste at the source has been initiated in some of the wards. The same will be implemented in all wards in phased manner.

The collected waste is transported to processing site through vehicles like tippers and lorries covered with plastics / tarpaulins, dumpers and compactors. The total number of vehicles engaged for collection and transportation of waste is around 80.

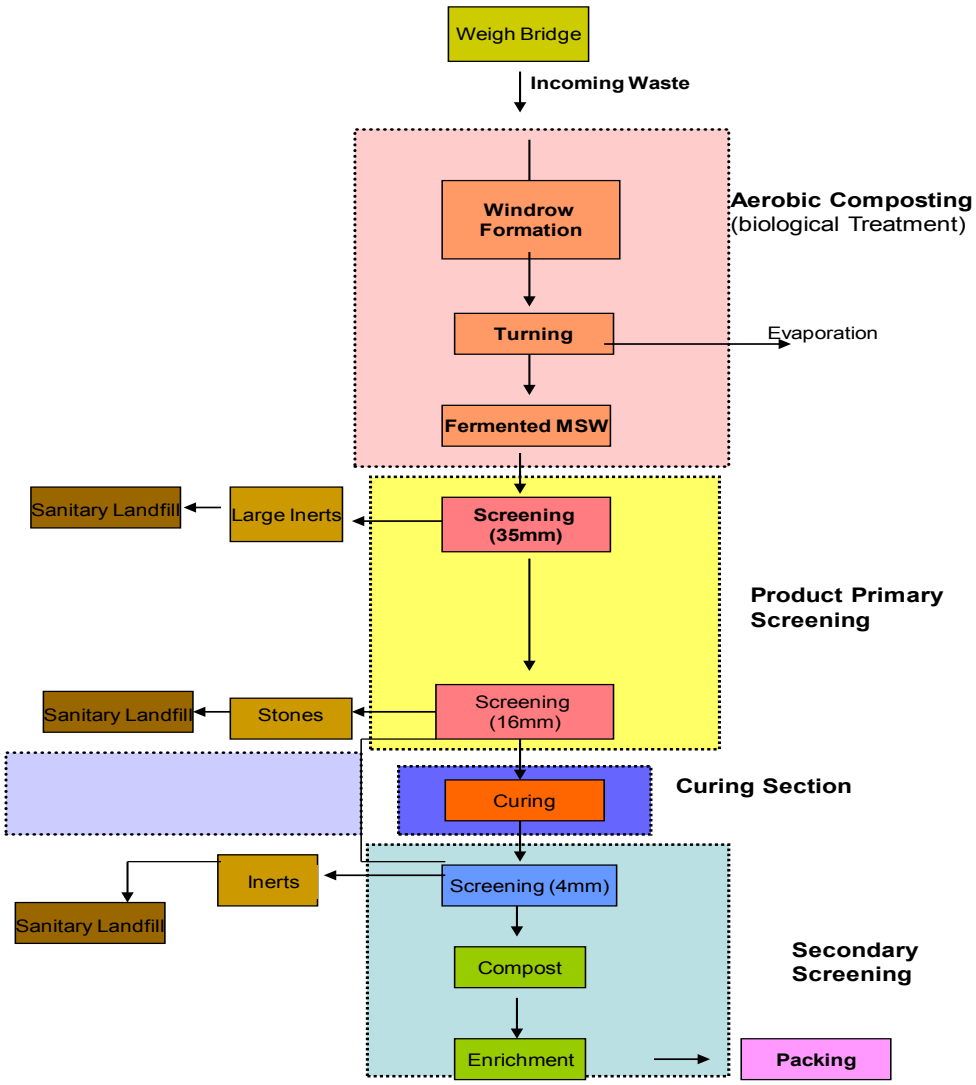
Windrow heap formation is done using excavator and Effective Micro Organism culture added (@ 1kg for 1MT of waste) for decomposition of wastes. 50% moisture is maintained in the heaps. The turning of heaps is carried out at regularly once in week.

After 35-40 days the fermented material is fed into 35mm sieve and the materials size less than 35mm are further fed into 16mm sieve and the materials below 16mm size are considered as Semi Finished Material (SFM) are stored for 10 days to better recovery of compost. Finally, the SFM are fed through 4mm sieve, the material size ranges less than 4mm are considered as compost and the material size above 4mm are again re fed into 4mm sieve to increase the yield and minimize the inert quantity. The rejected materials from the sieves are sent to secured landfill (SLF) which is located in the premises only.

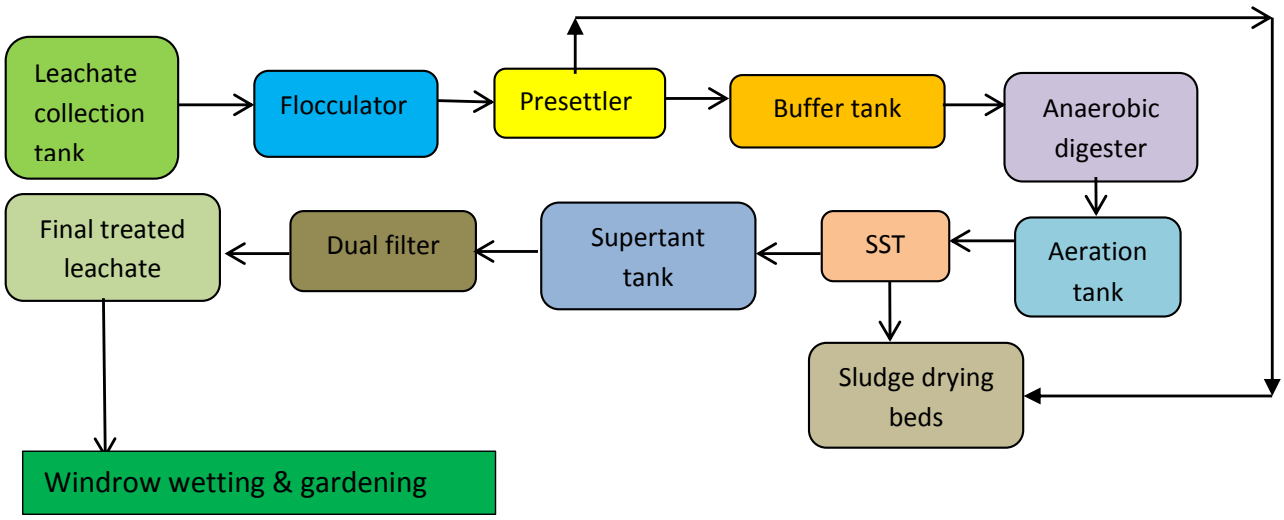
The final compost is stored in shed which is covered and moisture of 20-25% is maintained & also compost is enriched with EM culture. The compost is analysed for quality test to meet FCO standards and the same will be selled to farmers in their own brand “Ramky Shakthi” at the cost of Rs. 200/- per 50kg.

The leachate generated from windrow platforms and secured landfill is collected in leachate collection tank and pumped to leachate treatment plant of 30 KL capacity. The leachate is treated by two biological processes i.e. anaerobic digestion and activated sludge process. The treated leachate is used for gardening purpose with dilution.

The flow diagram of waste process and Leachate treatment plant (LTP) is given below:



Process Flow Sheet



Windrows Composting Screening Trammels

Landfill site, Leachate treatment plant

14.1.3 Demonstration Facilities for Management of Municipal Solid Wastes in Udumalpet, Tamilnadu

The Udumalpet Municipality has 33 wards, out of that only in two wards segregation at source were made. In remaining 31 wards solid waste is collected through house to house by push carts. Presently around 78 push carts were exist to collect waste from house to house. 68 temporary bins were placed in different areas of UM to collect waste and the same is lifted by using Hydraulic containers lifting device (3 no.) and transported to compost yard. One tractor with front head loader was found procured to clear debris and other wastes. 3 tipper lorries were found procured to transport wastes from collection centre to compost yard. The solid waste process is carried out through M/s Infra Leasing &Financial Services (IL&FS). Around 25 MT/day is received without segregation. The waste received is segregated manually to separate recyclable waste viz, pet bottles, plastic bags, glass bottles and coconut shells. They provided concrete plat form in 1.3 acres for making compost with garland drain to collect leachate. These wastes were sold to local recycler. The remaining waste being stocked for composting by churning and spraying of leachate. After maturation same being segregated by using sieving machine. Around 20% of waste being composted remaining waste of around 10MT/day (dry basis) being dumped in the same premises of compost yard, the dump site is not prepared as per MSW Rule, no lining, no garland drains to collect leachate. The non-biodegradable waste was found dumped in haphazard way.

Bio-chopper cum screener

Compost screener with belt conveyor

Unsegregated waste

14.1.4 Municipal Solid Waste Management site in Mysore city

The MSW facilities located in Mysore City during November 24 – 25, 2015. The population of Mysore city according to 2011 census is 9,14,919, and at present it is around 12 lakhs. The Solid waste generated in the city is 402 TPD, out of which 60% is a wet waste and 40% is a dry waste. MCC has been carrying out collection and transportation of MSW in the city by deploying its own resources and through private operators. A compost plant of 200 TPD capacity was installed in the year 2001 for treatment of MSW generated. The MCC has developed eight (8) Zero Waste Management Plants (ZWMP) around the city covering all the wards of the city, in which about 45-50 MTD of waste is been processed in all the Zones. The city has one Sanitary Landfill facility for disposal of rejects generated from the processing and ZWM plants.

The following recommendations were directed to MCC:

1. To obtain Consent to operate under Water & Air Act and Authorisation from KSPCB.
2. To dispose the non-biodegradable waste and the rejects dumped in the compost plant in the landfill site.
3. The tendering process for the management of Zero Waste Management plant should be done before

the tender lapse date and the treatment of MSW process in the ZWMP should not be stopped.

4. The Dry waste in the ZWMP and Compost plant needs to be removed and landfilled and to improve the housekeeping in these plants.
5. To provide Leachate Management facilities and methane gas collection system in the existing land fill site as per the MSW Rules.
6. To provide the storm water drains in the landfill site as per the MSW Rules.
7. To completely move accumulated waste beside the landfill area to the landfill site at the earliest.

Landfill Site

ZWMP

Compost plant

14.1.5 Airborne microbial Monitoring

Airborne microbial emissions were monitored using a portable air sampler (Sampl'air PRO, AES, France) based on solid impaction technology at MSW and CBMWTF sites along with control site in Kerala. During sampling (100L/ minute) bio aerosols were impacted on the solid agar media in the petri plates and incubated at room temperature and at 350C microbial density was counted as colony forming unit (CFU) and results expressed per 1000L (one cubic meter) of air.

Monitoring Locations:

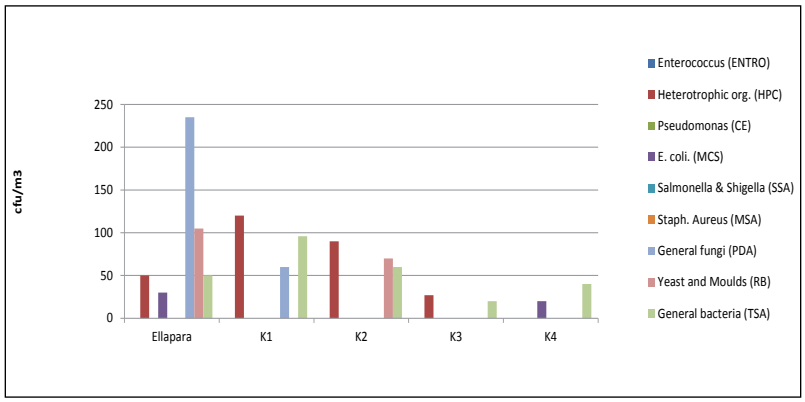
S No.	Place of monitoring	Nature of MSW facility	Managed by
1	Ellapara, Kerala	Control location, hill station, high grass area	
2	Munukadi, Kumily, Kerala	Integrated MSW management facility	Green Kumily Society, Clean Kumily
3	Pallakad, Kerala	Common biomedical waste treatment facility (CBMWTF)	Municipality, Kerala

Salmonella & Shigella, E. coli, Enterococci, Staphylococcus aureus were highest at Palakkad. High concentrations of Pseudomonas spp. were encountered in Kumily. Only E. coli was detected in the Ellapara location which was the control area.

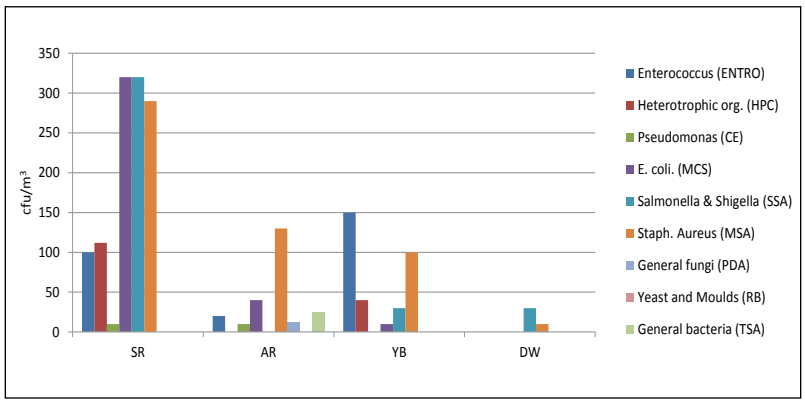
Airborne microbes and opportunistic pathogens

Sl. No.	Microorganisms (cfu/m^3)	Ellapara	Kumily	Pallakad
1	Salmonella & Shigella	0	0	320
2	E.coli	30	20	40
3	Enterococci	0	0	150
4	Staphylococcus aureus	0	0	290

Concentration of airborne microbes (CFU/m^3)



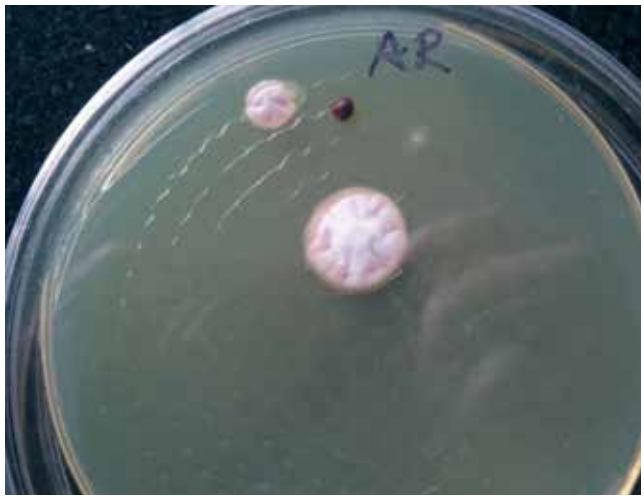
Concentration of airborne microbes (CFU/m^3) in CBMWTF, Palakkad



a) SR- Sorting Area b) AR- Autoclave Room c) YB- yellow bag d) DW- Down Wind

Viable airborne bacteria on blood agar plates

General Fungi



Enterococci

The assessments have showed that, MSW management and handling invariably emits airborne biological particles and magnitude of emission in turn depends on the degrees of handling and methods of handling. The study indicates that MSW processing site demands more intense scientific handling of waste like segregation, sorting etc. Wind patterns and local meteorological conditions influence the dispersion of bio aerosols emissions to surroundings. Presence of indicator microorganisms and other opportunistic pathogens is a clear indication of lacuna in storing and clearing waste in a scientific manner.

14.1.6 Solid waste management at Sabarimala shrine, Kerala

CPCB team visited the famous Sabarimla temple in the Periyar Tiger Reserve, Pathanamthitta district, Kerala during December, 2015 to assess the solid waste management. Solid waste incinerators are provided at Pamba and Sabarimala for disposing solid wastes. Solis wastes like plastic covers, cloths rags, flowers and other surplus offerings by devotees are incinerated and biodegradable items are just dumped near the incinerator premises. In Pamba the biodegradable fractions and rejects are dumped near to the stream joining River Pamba and the leachates are ultimately flowing to the river.

In general, solid waste management in Sabarimala shrine was very poor. The solid wastes are partially incinerated and dumped near to forest, which was still burning at the time of inspection. This cause serious concern of forest fire and run off of partially burnt plastic waste along with ash to forest during rainy season. Moreover, scrubber water with high temperature was disposed to the nearby forest land without any treatment which may serious ecological disturbance in the surrounding fragile rain forest ecosystem.

Though waste bins are provided encouraging waste segregation, the waste transportation mixes all wastes defeating the very purpose of segregation. There is no monitoring mechanism to stay vigil on the waste management practices. These points brought to the notice of KSPCB officials on duty at Sabarimala during the inspection. It was also observed that the sanitation workers were indiscriminately using large amounts of bleaching powder near the forest pilgrimage path from Pamba to Sabarimala. The excessive use of bleaching powder and other disinfectants in the forest path may cause irreparable damage to the forest ecosystems. Airborne microbial pollution assessment revealed a large number of indicator microbes in the ambient air.

14.1.7 Solid waste management at Sabarimala shrine, Kerala

Solid waste incinerator at Pamba

Solid waste dumped near the incinerator facility, Pamba

Solid waste incinerator at Sabarimala

Air borne microbial pollution assessment at Sabarimala

Partailly incinerated waste dumped near forest: Sabarimala

Incinerator scrubber water disposed to forest with out treatment: Sabarimala

14.1.8 MSW Management in Mathura-Vrindavan & Agra:

(a) **MSW Treatment & Disposal Facility at Mathura:** The capacity of the plant is 185MTD and was installed in 2011. The plant is non functional since Nov.2014. The machinery was damaged and solid waste was filled in whole plant area. Due to non operation of plant solid waste is dumped along the roads/ barren land in unscientific manner in Mathura & Vrindavan city.

(b) **MSW Treatment & Disposal Facility at Agra:** Landfill Site & Composting Plant of 750TPD capacity at Kuberpur, Agra was established by Agra Nagar Nigam. The outsourced company had stopped collection of waste since October-2012. presently Agra Nagar Nigam is handling, collection and transporting of solid waste in city. The solid waste management system is not proper in Agra.ANN is in the process of finalization of SW disposal facility agreement with private firm.

14.1.8 Impact Assessment of major MSW Landfill sites on ground water quality of surrounding area of Raipur (CG) Jaipur (Raj.) and Bhopal (MP)

Ground Water Quality monitoring at the Surrounding Areas MSW Landfill sites in Jaipur: The study was carried out around the Municipal solid Waste dumping sites near Jaipur at Mathuradaspura, Langadiawas & Sewapura.

The ground water sample were collected 5 Km radius from MSW dumping site in four directions, at 01km, 03km & 05km, surrounding the dumping site. Sampling was carried out at 08 locations of Mathuradaspura dumpsite, 06 locations around Langadiawas dumpsites & 08 locations around Sewapura dumpsites during June -2015 (Pre monsoon season) and February 2016 (Post monsoon season) period.

The ground water sample were analysed at CPCB Zonal

Office Laboratory, Bhopal, for physico-chemical parameters i.e. pH, Conductivity, TDS, Total Hardness, Total Alkalinity, Chloride, COD, NO_2-N , NO_3-N, SO4, PO4, Na, K, and Heavy Metals. The results reflects that in ground water near the dumping site within 01Km. the TH, TDS and CL were found above the limit and heavy metals Cu, Zn, Pb within permissible limits.

Ground Water Quality monitoring in the Surrounding Area of MSW dumpsites at Bhanpura in Bhopal:

To assess the water quality 16 samples have been collected around the Bhanpura dumping sites. The samples are analysed for physicochemical parameters and heavy metals. The results reveals that the Total Hardness found to be beyond the prescribed limits at locations whereas TDS exceeds at 03 locations.

Ground Water Quality monitoring in the Surrounding Area of MSW dumpsites at Sarona in Raipur:

To assess the water quality 08 samples have been collected around the Sarona dumping sites. The samples are analysed for physicochemical parameters. All the parameters are found within the prescribed limits.

14.2 Plastic Waste Management

As per the study conducted by Central Pollution Control Board (CPCB) in 60 major cities of India, it has been observed that around 4059 T/day of plastic waste is generated from these cities. The fraction of plastic waste in total Municipal Solid Waste (MSW) varies from 3.10% (Chandigarh) to 12.47% (Surat). Average plastic waste generation is around 6.92% of MSW. With extrapolation of the plastic waste generation data from 60 major cities, it is estimated that around 25,940 T/day of plastic waste is generated in India. As per the results of the study, out of total plastic waste, around 94% waste comprises of thermoplastic content, which is recyclable such as PET, LDPE, HDPE, PVC etc. and remaining 6% belongs to the family of thermoset and other categories of plastics such as SMC, FRP, multi-layered, thermocol etc., which is non-recyclable.

Environmental Issues on Plastic Waste Management (PWM):

Following are the major environmental issues generated due to plastic waste

- Manufacture, stock, sale, & use of substandard carrybags (<50µ).
- Littering of plastic waste is major environmental issues, it makes land infertile, choke the drains, on ingestion by cattle cause death, give ugly look of a city or town and also damage marine eco-system.
- Accumulation of Non-recyclable plastic waste such as multilayered laminated packaging, thermoset plastic like SMC, FRP etc.
- Open burning of plastic waste, specially thermoset plastic waste is major health and environmental issue, as it emits toxic gases.
- Leaching impact on soil, underground water etc. due to dumping (contain metals & phthalates).

Silent Features of Plastic Waste Management Rules, 2016

For effective plastic waste management, Government of India notified Plastic Waste Management Rules, 2016 on 18th March, 2016, superseding earlier Plastic Waste (Management and Handling) Rules, 2011. Following are the silent features of the PWM Rules, 2016:

- These rules shall apply to every Waste Generator, Local Body, Gram Panchayat, Manufacturer, Importer, Producer and Brand Owner (Rule '2').

- Carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness. The provision of thickness shall not be applicable to carry bags made up of compostable plastic, complying IS/ISO:17088 (Rule '4(c&h)').
- Waste Generators including institutional generators, event organisers shall not litter the plastic waste, shall segregate waste and handover to authorized agency and shall pay user fee as prescribed by ULB and spot fine in case of violation (Rule '8').
- Producer, Brand Owner need to work out modalities for waste collection system for collecting back the plastic waste within a period of six months in consultation with local authority/State Urban Development Department and implement within two years thereafter (Rule '9').
- Promote use of plastic waste for road construction or energy recovery or waste to oil or co-processing in cement kilns etc. (Rule '5b').
- Only the registered shopkeepers or street vendors shall be eligible to provide plastic carry bags for dispensing the commodities after paying plastic waste management fees (minimum 48,000 per annum) to concerned Local Body (Rule '15').
- SPCB/PCC shall be the authority for enforcement of the provisions of PWM Rules, 2016, relating to registration, manufacture of plastic products and multi-layered packaging, processing and disposal of plastic wastes (Rule '12(1)').
- Concerned Secretary-in-charge of Urban Development of the State or a Union Territory and concerned Gram Panchayat in the rural area of the State or a Union Territory shall be the authority for enforcement of the provisions of PWM Rules, Rules relating to waste management by waste generator, use of plastic carry bags, plastic sheets or like, covers made of plastic sheets and multi-layered packaging (Rule '12(2&3)').

Plastic Waste Management Technologies:

As per the provision '5(b)' of PWM Rules, 2016, local bodies shall encourage the use of plastic waste for road construction as per Indian Road Congress Guidelines or energy recovery or waste to oil etc. Brief descriptions about major technologies for plastic waste management are given below:

1. Utilization of plastic waste in road construction (As per IRC: SP: 98-2013)

Plastic waste is collected and segregated (except chlorinated/brominated plastic waste). The plastic waste is stored and transported to the location of use where it is cleaned and dried. The dried plastic waste is shredded to 2-4 mm size and added to heated stone aggregate (160oC-170oC and mixed for 30-40 seconds. The coated aggregate is mixed with hot bitumen, which is further used for laying and compaction. As per available information, few States/UTs namely: Himachal Pradesh, Nagaland, West Bengal, Pondicherry etc. are using some of their plastic waste for polymer bitumen road construction work.

2. Co-processing of plastic waste in cement kilns

In cement plants, plastic waste is used as Alternate Fuel and Raw-material (AFR), subjected to higher temperature around 1400ºC. During the process, energy is recovered while burning of plastic waste and its inorganic content get fixed with clinker. It requires an automatic feeding mechanism for feeding plastic waste to cement kilns. It has been reported that few States/UTs namely: Goa, Chhattisgarh, Himachal Pradesh, Madhya Pradesh, Gujarat, Odisha etc. are using their plastic waste for co-processing in cement plants.

3. Conversion of plastic waste into liquid RDF (Oil)

Segregated plastic waste (only HD, LD, PP and multilayer packaging except PVC) is fed into reactor of random de-polymerization in presence of additives to get liquid RDF. Some States have setup for plastic waste to liquid fuel plant for disposing plastic waste and recovering crude oil.

4. Disposal of plastic waste through Plasma Pyrolysis Technology (PPT)

Pyrolysis is the thermal disintegration (around 2000oC) of carbonaceous material in oxygen-starved atmosphere. Segregation of different categories of plastic is not necessary in this method. Heat energy produced during the process can be utilized for beneficial purposes. PPT can be used in hill stations, tourist places and pilgrimage centers. Few institutions like Goa Medical College, Andaman & Nicobar Islands municipal committee have tried this technology.

CPCB's Initiatives for Effective Plastic Waste Management:

CPCB has taken following initiatives for effective plastic waste management:

- Circulated Plastic Waste Management Rules, 2016 to all SPCBs/PCCs and Secretaries-in-charge, Urban Development, for implementation (04.05.2016).
- Circulated "Guidelines for disposal of Thermoset Plastic Waste including Sheet Moulding Compounds (SMC)/ Fibre Reinforced Plastics (FRP)" to all SPCBs/PCCs, for implementation (08.06.2016).
- Circulated report on "Assessment and Characterization of Plastic Waste in 60 Major Cities" to all SPCBs/PCCs and Secretaries-in-charge of Urban Development and requested them to submit the action plan for proper plastic waste management (28.06.2016).
- Issued Directions to Municipal Commissioners of 46 Million-Plus & 20 State Capitals cities and Executive Officers of Municipalities in 112 towns situated on the banks of river Ganga u/s '5' of Environment (Protection) Act, 1986 regarding closure of Unauthorized Plastic Manufacturing Industries and implementation of Plastic Waste Management as per PWM Rules, 2016 (30.06.2016 & 22.07.2016 respectively).
- Published an advertisement in newspapers (English and Hindi) for awareness regarding use and sell of plastic carry bags not less than '50 microns' and other issues related to plastic waste management (30.07.2016).
- Finalized Standard Operating Procedure (SOP) for registration of Compostable carry-bag manufacturers, sellers and stockists as per Rules 4(h) of PWM Rules, 2016and uploaded on CPCB's website (12.08.2016).
- CPCB has prepared the draft for "Guidelines for disposal of non-recyclable plastic waste" and uploaded for comments on the CPCB's website.

Current Status of Plastic Waste Management in India as per Annual Report (2014-15) on implementation of Plastic Waste Management Rules:

- The manufacture, stock, sale & use of thin (<40µm) plastic carrybags is continued in majority of the States/UTs, without any check.
- A number of unlicensed/unregistered plastic manufacturing and recycling units are running in residential or non-conforming area.
- Dumping and littering of plastic waste has been continued on road-side, railways tracks, open areas, open drains, sea shore, beaches, public places like Bus Stations/Bus-stops, open market etc.
- No proper system has been evolved by majority of municipalities for plastic waste management.
- Many States/UTs have not constituted State Level Advisory Body for implementation of PWM Rules,

2016.

- Carrybags/films are manufactured & sold without proper label or marking.

Way forward for Plastic Waste Management:

- Setting-up of systematic mechanism for plastic waste collection, segregation and disposal.
- Extended Producer Responsibility (EPR)or Corporate Social Responsibility (CSR) in management of plastic waste.
- Closure of industries in non-conforming areas.
- Recycling of plastic waste in environment friendly manner and utilization of plastic waste in road construction, energy recovery, waste to oil or co-processing in cement kilns etc.
- Widespread mass awareness programme on use of plastic packaging, and its impact on environment, on littering.
- Restriction on use of petro-based plastic carrybags and promotion of carry bags made of Compostable material conforming IS/ISO: 17088.
- Formation of squad for surprise inspection by SPCB/PCC and Municipality for carrybag thickness, marking& labelling of carrybags, composability certificate and registration of shopkeepers/vendors for providing carry bags to customers.

14.3 Hazardous Waste Management

As per the up-dated information from SPCBs/PCCS, there are about 47,103 hazardous waste generating units in the country generating about 7.81 million metric tons of hazardous waste of which, 3.16 million metric tons (40.4%) are recyclable waste, 3.83 million metric tons (49%) are landfillable waste and 0.83 milllion metric tons (10.6%) are incinerable wastes.

The number of common Hazardous Waste Treatment, Storage and Disposal Facilities (TSDFs) has increased from 4 facilities in the year 2003 to 41 common TSDFs (there are 17 integrated TSDFs with both i.e. Secured Landfills and incinerators; 9TSDFs with only incinerators, and; 15TSDFs with only Secured Landfills) located in 17 States/UTs. Availability of common facilities in the country is given below;

Table: Availability of Common Treatment, Storage & Disposal Facilities (TSDFs), Exclusive Common Incinerators & Secured Landfills

S. No.	Name of the State/UT	Integrated TSDFs	Exclusive Common Incinerators	Exclusive Common Secured Landfills
1	Andhra Pradesh	1	0	0
2	Assam	0	0	0
3	Bihar	0	0	0
4	Chhattisgarh	0	0	0
5	Delhi	0	0	0
6	Gujarat	4	2	5
7	Goa	0	0	0
8	Haryana	1	0	0
9	H.P.	0	0	1
10	J.& K.	0	0	0
11	Jharkhand	0	0	0

S. No.	Name of the State/UT	Integrated TSDFs	Exclusive Common Incinerators	Exclusive Common Secured Landfills
12	Karnataka	0	5	2
13	Kerala	0	0	1
14	Madhya Pradesh	1	0	0
15	Maharashtra	3	0	1
16	Manipur	0	0	0
17	Meghalaya	0	0	0
18	Mizoram	0	0	0
19	Nagaland	0	0	0
20	Orissa	0	0	1
21	Punjab	0	0	1
22	Rajasthan	0	1	2
23	Tripura	0	0	0
24	Tamil Nadu	1	0	0
25	Telangana	1	0	0
26	Uttar Pradesh	2	1	1
27	Uttarakhand	1	0	0
28	West Bengal	1	0	0
U.T.				
1	Daman, Diu, Dadra & NH	1	0	0
2	Pondicherry	0	0	0
3	Chandigarh	0	0	0

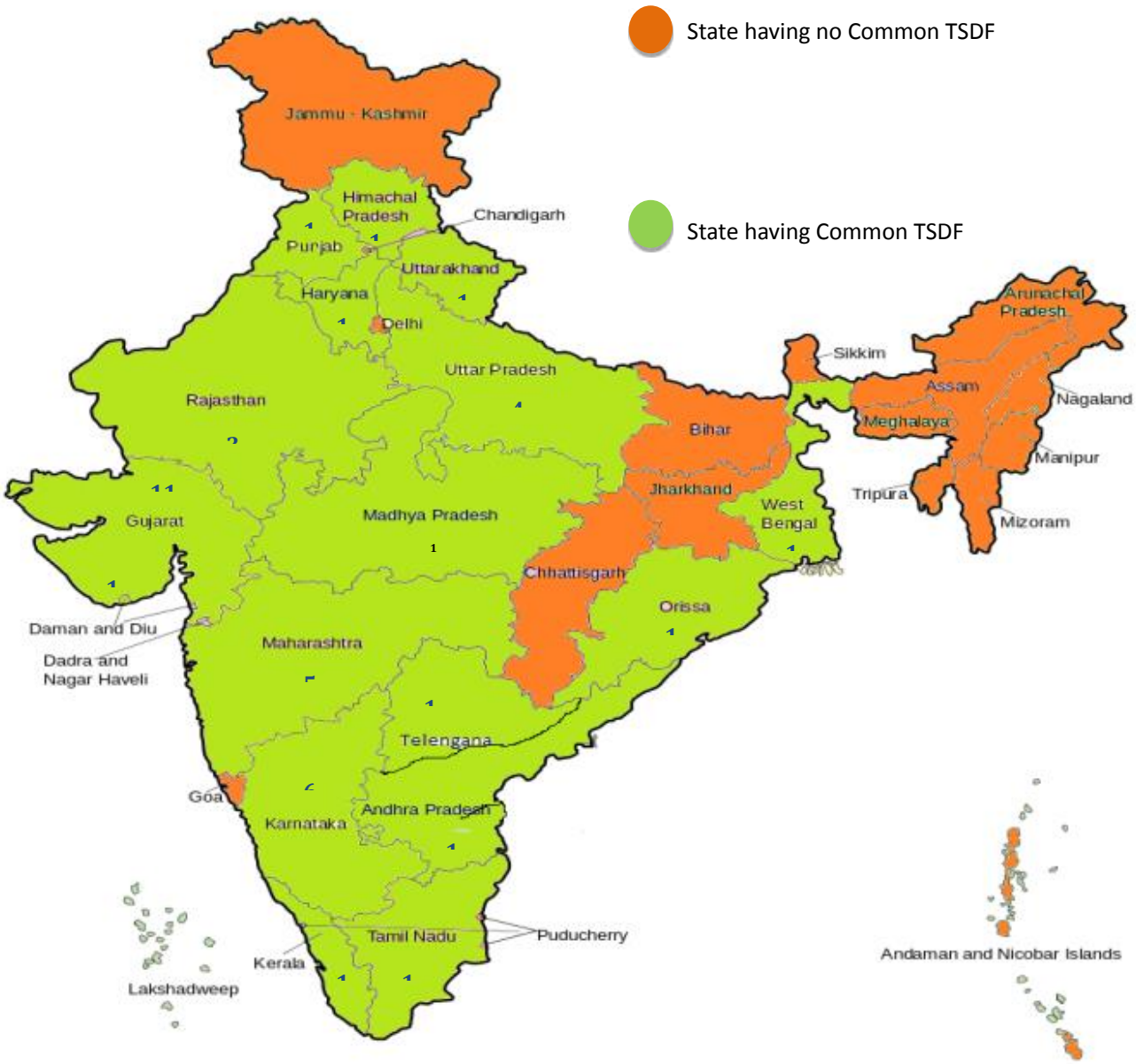
The following 4 States/UTs are generating about 11% of the total landfillable hazardous waste in the country are not having common secured landfills at TSDFs;

- Jharkhand
- Chhattisgarh
- Jammu & Kashmir
- Goa

4 States/UTs (Assam, Bihar, Delhi and Chandigarh) are generating between 1000 – 5000 MTA of landfillable HW (3% of total generation)

Remaining 11 States/UTs generating between 0 – 1000 MTA of land fillable HW (0.3% of total generation).

There are no common incinerators at TSDFs in 23 States / UTs, out of which 3 States (Goa, Punjab and Odisha) are generating about 46700MTA of Incinerable HW (i.e. 5.6% of total generation) and the remaining 20 States/UTs are generating between 0- 2000 MTA of Incinerable HW (i.e. 0.6% of total generation).



Utilization of hazardous Waste

There are provisions under Hazardous Waste Management Rules for utilization of various types of hazardous wastes. The Rule 11 of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, stipulated that;

"The utilisation of hazardous wastes as a supplementary resource or for energy recovery, or after processing shall be carried out by the units only after obtaining approval from the Central Pollution Control Board."

In order to enforce the aforesaid provision, CPCB has evolved Standard Operating Procedure (SoP) for processing the proposals of utilizing hazardous wastes other than co-processing in cement kilns. CPCB has received about 67 different proposals for utilization of 48 types of hazardous wastes, of which CPCB has so far developed 18 Standard Operating Procedures (SoPs) and check-list of requisite facilities for utilization of 14 types of hazardous wastes. Conditional permissions have been given to the units for utilization of hazardous wastes for which successful trial runs were conducted by CPCB.

Table: List standard operating procedure

S. No	Name of HW	Source of generation	Type of utilization/Intended use
1	Spent Solvent – containing Toluene, Xylene, Cyclohexane, Acetone, Methyl isobutyl ketone, Methanol, Isopropyl alcohol, Methylene Dichloride, Tetra Hydro Furan, Ethyl Acetate, Iso Propyl Ether, Dimethyl formamide, Butyl acetate, Methyl Acetate, Butanol, Benzene, Ethanol and Methyl Ethyl Ketone	Industrial use of solvents, production/formulation of drugs/ pharmaceuticals, Petrochemical process and pyrolytic operations.	Recovered solvents/mixed solvents for Industrial use
2	APCD Dust/ Residue	LD Furnace/Electric Arc Furnace (EAF)/Blast Furnace of Steel Plant/ captive Blast Furnace and Ferro-Alloy Plant	As Briquettes for further use in blast furnace to produce pig iron.
3	Spent Catalyst containing precious metals and ETP Sludge containing platinum	Petrochemical process and pyrolytic operation, petroleum refining, production of acids, production of nitrogenous and complex fertilizers, production/formulation of drugs/ pharmaceuticals and ETP sludge	Recovery of Precious metals - Platinum, Iridium, Osmium, Palladium, Rhodium, Ruthium, Rhenium, Gold & Silver
4	Spent H2SO4	Pickling operations of MS rods / sheets	Ferrous Sulphate *(Not to be used in drinking water purification and to be used only for industrial purposes)*
5	Spent Acid - Containing Molybdenum	Filament and bulb Industry	Molybdenum Trioxide
6	Spent HCl	Metal surface cleaning in steel and rolling industry	Ferric Chloride *(Not to be used in drinking water purification or agriculture applications and to be used only for industrial purposes)*
7	Used Anode butt	Aluminum Smelter units	Carbon pellets and high energy coke for use in Steel furnaces/foundries
8	Used Anode butt	Aluminum Smelter units	Carbon blended coke/ electrode carbon paste/carburizer for use in Steel or Ferro Alloy furnaces
9	Used Anode butt (Pre-processed)	Aluminum Smelter units	Green anodes for use in Aluminum Smelters
10	Used Anode butt (Pre-processed)	Aluminum Smelter units	Carbon Electrode Paste for use in Ferro Alloy Plants
11	Coal Tar/Tarry Residue	Coal gasifier units	As supplementary fuel in furnace of sodium silicate units
12	Contaminated Container/ barrels/ drums	Pharmaceuticals, food processing, cosmetic, textile, paint formulation and beverages industries	Cleaned barrel and drums for industrial use and/or production of plastic granules.
13	Process and primary sludge of ETP – Pulp and Paper	Paper & Pulp Industry	Paper Board/ Mill Board / Card Board
14	Aluminium Dross	Refining and casting house of Aluminium smelter units	To recover aluminium metal (captive use)
15	Aluminium Dross	Refining and casting house of Aluminium smelter units	To recover aluminium metal

S. No	Name of HW	Source of generation	Type of utilization/Intended use
16	Oil based iron sludge	Grinding mill section of Ball & Roller bearings	Ferrous Sulphate *(Not to be used in drinking water purification or agriculture applications and to be used only for industrial purposes)*
17	Spent catalyst - Containing Mercury and mercury waste	Various industry	Mercury
18	Spent H_2SO_4 containing organic compounds	Dye and Dye intermediates units	Chemical Gypsum for use in cement plants

Since Nickel was not present in detectable limits in the emission from stack.

Liabilities for Improper Handling and Disposal of Hazardous Waste

The Rule 25 of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008lays down the provision for liability of occupier, transporter, operator of a facility and importer. The Rule 25(1) stipulates that the occupier, importer, transporter and operator of the facility shall be liable for all damages caused to the environment or third party due to improper handling of the hazardous wastes or disposal of the hazardous wastes. Further, the Rule 25(2) stipulates that the occupier and the operator of the facility shall be liable to pay financial penalties as levied for any violation of the provisions under these Rules by the State Pollution Control Board with the prior approval of the Central Pollution Control Board.

Incidences of fire, spillage, illegal disposal, etc. of hazardous waste are being noticed regularly which necessitates systematic imposition of liability on occupier, importer, transporter and operator of the facility for the damages caused to the environment or third party as well as levy financial penalty for violation of the provisions of the Rules so as to enforce the provisions of Rule 25 of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.

However, assessing various types of liabilities and translating the same in terms of monetary value are challenges before the State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs). Similar difficulties have also been faced in evaluating a methodical approach for deriving financial penalties to be levied for various kind of violations stipulated on the occupier, importer, transporter and operator of the facility.

With an objective to address the above, CPCB has prepared guidelines on "Implementing Liabilities for Environmental Damages due to Handling & Disposal of Hazardous Waste and Penalty" which includes description of liabilities, approach for valuation of the same, methodology for levying financial penalty, role of SPCB/PCC and other stakeholders etc. The Ministry of Environment, Forest & Climate Change, Govt. of India, has accorded the approval to these guidelines. Further, the said guidelines have been prepared in compliance with the order dated 18/2/2014 of the Hon'ble National Green Tribunal, (Western Zone) Bench, Pune, in the matter of Application No. 87/2013(WZ), Ramubhai Kariyabhai Patel & others versus Union of India & others. Soft copy of the same is also available at http://www.cpcb.nic.in/Guidelines_Environmenal_Damages_Costs_200116.pdf. CPCB, Delhi has also organised a training programme on the aforesaid guidelines on 24th February 2016, for the officials of SPCBs/PCCs/ Zonal Offices of CPCB.

Further, the aforesaid guidelines are being circulated to SPCBs/PCCs to ensure implementation of provisions of the aforesaid guidelines.

Finalisation of Draft Hazardous and Other Waste (Management, and Transboundary Movement) Rules, 2016

CPCB has assisted the Scientists in Hazardous Substance Mangement Division in MoEF&CC in finalization of Draft notification on Hazardous and Other Waste (Management, and Transboundary Movement) Rules, 2016. CPCB has also participated in Regional consultation meeting organised by MoEF&CC in various Cities in the country. CPCB has proposed major changes in amending Schedule II of the earlier Hazardous Waste (Management, Handling and Transoundary Rules), 2008, wherein concentration limits for non-specific sources of hazardous wastes proposed based on following classification.

Class A: Based on leachable concentration limits of toxic constituents
Class B: Based on total threshold limit of toxic constituents
Class C: Based on Hazardous Characterstics of wastes

The other proposed amendments for HOWM Rules, 2016 compared to 2008 Rules are given below;

S. No	Provisions	Proposed Amendments
1.	Inclusion of Other Waste	The ambit of the Rules has been expanded by including 'Other Waste'.
2.	Definition of Waste	'Waste & by-product' definition has been incorporated and definition of 'hazardous waste' has been reviewed.
3.	Registration of recyclers	Authorization and Registration requirement is replaced with one permission i.e. Authorization under the Rules for all stakeholders handling the hazardous and other waste.
4.	Amended Provisions for Authorisation	The basic necessity of infrastructure to safeguard the health and environment from waste processing industry has been prescribed as per Standard Operating Procedure (SOPs) specific to waste type which has to be complied by the stakeholders and ensured by SPCB/PCC while granting such Authorisation.
5.	Waste Management hierarchy introduced	Waste Management hierarchy in the sequence of priority as prevention, minimization, reuse, recycling, recovery, co-processing; and safe disposal is incorporated.
6.	Amended provisions for Utilization of HW	The provision on co-processing as preferential mechanism over disposal for use of waste as supplementary resource or for recovery of energy is being enumerated with simplification of process for approval of such activity. Further, SPCBs can authorise industries for utilisation of hazardous and other wastes for which Standard Operating Procedures have been prepared by CPCB. Cement plants shall comply with notified emission standards for co-processing of Wastes.
7.	New provision Introduced to ensure safety, health and skill development of workers involved in in recycling operations.	Department of Labour in the State or any other government agency authorised in this regard by the State Government need to ensure recognition and registration of workers involved in recycling, pre-processing and other utilisation activities; assist formation of groups of such workers to facilitate setting up such facilities; undertake industrial skill development activities for the workers involved in recycling, pre-processing and other utilisation activities; and undertake annual monitoring and to ensure safety & health of workers involved in recycling, pre-processing and other utilisation activities.
8.	Introduced provision for allocation of land for recycling, pre-processing and other utilisation of hazardous or other waste	Department of Industry in State or any other government agency authorised in this regard by the State Government is to ensure earmarking or allocation of industrial space or shed for recycling, pre-processing and other utilisation of hazardous or other waste in the existing and upcoming industrial park, estate and industrial clusters.

S. No	Provisions	Proposed Amendments
9.	Introduced provision of submitting Annual Report / Inventory	State Pollution Control Board to prepare an annual return of the waste generated; waste recycled, recovered, utilised including co-processed; waste re-exported and waste disposed and submit to the Central Pollution Control Board by the 30th day of September every year. State Pollution Control Board shall also prepare the inventory of hazardous waste generators, actual users, and common and captive disposal facilities and shall submit the information to Central Pollution Control Board every two years. The Central Pollution Control Board to submit the consolidated review report on management of hazardous and other wastes to the Ministry of Environment, Forest and Climate Change, along with its recommendations before the 30th day of December once in every year.
10.	Review of Schedule I	Schedule I giving "List of processes generating hazardous wastes" has been proposed for revision taking into account technological evolution in industries.
11.	Amended provisions for Import / Export of Hazardous and Other Wastes	The process of import/export of waste under the rules has been streamlined with simplified procedures by revising the list of waste regulated for import/ export under Schedule III. Separate Schedule has been introduced which comprises of waste such as metal scrap, Paper waste and various categories of electrical and electronic equipment for re-use purpose are proposed for exemption from the need of obtaining Ministry's permission.

Trial Incineration of UCIL Waste

In the matter of Petitions(s) for Special Leave to Appeal (Civil) No. 9874 of 2012; Union of India Versus Alok Pratap Singh and others, the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, directed Central Pollution Control Board (CPCB) to undertake trial incineration of 10 tonnes of hazardous waste of erstwhile M/s Union Carbide India Limited, Bhopal, at Common Hazardous Waste Treatment, Storage and Disposal Facility (TSDF), Pithampur (MP), so as to ensure the compliance of the orders dated 17/4/2014 of the Hon'ble Supreme Court of India.

CPCB placed work order on M/s MP Waste Management Project, (Ramky Group Company) - the common TSDF Pithampur Operator, for trial incineration of said 10 tonnes at common hazardous waste incinerator installed at the TSDF Pithampur apart from collection, packaging, labeling and transportation of the said 10 tonnes waste.

Samples were collected by CPCB and also the operator of the facility on 10th July, 2015 in the presence of officials from CPCB, BGTRR and MPPCB. One sample was collected each from 5 segregated wastes i.e. Semi Processed Residue, Napthol Waste Residue, Sevin Residue, Excavated Waste and Reactor Residue. The Samples were analyzed for relevant parameters by the laboratories of CPCB, facility operator and private labs

Partailly incinerated waste dumped near forest: Sabarimala

Incinerator scrubber water disposed to forest with out treatment: Sabarimala

Collection of about 10 tonnes of hazardous waste from UCIL premises was initiated in the wee hours on 25.7.2015. Five types of the segregated wastes lying in the premises viz. Semi Processed Residue (1652 kg), Napthol Waste Residue (1389.85Kg), Sevin Residue (1373.5 kg), Excavated Waste (4857.4 kg) and Reactor Residue (884.8 kg) were collected in a proportion according to their quantities available at the site. Net weight of the collected wastes was 10.157 tonnes. Each category of the aforesaid five categories of wastes were collected and packaged separately in HDPE / MS drums of sealed with mechanical clamp.

The wastes were transported to the common TSDF, Pithampur on 26/07/2015. The common incineration system at the TSDF Pithampur has flue gas treatment systems namely spray drier (quencher), multi cyclone dust collectors, dry powder chemical (Lime, activated carbon and Sulpur in powder form) adsorption system, filter bag house, alkali scrubber with mist eliminator and ID fan followed by chimney of 35 metres height. For the purpose of the trial incineration, solution of Sodium Sulphide mixed with water was used as spray drying medium in the spray drier. Caustic Lye was used with water in alkali scrubber.

Mixed UCIL feed material in drums ready for incineration

The trial incineration of UCIL waste started from 13/8/2015 with waste feeding rate of 90 kg/hour along with lime powder at the ratio 1:1 and continued till 18/8/2015. During this period, CPCB collected samples of stack emissions for various parameters. The parameters sampled/monitored are Dioxins & Furans, Particulate Matter, Sulphur Dioxide, Nitrogen Dioxide, Carbon Monoxide, Oxygen, Carbon Dioxide, Cadmium, Thallium, Hydrogen Chloride, Hydrogen Fluoride, Total organic Carbon, Tin, Mercury and other Heavy Metals.

Apart from the aforesaid stack emission samples, ambient air quality was also monitored by CPCB at 3 locations in and around the facility, including a station representing Tarpura village in the vicinity of incinerator. The parameters monitored are PM_{10}, Sulphur Dioxide, nitrogen dioxide, heavy metals and benzene.

View of Incinerator during trial run

The results of trial incineration monitoring reveal that all the monitored parameters were complying with the prescribed parameters of common hazardous waste incinerator as prescribed vide notification no. GSR 481(E), dated 26.6.2008 under Schedule-I of the Environment (Protection) Rules, 1986 notified under the Environment (Protection) Act, 1986.

Ambient air quality around incinerator was within the National Ambient Air Quality standards for monitored parameters namely PM_{10}, SOX, NOX, arsenic, lead and benzene. Nickel in ambient air was also complied except in samples collected in TSDF premises; however, this exceedance could not be attributed to trial incineration of UCIL waste

Co-Processing of Wastes in Cement Kilns

Co-processing refers to the substitution of primary fuel and raw material by waste; and recovering energy and material from waste. Waste materials used for co-processing are referred to as alternative fuels and raw materials (AFR).

Based on various trial runs conducted, CPCB has granted permission to about 12 cement plants for co-processing of wastes in cement kiln under the Rule 11 of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 during 2014 - 2015.

Co-processing of waste is having following advantages:

- Solving the disposal problem of wastes
- Reducing the emissions of greenhouse gases,
- Conversion of waste into energy/as a raw mix component
- Reducing the burden on TSDF
- Conservation of fossil fuel resources
- Avoiding incineration / land disposal of wastes
- Destruction of waste completely, eliminating potential for future liabilities.

14.4 Biomedical Waste Management

The Bio-medical Waste (Management & Handling) Rules, 1998 and amendments thereof (hereafter referred as BMW Rules) were notified under the Environment (Protection) Act, 1986 by the Ministry of Environment, Forests & Climate Change (MoEF & CC) (Formerly known as Ministry of Environment & Forests) in the year 1998 and further amendments were made in the year 2000 and 2003. As per BMW Rules, 1998, State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs) in the respective States/UTs and Director General Armed Forces Medical Services (DGAFMS) in respect of the Health Care Establishments (HCEs) under the jurisdiction of the Ministry of Defence have been notified as the 'Prescribed Authority' for overall enforcement of the said Rules. As per Rule 10 of the BMW Rules, 'SPCBs and PCCs as well as DGAFMS are required to submit annual report information in a compiled form to the Central Pollution Control Board (CPCB), for the preceding year by 31st March of every year.

Annual report information for the year 2014 received from the State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs) and Director General of Armed Forces Medical Services (DGAFMS), there are 1,69,913 no. of HCFs having 17,86,108 beds strength and generating bio-medical waste at about 495.3 Tonnes /day. 1,18,964 no. of HCFs have obtained authorization under the BMW Rules. There are 191 no. of CBWTFs in operation (33 under construction) as well as 21,491 no. of HCFs are having captive bio-medical waste treatment and disposal facilities and 461.9 out of 495.3 Tonnes per day (TPD) of bio-medical waste generated is treated and disposed of by these facilities. About 5980 no. of HCFs/CBWTFs violating the provisions of the BMW Rules. The detailed bio-medical waste management scenario in the Country is given below:

➢	No. of healthcare facilities	:	1,69,913
➢	No. of beds	:	17,86,108
➢	No. of Common Bio-medical Waste Treatment Facilities (CBWTFs)	:	191* + 33**
➢	No. of healthcare facilities (HCFs) using CBWTFs	:	1,38,001
➢	No. of HCFs having treatment & disposal facilities	:	21,491
➢	No. of healthcare facilities applied for authorization	:	1,11,690
➢	No. of healthcare facilities granted authorization	:	1,18,964
➢	Total no. of on-site/captive treatment equipment installed		
	(Excluding CBWTFs) by the HCFs	:	
	• No. of incinerators	:	440
	(i) With Air Pollution Control Device	:	358
	(ii) Without Air Pollution Control Device	:	82
	• No. of autoclaves	:	2634

- No. of microwaves : 317
- No. of Hydroclave : 02
- No. of Shredders : 2722

➢ Total no. of treatment equipment installed by the CBWTFs :

- No. of incinerators : 215
- No. of autoclaves : 202
- No. of microwaves : 04
- No. of Hydroclave : 02
- No. of Shredders : 218

➢ Quantity of bio-medical waste generated in Tonnes/day : 495.30

➢ Quantity of bio-medical waste treated in Tonnes /day : 461.95

➢ No. of HCFs/CBWTFs violated BMW Rules : 5980

➢ No. of Show-cause notices/Directions issued to defaulter HCFs : 4965

*Note: (i) * - CBWTFs in operation; ** - CBWTFs under installation*

Bio-medical Waste Management in Armed Forces Healthcare Establishments:

Rule 7 (1) of the Bio-medical Waste (Management & Handling) Rules, 1998 as amended, stipulates that "the prescribed authority for enforcement of the provisions of these rules in respect of all health care establishments including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, Animal houses, pathological laboratories and blood banks of the Armed Forces under the Ministry of Defence shall be the Director General, Armed Forces Medical Services (DGAFMS)". Further, as per Rule 9 A of the said Rules, CPCB shall monitor the implementation of BMW Rules in respect of all Armed Forces Healthcare Establishments under the Ministry of Defence.

As per the Annual Report Information for the year 2014 submitted by Director General Armed Forces Medical Services (DGAFMS), there are 408 Armed Forces Health Care Establishments (AFHCEs) which are generating about 18,980 kg/day of bio-medical waste. Almost all the AFHCEs are having captive treatment & disposal facilities except 01 AFHCE which is ensuring treatment and disposal of generated bio-medical waste through a CBWTF. Also, all the 408 AFMHCEs reported to have obtained authorization under Bio-medical Waste (Management & Handling) Rules, 1998 from DGAFMS. As reported by DGAFMS, all the captive incinerators installed by the AFHCEs are provided with Air Pollution Control Devices.

Based on the annual reports received from 2009 to 2014 and observations made during the inspections of AFHCEs, CPCB also prepared a ' Status Report on Compliance to the Bio-medical Waste Management Rules, by the AFHCEs, which is presently under publication.

State-wise Details of Common Bio-medical Waste Treatment Facilities:

At present, there are 191 no. of CBWTFs in operation and 33 no. of CBWTFs are under construction, as reported by SPCBs/PCCs. Though CBWTFs are widely accepted by the HCFs for the treatment & disposal of bio-medical waste, still States namely Arunachal Pradesh, Goa, Mizoram, Nagaland & Sikkim as well as Union Territories (UTs) namely A & N Islands, Lakshadweep are yet to develop the CBWTFs in the respective States/UTs

S.No.	Name of the State/UT/DGAFMS	No. of Common Bio-medical Waste Treatment Facilities (CBWTFs)	
		Operational	Under Construction
1	Andaman & Nicobar	0	0
2	Andhra Pradesh	08	02
3	Arunachal Pradesh	0	0
4	Assam	01 £	0
5	Bihar	03	01
6	Chandigarh	02	0
7	Chhattisgarh	04	01
8	Daman & Diu and Dadra & Nagar Haveli	01	0
9	Delhi	03	0
10	Goa	0	0
11	Gujarat	18	06
12	Haryana	11	0
13	Himachal Pradesh	01**	0
14	Jharkhand	01	INP
15	J & K	04****	0
16	Karnataka	21	09
17	Kerala	01	0
18	Lakshadweep*	0	0
19	Madhya Pradesh	15	0
20	Maharashtra	29	04
21	Manipur	01	0
22	Meghalaya	01	0
23	Mizoram	0	0
24	Nagaland	0	0
25	Odisha	05	01
26	Puducherry	01	0
27	Punjab	04	0
28	Rajasthan	10	03
29	Sikkim	0	0
30	Tamilnadu	11	03
31	Telangana	09	02
32	Tripura	01	0
33	Uttrakhand	02	0
34	Uttar Pradesh	17	01
35	West Bengal	06	0
36	DGAFMS	NA	NA
	Total	191	33

Note :

*** CBWTF at Pathankot, Punjab is utilized to cater services to some HCFs located in H.P.*

***** 03 CBWTFs & the captive Facility in 01 HCF is also used by the associated HCFs located in J & K State.*

£ : 01 CBWTF & Incinerator facility at Hospital used by other 04 HCFs.

14.5 E-Waste Management

Implementation of the E-Waste (Management & Handling) Rules, 2011

E-Waste (Management & Handling) Rules, 2011 have come into effect since 01-05-2012. These rules are applicable to every producer, consumer or bulk consumer, collection centre, dismantler and recycler of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components specified in schedule – I. Two categories of end of the life electrical and electronic equipment namely (i) IT and Telecommunication Equipment and (ii.) Consumer Electricals and Electronics such as TVs, Washing Machines, Refrigerators and Air Conditioners are covered under these Rules. Looking into the practical difficulties in implementation of these Rules, MoEF & CC has initiated for amendments to E-Waste rules for the year 2016.

Extended producer's responsibility (EPR) is the main feature of the E-waste (Management and Handling) Rules, 2011, wherein the producer of electrical and electronic equipment has the responsibility of managing such equipment after its 'end of life', thus the producer is responsible for their products once the consumer discards them. Under this EPR, producer is also entrusted with the responsibility to finance and organize a system to meet the costs involved in complying with EPR.

State Pollution Control Boards/Committees are the prescribed authority for implementation of E-waste Rules in respective States. The CPCB is the prescribed authority for implementing Reduction of Hazardous Substances (RoHS) compliance in manufacturing of items listed in Schedule-I.

The producers are required to obtain authorization from SPCB/PCCs for implementing their EPR, which can be achieved by setting up collection centres, or implementing take back systems or joining a collective scheme or joining a collection centre for effective channelization of E-waste to the registered dismantlers/ recyclers which shall be specified in their application for authorization.

As per the information available at CPCB One Hundred fifty-one (151) producers have applied for grant of authorisation for managing their EPR in eleven (11) states. Presently one hundred and thirty two (132) collection centres in 17 States have been granted authorization to create an E-waste collection & channelization system:

As per the information available in CPCB there are One hundred forty- eight (148) Registered Recycler/ Dismantlers in the 12 States with a total capacity of 455058.7 MT/A. The details of State- wise registered E- Waste recyclers/ dismantlers are given below;

S. No.	State	Number of registered Dismantler and Recycler	Registered Capacity in tonne per Annum
1.	Andhra Pradesh	2	11800
2.	Chhattisgarh	2	1650
3.	Gujarat	7	20849.12
4.	Haryana	14	49385
5.	Karnataka	52	50318.5
6.	Madhya Pradesh	2	6585
7.	Maharashtra	24	32610
8.	Rajasthan	9	67470
9.	Tamil Nadu	16	111931.08
10.	Uttar Pradesh	16	73860
11.	Uttarakhand	3	28000
12.	West Bengal	1	600
	Total	**148**	**455058.7 Approx. 455059**

Compliance to RoHS Provisions

Central Pollution Control Board has been given the responsibility of enforcing of RoHS as per Rule 13 of the E-Waste (M&H) Rules, 2011. However, the said Rules do not outline set procedure for enforcement. Verification of compliance to RoHS may require extensive testing of EEE, which is not actually a waste material. The laboratory infrastructure available at CPCB is only equipped for testing of water, air and waste samples, and not having capabilities for testing EEE samples under RoHS compliance. It may take time to develop a dedicated testing laboratory at CPCB including the training of scientific staff in sampling and testing.

Implementation frame work for RoHS enforcement is envisaged as below;

i. Self-regulation by producers of EEE.

ii. Random sampling and verification on RoHS (of both declared and non- declared EEEs)

iii. Provision of RoHS information in authorization of Producers.

iv. Entering in to MoU with C-MET (Centre for Material for Electronic technology) RoHS laboratory, located at Hyderabad for a period of 3 years for using Lab facilities for RoHS testing, development of sampling and testing methodologies and protocol for enlisting RoHS test laboratories.

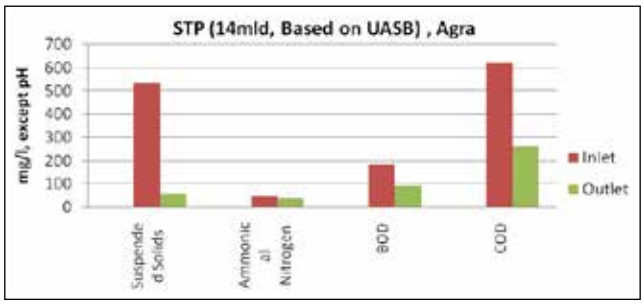
14.6 Sewage Treatment Plant/ Common Effluent Treatment Plant

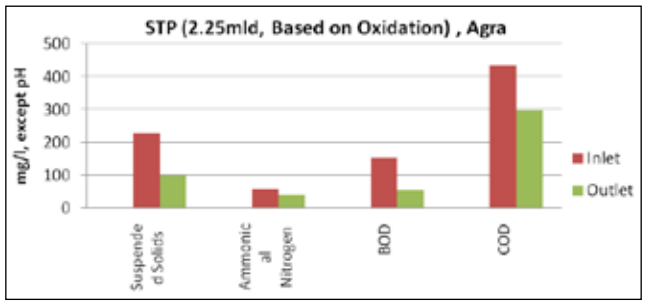
Monitoring and Study of STPs/CETP in Mathura-Vrindavan & Agra:

Inspection and Monitoring of STPs/CETP installed in Agra, Mathura-Vrindavan cities were carried out during the year-2015-16.

Sewage Treatment Plants in Agra:

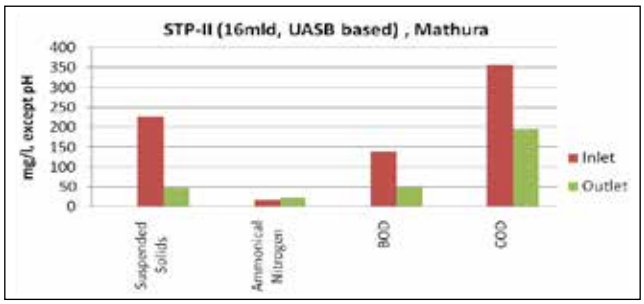
There are 08 nos. STPs in Agra with installed capacity of 184.75mld. One STP of 36mld is under construction. Total sewage generation is about 225 mld.

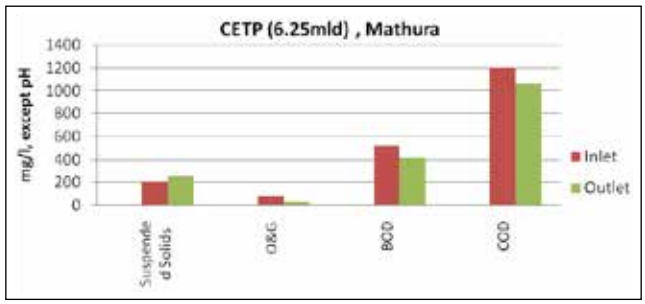




Sewage Treatment Plants in Mathura:

Mathura is located on the bank of River Yamuna. The total sewage generation of the city is approx. 50 MLD, Sewage treatment installed capacity is 44 MLD through three STPs located at Masani Nalla STP (12.5 MLD based on Oxidation Pond), Trans Yamuna STP-I (14.5 MLD, Oxidation pond) and STP-II (16MLD- UASB) and the remaining is discharged into Yamuna River through nalla. There are 19 tapped drains in Mathura, but due to poor operation & maintenance, sewage is directly discharged to Yamuna River without treatment.





Sewage Treatment Plants in Vrindavan:

Vrindavan has sewage generation of approx 08 MLD. This city has two Sewage Treatment Plants, One is Pagla Baba STP with capacity of 04.0 MLD (based on Oxidation) and newly constructed 8.0 MLD STP (UASB). There are 18 tapped drains in Vrindavan, poor operation and maintenance of pumping stations, STP has been observed.

Performance Evaluation of In CETPs Rajasthan:

In Rajasthan there are about 2500 Textile industries in operation in the industrial clusters of Balotra-400, Bitthuja-214 and Jasol-111, Jodhpur-212, pali-550, sanganer-680 and Bhiwadi-60. These units are involved in washing, dyeing and printing of cotton and synthetic cloth. Jiggers are being used for dying of cotton fabrics and Jet dying process used for synthetic fabric dying purpose. All the industries are having bore wells in their premises and ground water is the main water sources for these industries .These units are highly water polluting and about 2000-2500 liters of wastewater generated in 150 kg of synthetic fabric process in each batch. Whereas about 3000 to 4000 liters of wastewater generated in 150 kg of complete cotton fabric processing in Jigger dying process. To treat the waste water generated from these industrial clusters 15 CETPs are installed by industrial associations in cooperation with state and central governments. Out of 15 CETPs the following 12 common effluent treatment plants of Rajasthan have been inspected along with RSPCB officials in compliance of direction of Hon'ble NGT. The detailed inspection report including observations and recommendations are submitted to NGT.

As per the NGT directions CETP Balotra and Jasol were installed 6 MLD and 2.5 MLD Reverse osmosis (RO) plants respectively. CETP Bithuja plant has made up gradation by installation of new clarifier & treated water holding tank and is proposing to install RO plant.

CETP Jodhpur has commissioned acidic waste conduit pipe, constructed new acid holding cum neutralisation tank, installed two new centrifuges, 5MLD tertiary treatment plant (sand filter followed by activated carbon filters) and proposing to upgrade the system by separate treatment of acidic waste and installation of 5 MLD RO plant.

Five CETPs installed for the treatment of industrial effluent being generated from the industries located in and around Pali town. The total capacity of all 5 CETPs is 46.68 MLD. One CETP of capacity of 12 MLD is under construction. During visit 4 CETPs were in operation and CETP–I is closed completely due to very old. All the four CETPs inspected and submitted report to NGT. After intervention of NGT, the CETPs at Pali have started upgradtion and planning to install 12 MLD RO plant at unit-V. Unit-VI is new plant based on SBR technology has tertiary treatment system also. Proposed for up-gradation Unit-II, III & IV.

S. No	CETPs	State	Capacity (MLD)	Type of industry Connected	Treatment System
1.	CETP-1 Mandia Road, Pali	Rajasthan	5.2	Textile Industry	ASP
2.	CETP-2 Mandia Road, Pali	Rajasthan	8.4	Textile Industry	ASP

S. No	CETPs	State	Capacity (MLD)	Type of industry Connected	Treatment System
3.	CETP-3 Punayata Road, Pali	Rajasthan	9.08	Textile Industry	ASP
4.	CETP-4 Punayata Road, Pali	Rajasthan	12	Textile Industry	ASP
5.	CETP-6 Punayata Road, Pali	Rajasthan	12	Textile Industry	SBR
6.	CETP-1 Balotra, Badmer	Rajasthan	6.0	Textile Industry	ASP
7.	CETP-2 Balotra, Badrner	Rajasthan	12	Textile Industry	ASP
8.	CETP-3 Balotra, Badmer	Rajasthan	18	Textile Industry	SBR
9.	CETP-1, Jasol, Badmer	Rajasthan	2.5	Textile Industry	ASP
10.	CETP-2, Jasol, Badrner	Rajasthan	4.0	Textile Industry	SBR
11.	CETP, Bithuja, Badrner	Rajasthan	30	Textile Industry	Stabilization Pond
12.	CETP, S.P.I, Sangaria Industrial Area, II Phase, Jodhpur	Rajasthan	20	Textile and Steel Re-rolling Mill	ASP

Sewage Treatment Plants (STPs) in Madhya Pradesh & Rajasthan:

A major problem in urban areas is the collection, treatment and disposal of domestic waste water, large volume of sewage is generated in many cities/ towns and the waste is not treated adequately and disposed off in the open drains which flows downstream and mixes in water bodies. The intensive use of ground water and the large quantity of wastewater generation in modern society often pose a threat to ground water quality. Therefore it is very much essential to treat the domestic wastewater in proper manner by installation of sewage treatment plants (STPs) of adequate capacity to prevent the contamination of ground water & surface water bodies etc.

In Central Zone 28 are operational (14 each in Madhya Pradesh & Rajasthan), 05 are non-operational, 09 are under construction and 36 are proposed. Performance evaluation of the following 28 operational STPs has been conducted and report has been forwarded to HO.

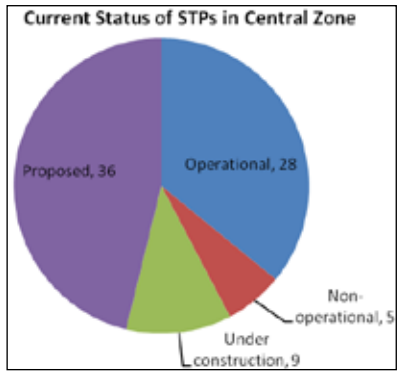
Madhya Pradesh:

To reduce the water pollution as well as to protect surrounding water bodies, Madhya Pradesh Government had constructed the sewage treatment plants to treat the sewage generated in the urban areas in Madhya Pradesh under various schemes like National River Conservation Plan (NRCP), Bhoj wet land project. The STPs are installed in 9 cities for the treatment of sewage in which 3 cities/ towns STPs were not in operation i.e Burhanpur, Nagda and Keolari. CPCB, Zonal Office Bhopal has visited the STPs located in various cities in state and collected the wastewater samples

STPs constructed under National River Conservation Plan (NRCP)

The responsibility of operation and maintenance of STPs lies with the local bodies, as per the policy framed during the inception of project. As per the GOI policy under the NRCP project the local body / Municipal Corporation has to take responsibility for the Operation and maintenance of the STPs.

STPs constructed in Bhopal under Bhoj Wet Land Project this project are being operated by PHED itself. These STPs are irregular in operation, responsibility of their operational & maintenance is in hands of non skilled persons due to which conditions of plant are very poor.



The details of STPs in MP are as under:-

S. No.	City/ town	STP Location	Year of commission	STP installed Capacity MLD	Technology
1.	Ujjain	Ujjain	--	52	Waste stabilization pond
2.		Sadaval	2001	53	Karnal Technology
3.	Gwalior	Laltipara	2010	50	Waste stabilization pond
4.	Indore	Kabitkhedi,	2006	78	UASB
5.		Kabitkhedi,	2009	12	UASB
6.	Burhanpur	Burhandpur	2009	6	Oxidation pond
7.	Jabalpur	Gwarighat	2012	0.15	FAB
8.	Bhopal	Maholi Damkheda	2001	25	Waste stabilization pond
9.		Badwai	2001	17	Oxidation pond
10.		Gondermau	2001	2.36	Oxidation pond
11.		Kotra	2001	10	Waste stabilization pond
12.		(NRCP) Ekant Park	2008	8	Oxidation pond
13.		Bawadia Kalan	1975	13.56	Oxidation pond
14.		Bio-Filteration Mata Mandir	1959	4.56	Bio-Filtration Plant
15.	Nagda	Nagda	Not functional		Karnal Technology
16.	Vidisha	Vidisha	2008	7.2	Karnal Technology
17.	Keolari	Keolari	Not functional	0.75	Karnal Technology
Capacity				**339.58 MLD**	

Rajasthan:

Government of Rajasthan is in process of installation of 61 STPs in 30 cities/towns of Rajasthan with a total treatment capacity of 842 MLD under Rajasthan Urban Infrastructure Development Project (RUIDP) funded by the Asian Development Bank (ADB) it includes operational 14 STPs in six major cities i.e. Jaipur, Jodhpur, Udaipur, Bikaner, Sawai Madhopur and Bhilwara. In addition to the above Rajasthan Government has already constructed 02 STPs at Kota & Rajasamand which are ready to commission. There are 09 STPs under construction in 6 cities/towns and 36 STPs proposed in 22 cities/ towns under various projects.

Following STPs of Rajasthan State have been monitored by Zonal Office, Bhopal for its performance evaluation :-

S. No	City/Town	STP Location	Year of commission	STP installed Capacity MLD	Technology
1	Jaipur	Delawas-I	2006	62.5	ASP
2		Delawas-II	2011	62.5	ASP
3		Jaisinghpura Khor	2011	50	ASP
4		Amer Road	2006	27	ASP
5		Jawahar circle	2010	1.0	Moving Bed Bio-film Reactor (MBBR)
6		JDA Ramnivas Garden	2014	1.0	MBBR
7		Vidyadhar Nagar	2014	1.0	MBBR
8		Gajodharpura	2013	30	ASP

9	Sawai Madhopur	Sawai Madhopur	2014	10	WSP
10	Jodhpur	Salawas	2011	50	ASP
11		Nandri	2004	20	WSP
12	Bhilwara	Kewara	2012	5.5	Sequencing Batch Reactor (SBR)
13		Kewara	2012	4.5	SBR
14	Udaipur	Eklingpura	2013	20	MBBR
15	Pali	Pali industrial area	2015	7.5	UASB
16	Bikaner	Vallabh Garden	2011	20	WSP
17	Alwar	Bhiwadi	2015	4.5	SBR
18		Ramgarh	2015	20	OP
Total Capacity				**D**	

Performance of Sewage Treatment Plants (STPs) in West Bengal

Thirty four STPs were commissioned under Action Plan of NRCP at twenty nine locations of West Bengal. Based on the mode of operation, STPs are mainly of three types i.e. Activated Sludge Process (ASP), Trickling Filter (TF) and Oxidation Pond (OP). The three types of treatment as mentioned serve for 127.06, 133.06, and 178.80 MLD respectively. However the STPs are generally accused for not able to serve the basic purpose of treating the sewage properly and adequately.

The failure modes for the STPs and overall operational status as being evident and is given below:

- None of the STP towns are equipped with sewerage network.
- STPs are not receiving sufficient hydraulic as well as organic load and merely serve as retention ponds for the pumping station.
- The inlet COD seldom exceeds 100 mg/l except for areas that are connected with industrial unit. Therefore as BOD : COD being very low, hence the biological treatment is not effective.
- Some of the STPs mainly based on oxidation pond technology selected at Kalyani , Bandipur and Natagarh were observed being completely bypassed the treatment system.
- Almost all the STPs are running in low capacity primarily due to non sewer connection and low organic with hydraulic load.
- The sludge digesters are kept idle due to low organic load and corresponding reduced amount of biological sludge produced. eg. Garden Reach (ASP)
- None of the STPs have any antibacterial or disinfection treatment for final treated water.

CETPS LOCATED IN GUJARAT & MAHARASHTRA

There are 61 numbers of CETPs operational in west zone. Gujarat has 34 and Maharashtra has 27 operational CETPs. Monitoring of CETPs in Gujarat & Maharashtra is carried out in selected CETPs as per Annual Action Plan 2015-2016. Zonal Office, Vadodara has carried out monitoring of 06 CETPs located in Maharashtra and 02 CETPs located in Gujarat besides quarterly monitoring in 04 CETPs/ FETP located in Critically Polluted Areas in Gujarat (i.e. Ankleshwar, Panoli and Vapi) and monthly monitoring of 05 CETPs located in Dombivali and Ambernath area as per the judgement of Hon'ble NGT.

It is observed that there is significant improvement in operation of CETP Vapi during last quarter of 2015-16, it is found meeting with discharge standards for monitored pollutants specially COD and nearly meeting with BOD except TSS and TDS. There is improvement seen in inlet quality of most of CETPs as well as outlet

of CETPs, though not meeting with discharge standards. Most of monitored CETPs in Maharashtra were not meeting the discharged standards prescribed by MPCB. The monthly monitoring of the CETPs in Dombivali and Ambernath area reveals that there is no major improvement in the performance of CETPs except the ChikloliMorivali CETP and ACMA CETP at Ambernath.

STPs IN GUJARAT & MAHARASHTRA

There are 127 STPs in the states of Gujarat and Maharashtra out of which 91 STPs were operational. Data obtained from 68 STPs show that many STPs operate with inadequate sewage flow. It is also noticed that some STPs operate with meagre treatment facilities such as preliminary treatment, lagoon and oxidation ponds that are inadequate to meet the present regulatory requirement. During 2015-16 monitoring was carried out at 09 STPs in Maharashtra (03 in Navi Mumbai area and 06 in Nashik).

14.7 Mercury Management in Fluorescent Lamp Sector

Asia is currently the largest market in general lighting and will likely strengthen its position to over 45 percent of the total market in 2020. General lighting, automotive lighting and backlighting are the three largest sectors in lighting – with General lighting accounting for approximately 75 % of the total lighting market in 2010.

Over the decades, the lighting sector has been witnessing a revolution in lighting technology continuously. Incandescent bulbs (ICLs) had a reign of almost a century across the globe and are being successively replaced by the visible products ex. Compact Fluorescent Lamp (CFL) and fluorescent Light (FL) due to the improved rise of fluorescent lighting technology and as a means of energy efficiency measure. However, the major environmental concern of fluorescent lighting is the management of end-of-life fluorescent lamps, in particular their random disposal.

'A status report of the Fluorescent Lighting Sector' is published in FY 2014-15 addressing the following aspects;

a. Energy Demand in the Lighting Sector

b. An Overview of Fluorescent Manufacturing practices in Fluorescent Lamp Sector – A Survey (2013-14)

c. Environmental Concerns of Lighting Sector

d. SWOT of the Management of End-of-Life Fluorescent Lamp

However, *'Technical Guidelines for Environmentally Sound Mercury Management in Fluorescent Lamp Sector'* published by CPCB mentions that the unrecoverable fluorescent lamp wastes from a lamp recycling facility shall be disposed properly by sending to a TSDF (Treatment, Storage & Disposal Facility) site, based on the provisions (compliance with contents mentioned in Schedule II) under Hazardous Waste (Management, Handling and Trans-boundary) Movement Rules, 2008.

Annexure I

DELEGATION OF POWERS BY CENTRAL POLLUTION CONTROL BOARD TO POLLUTION CONTROL COMMITTEES

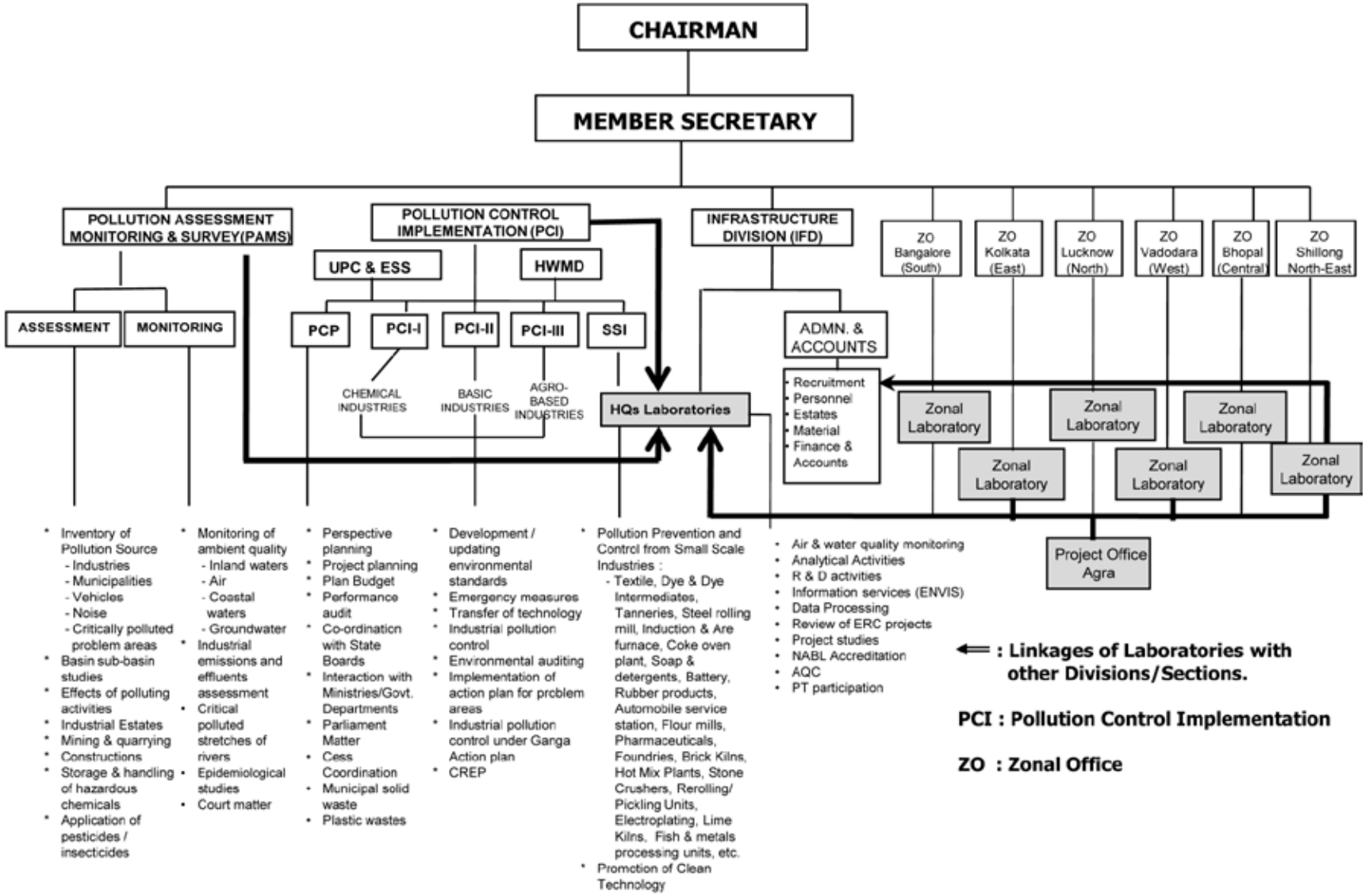
S. No	Union Territory	Pollution Control Committee	Gazette Notification No. for Power Delegation	Date of Notification
1.	**Andaman & Nicobar Islands**	The Pollution Control Committee Andaman & Nicobar Islands	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No. 33 Dated 16.01.1992 & Legal /156(4) 1990 dated 3.06.2004	16.01.1992
2.	**Chandigarh**	Chandigarh Pollution Control Committee	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No. 199(E) dated 15.03.1991 & S.O. 1131 (E) dated 23.10.2002	15.03.1991
3.	**Daman Diu & Dadra Nagar Haveli**	Pollution Control Committee Daman Diu & Dadra Nagar Haveli	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No. 862 (E) dated 26.11.1992; amended vide notification No. S.O. 384 (E) dated 19.2.1996 and S.O. 698(E) dated 03.07.1998 File No. B-12015/7/04/AS, dated 17.12.2004	26.11.1992
4.	**Delhi**	Delhi Pollution Control Committee	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No. 198 (E) dated 15.03.1991; amended vide Notification No. S.O. 640 (E) dated14.06.2002	15.03.1991
5.	**Lakshadweep**	Lakshadweep Pollution Control Committee	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No 842 (E) dated 31.08.1988 & legal /156(4) 1990 dated 23.03.2006	31.08.1988
6.	**Puducherry**	Puducherry Pollution Control Committee	Gazette of India Extraordinary, Part-II, Section-3, Sub-section (ii) S. O. No. 787 (E) dated 10.03.1992; amended vide Notification No. F.No.Legal/158/(4)/90 dated 01.05.2011	10.03.1992

Annexure – II

STATUS OF BOARD MEMBERS AS ON 31.03.2016

S.No.	Name	
1.	Shri Arun Kr. Mehta, IAS Chairman, CPCB	Chairman
2.	Shri Praveen Prakash, IAS, Joint Secretary, M/o Urban Development	Joint Secretary
3.	Dr. Amita Prasad, IAS, Joint Secretary (A & GW), Ministry of Water Resources	Joint Secretary
4.	Dr. Rashid Hasan, Advisor, MoEF&CC	Advisor
5.	Dr. Kalyan Rudra, Chairman, WBPCB	Chairman
6.	Shri Vivek Narayan Shejwalkar Mayor, Gwalior Municipal Corporation	Mayor
7.	Shri Ramakant Bhardwaj, National V.P., Laghu Udyog Bharti	Member
8.	Shri Kanwal Singh Chauhan, Haryana	Member
9.	Dr. Sukumar Devotta, Ex-Director, NEERI, Chennai	Ex-Director
10.	Shri N. Kumar, Director, Coal India Ltd.	Director
11.	Shri Sanjiv Singh, Director, IOCL	Director
12.	Dr. A.B. Akolkar, Member Secretary, CPCB	Member Secretary

ORGANISATIONAL STRUCTURE OF CENTRAL POLLUTION CONTORL BOARD



Annexure – IV

SANCTIONED STAFF STRENGTH IN CPCB AND NUMBER OF VACANCIES IN EACH CADRE AS ON 31.03.2015

Sl. No.	Name of the Post	Sanctioned Posts as on date Regular/ Dep.	Filled	Vacant Post
1	Scientist 'F' (02)	03	03	-
2	Scientist 'E' (08)	34	30	04
3	Scientist 'D' (22)	32	30	02
4	Scientsit 'C' (60)	76	68	08
5	Scientist 'B' (75)	22	05	17
6	Senior Law Officer	01	00	01
7	Finance & Account Officer	01	00	01
8	Sr. Administrative Officer	01	01	-
9	Administrative Officer	07	06	01
10	Law Officer	02	00	02
11	Assistant Law Officer	02	02	-
12	Hindi Officer	01	01	-
13	Accounts Officer	02	02	-
14	Assistant Accounts Officer	05	05	-
15	Assistant Technical Officer	01	00	01
16	Section Officer*	08	08	-
17	Private Secretary*	18	18	-
18	Senior Technical Supervisor	09	09	-
19	Draughting Supervisor	01	01	-
20	Senior Scientific Assistant	32	31	01
21	Senior Hindi Translator	01	01	-
22	Technical Supervisor*	06	05	01
23	Assistant*	21	16	05
24	Data Processing Assistant	04	01	03
25	Senior Draughtsman	02	01	01
26	Junior Enginner (E & M)	01	00	01
27	Junior Enginner (Civil)	01	00	01
28	Personal Assistant *	03	03	-
29	Accounts Assistant	08	06	02
30	Junior Hindi Translator	01	01	-
31	Publication Assistant	01	01	-
32	Junior Scientific Assistant	27	14	13
33	Senior Technician*	11	04	07
34	Junior Technician	07	05	02
35	Senior Laboratory Assistant	29	17	12

36	Junior Laboratory Assistant	31	25	06
37	Field Attendant	07	07	-
38	Upper Division Clerk	24	20	04
39	Lower Division Clerk	20	06	14
40	Senior Attendant	15	15	-
41	Driver Special Grade	01	01	-
42	Driver Grade-I	06	06	-
43	Driver Grade-II	02	02	-
44	Driver (Ordinary)	13	08	05
45	Data Entry Operator Grade-I	02	02	-
46	Data Entry Operator Grade-II	06	04	02
47	Stenographer	03	00	03
48	Pump & Wheel Valve Operator	01	01	-
49	Plumber	01	01	-
50	Attendant	22	20	02
	Total	**535**	**434**	**101**

- *Figures shown in the brackets are the number of scientific posts at the time of induction of the Flexible Complementing Scheme in CPCB (Interchangeable)*

04 post of Technical Supervisor have been adjusted to the lower posts of Sr. Technician (Vide Sl. No. 22, & 33), two posts of PS adjusted to the post of PA (Sl. No. 17 & 28) & two post of Section Officer adjusted to the post of Assistant (Sl. No. 16 & 23) 01 post of Driver Grade-I and 04 posts of Driver Grade-II adjusted to Driver (Ordinary) (vide Sl. No. 42, 43, and 44) under GFR - 254

Details of Contractual Employees

Sl. No.	Name of the Post/Fellowship	Number of Post/Fellowship
1	Research Associate-I	29
2	Senior Research Fellow	11
3	Junior Research Fellow	4
4	Project Scientist-I	1
5	Project Assistant Grade-II	1
6	Project Driver	3
7	Project Lab Attendant	1
8	Project Attendant	16
9	Project Attendant Cum-Safaiwala	1
10	Accounts work	1
11	Project Officer	1
12	Project Assistant	1
	Total	**70**

SANCTIONED STAFF STRENGTH IN CPCB AND NUMBER OF VACANCIES IN EACH CADRE AS ON 31.03.2013

Sl. No.	Name of the Post	Sanctioned	Filled		Vacant	Deemed abolished/approval for revival awaited	Abolished by MoEF
			Regular/ Dep.	Ad-hoc			
Total number of scientific posts at the time of induction of the Flexible Complementing Scheme (Interchangeable)							
1	Scientist 'F' - 02	168	2	-	25	-	-
2	Scientist 'E' - 08		7	-		-	-
3	Scientist 'D' - 22		45	-		-	-
4	Scientsit 'C' - 60		36	-		-	-
5	Scientist 'B' - 76		52	-		1	-
6	Senior Law Officer		1	-		-	-
7	Finance & Account Officer		-	-		-	-
8	Sr. Administrative Officer		1	-		-	-
9	Administrative Officer		6	-		-	-
10	Law Officer		2	-		-	-
11	Assistant Law Officer		1	-		-	-
12	Hindi Officer		1	-		-	-
13	Accounts Officer		2	-		-	-
14	Assistant Accounts Officer		5	-		-	-
15	Assistant Technical Officer		-	-		-	-
16	Section Officer		8	-		-	-
17	Private Secretary		18	-		-	-
18	Senior Technical Supervisor		8	-		-	-
19	Draughting Supervisor		1	-		-	-
20	Deputy Librarian		-	-		1	-
21	Senior Scientific Assistant		30	-		-	1
22	Senior Hindi Translator		1	-		-	-
23	Technical Supervisor		2	-		-	-
24	Assistant		16	-		-	-
25	Data Processing Assistant		-	1		-	-
26	Senior Draughtsman		2	-		-	-
27	Junior Enginner (E & M)		1	-		-	-
28	Junior Enginner (Civil)		-	-		-	-
29	Personal Assistant		1	-		-	-
30	Accounts Assistant		8	-		-	-
31	Junior Hindi Translator		-	-		-	-
32	Publication Assistant		1	-		-	-
33	Junior Scientific Assistant		27	1		-	6
34	Senior Technician		8	-		-	4

35	Junior Technician		7	-		-	-
36	Senior Laboratory Assistant		28	-		-	3
37	Junior Laboratory Assistant		26	-		-	7
38	Field Attendant		7	-		-	-
39	Upper Division Clerk		24	-		-	-
40	Lower Division Clerk		15	-		13	2
41	Senior Attendant		15	-		-	-
42	Driver Special Grade		1	-		-	-
43	Driver Grade-I		7	-		-	-
44	Driver Grade-II		1	-		-	-
45	Driver (Ordinary)		6	-		-	-
46	Data Entry Operator Grade-I		1	-		-	-
47	Data Entry Operator Grade-II		6	-		-	2
48	Junior Draftsman		-	-		1	-
49	Stenographer		3	-		5	2
50	Cashier		-	-		6	-
51	Pump & Wheel Valve Operator		1	-		-	1
52	Plumber		1	-		-	-
53	Attendant		22	-		8	9
	Total		**464**	**2**		**35**	**37**

02 posts of Scientist D (one Sr. Env. Engineer and one Sr. Scientist Sl. No. 3), 02 posts of Scientist B (Sl. No. 5), 02 posts of Senior Scientific Assistanat (Sl. No. 21) and 02 posts of Junior Scientific Assistant (Sl. No. 33) are sanctioned under HWMD for which approval for continuation is awaited.

One post of Assistant Technical Officer (Sl.No. 15) is sanctioned, however approval for Recruitment Rules are still awaited.

Five post of Sr. Technician are abolished by MoEF, however, one post is filled up due to exigency of work. (Sl. No. 34).

POST CREATED BY THE CENTRAL POLLUTION CONTROL BOARD AFTER THE NOTIFICATION OF CPCB REGULATIONS, 1995 AND FOR WHICH CONCURRENCE OF GOVERNMENT IS AWAITED.

Sl. No.	Name of the post	Approved by the CPCB	Filled		Unfilled
			Regular/Dep.	Ad-hoc	
1	Assistant Law Officer	1	-	-	1
2	Sr. Hindi Officer	1	-	-	1
3	Accounts Assistant	6	-	-	6
4	Senior Hindi Translator	1	-	-	1
5	Junior Hindi Translator	7	-	-	7
6	Hindi Typist (LDC)	7	-	-	7
7	Driver Grade II	3	-	-	3
8	Attendant (Safaiwala)	10	-	8	2
9	Field Attendant	11	-	-	11
	Total	**47**	**0**	**8**	**39**