Annual Report

2008 – 2009


cpcb
CENTRAL POLLUTION CONTROL BOARD
Ministry of Environment & Forests
(Govt. of India)

Published by: Sh. J. S. Kamyotra, Member Secretary, Central Pollution Control Board, Delhi – 110 032
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Printing Supervision & Layout: Sh. Keyur Shah and Sh. Satish Kumar
Composing & Laser Typesetting: Sh. K. P. Srivastava
Printed at: National Institute of Science Communication and Information Resources, CSIR, Dr. K.S. Krishnan Marg, New Delhi – 110 012

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CHAPTER I

INTRODUCTION

Under the provisions of The Water (Prevention & Control of Pollution) Act, 1974, the Central Govt. constituted the '**Central Board for the Prevention and Control of Water Pollution**' on September 23, 1974. The name of the Central Board was changed to **Central Pollution Control Board (CPCB)** under the Water (Prevention & Control of Pollution) Amendment Act 1988 (No. 53 of 1988).

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.

The Central Pollution Control Board has been continuously playing a key role in abatement and control of pollution in the country by generating relevant data, providing scientific information, rendering technical inputs for formation of national policies and programmes, training and development of manpower, through activities for promoting awareness at different levels of the Government and Public at large. The Central Pollution Control Board is continuously growing organization with consistent output and continuous improvements in its infrastructure facilities, human resource development and development of expertise to meet the challenges of unending task of environment protection in the country

1.1 FUNCTIONS OF THE CENTRAL BOARD

In addition to the main functions of promoting cleanliness of streams, wells and 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 equipment, 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 CPCB

As per policy decision of the Government of India, the Central Pollution Control Board, delegated its powers and functions 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 Union Territories to respective Pollution Control Committees under the local Administration.

CHAPTER II

CONSTITUTION OF THE CENTRAL BOARD

2.0 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.

2.1 List of Board Members during year 2008-2009 is provided at Annexure-I. The organisation structure of the Central Pollution Control Board is provided at Annexure-II. Staff strength as on March 31, 2009 is furnished in Annexure-III & IV.

CHAPTER III

MEETINGS OF THE CENTRAL BOARD

3.1 MEETINGS OF THE BOARD

During the reporting period (i.e. April 1, 2008 to March 31, 2009), five meetings of the Central Board were held as detailed below:

S. No.	Meeting No.	Date	Place
1.	146th	April 12, 2008	Delhi
2.	147th	May 23, 2008	New Delhi
3.	148th	July 24, 2008	Delhi
4.	149th	October 23, 2008	New Delhi
5.	150th	January 09, 2009	New Delhi

3.2 MAJOR DECISIONS TAKEN BY THE BOARD

- CPCB's Annual Action Plan 2008-2009 approval.
- Financial Assistance provided by CPCB to State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) during 2007-08
- Application of Remote Sensing in identification of landfill sites for disposal of municipal solid waste
- Status of Demonstration projects for implementation of MSW Rules- on-going schemes.
- Imposing fine on defaulting industries against whom directions imposing fine under Rule 16 of the Hazardous Waste (Management & Handling) Rules, 1989 as amended issued by the Maharashtra Pollution Control Board
- Up-gradation of two posts of Law Officer (Rs.10000-15200) to the level of Senior Law Officer in the scale of (Rs.12000-375-16500)
- Sampling and analysis charges for the analysis of Water, Soil, Hazardous Waste, Air and Source Emission samples at CPCB Laboratories.
- Environmental Trainings for the year 2008 – 09

- Levy of fine on M/s. Bajaj Auto Limited, Aurangabad for violation in implementation of Hazardous Waste (Management & Handling) Rules, 1989 as amended 2000, 2003

- Limiting storage time for storage of incinerable hazardous wastes by the Hazardous Waste Treatment, Storage and Disposal Facility for Incineration Operators

- SSI Sector: Environmental Issues, implémentation status & options

- Notification of Environmental Standards for Cashew Seed Processing Industry

- Levy of Fine to M/s. Wockhardt Ltd., Aurangabad for violation in implementation of Hazardous Waste (Management & Handling) Rules, 1989 as amended in 2000, 2003

- Advanced Technologies in Distilleries to meet Zero Discharge

- Work Plan of Central Pollution Control Board for next Five Year (2007 – 2012)

- Revision of Ambient Air Quality Standards as proposed by the Steering Committee

- Draft Standards and Guidelines for Incinerator of Bulk Drug Industry

- Compliance to the implementation of Municipal Solid Waste (Management and Handling) Rules, 2000

- Execution of demo-project on management of Municipal Solid Wastes at Mandi (H.P.) and Suryapet (A.P.) through National Buildings Construction Corporation (NBCC)

- Amendment in Notification No. S.O. 394(E), dated 16.4.1987 regarding (CPCB Vs M/s Jakson & Co. Ltd.)

- Recruitment Rules for the post of Data Processing Assistant in the Scale of Pay of Rs. 5500 – 175 – 9000/-.

- Revision in reimbursement of Canteen Expenses in lieu of subsidized Canteen Facilities to Central Pollution Control Board employees

- Switch over from existing Medical Attendance Rules to CS(MA) Rules, 1944

- Revision of Lease Entitlement in respect of Project Office, Agra, functioning under Zonal Office, Lucknow

- Modification in National Emission standards for Petrochemical Plants
- Standards for Faecal Coliform in Treated Sewage
- Annual Report of CPCB for the year 2007-2008
- Effluent Standards for Pharmaceutical Industry
- Notification of Environmental Standards for Electric Arc & Induction Furnaces
- Notification of Emission Standards for Plaster of Paris Industries regarding
- Substitution of Government Analyst at Central Laboratory of National Fertilizers Limited, Vijaipur, Guna, M.P. under the Environment (Protection) Act, 1986
- Standards and Guidelines for Hotel Industry
- Implementation of the 6th Central Civil Services (Revised Pay) Scales, 2008 in CPCB
- Annual Audits of CPCB for the Year 2007-08
- Provision for extending the facility of special Medical Claims to the staff of CPCB
- Department related Parliamentary Standing Committee on Science & Technology, Environment & Forests – One Hundred Ninety Second Report on Functioning of Central Pollution Control Board
- Annual Plan and Budget Estimate for 2009 – 10
- Status of demonstration projects for implementation of MSW Rules – ongoing schemes
- Recruitment Rules for the post of Assistant Technical Officer (ATO) in the Pay Scale of Rs. 8000 – 275 – 13500 – amendment reg.
- Provision of extending the facility of reimbursement of one news paper expenses to Group C & D staff working in CPCB
- Adoption of payment procedure under National Air Monitoring Programme (NAMP) as per revised approved rates approved by the Board
- General establishment matters arising out of implementation of 6th pay commission's recommendations.

- Approval of Creation of Different posts for Official Language Section in Head office & Zonal Offices

3.3 NATIONAL CONFERENCE OF CHAIRMAN & MEMBER SECRETARIES OF CPCB/SPCBs/PCC

The 54th Conference of Chairmen & Member Secretaries of CPCB/SPCBs/PCCs was organized during May 22-23, 2008 at CGO - Scope Complex, Lodhi Road, New Delhi. Over 100 participants from 32 State/UTs, MoEF and CPCB attended the Conference.

The major issues discussed during the conference are as follows:

- Implementation of Hon'ble Supreme Court Directions
- Status of Common Hazardous Waste Treatment, Storage and Disposal Facilities
- Guidelines for Storage of Incinerable Hazardous waste
- Environmentally Sound Recycling of E – Waste
- Implementation of Bio-medical Waste (Management & Handling) Rules
- Implementation of Plastics Manufacture and Usage Rules
- Implementation of MSW Rules
- Execution of Schemes identified by CPCB through SPCBs / PCCs
- National Ambient Air Quality Standard and rationale for National Ambient Air Quality Standard
- Calibration & Evaluation of Ambient Air Quality Monitoring Stations in India
- Hazardous Air Pollutants
- Status of Source Apportionment Studies in Six Cities
- National Air Quality Monitoring Programme (NAMP) including online Entry via Environmental Data Bank (EDB)
- National Water Quality Monitoring Programme (NWMP)
- Issues Related to Interstate River Water Quality Monitoring
- Corporate Responsibility for Environmental Protection
- Pollution Control in 24 Critically Polluted Areas
- Pollution Control Implementation in SSI Sector
- National Reference Trace Organics Laboratory
- Advance Technology for Distilleries to meet Zero Discharge
- Setting up of CAAQMS in 16 Cities

CHAPTER IV

COMMITTEES CONSTITUTED BY THE BOARD AND THEIR ACTIVITIES

4.1 RESEARCH ADVISORY AND MONITORING COMMITTEE AT CENTRAL POLLUTION CONTROL BOARD

The Central Pollution Control Board regularly formulate programmes and undertake research and development activities covering different thrust areas related to prevention and control of pollution. The Central Pollution Control Board had constituted its first Research Advisory Committee on 24th April, 2002 comprising experts from the leading environmental laboratories of CSIR, Department of Science and Technology and Ministry of Environment & Forests and other eminent scientists for guiding and reviewing the research activities of the organization.

The Research Advisory Committee has been reconstituted during February, 2007 and later again reconstituted in view of WII Guidelines and as per discussion & minutes of the Review meeting chaired by Secretary (E&F) on 28.7.2006 and 16.1.2007. The Research Advisory Committee has also been renamed as Research Advisory and Monitoring Committee (RAMC) and constituted as broad based committee comprising representatives of various stakeholder sector groups as members. The stakeholders from farming sector, industrial sector, mining sector, transport sector, infrastructure developer and representative of various sections of societies such as Teacher, Doctor, Lawyer, woman and youth. Further, the stakeholder from various government agencies, eminent scientist and NGO's are represented to the RAMC for the category of "meaningful contributors". Further, in-house scientists in various cadre i.e. senior, middle and junior level from CPCB has also been made as part of RAMC. The Terms of Reference (TOR) and constitution of Research Advisory and Monitoring Committee of CPCB is presented below.

Terms of Reference of RAMC

The Research Advisory & Monitoring Committee (RAMC) is overseeing the research activities of Central Pollution Control Board as per guidelines of Department of Scientific & Industrial Research, Ministry of Science & Technology, New Delhi.

The RAMC is providing the following functions:

(a) The RAMC recommends research projects for approval and monitoring progress of research projects. The approval of the project is being guided by the guidelines for research projects by RE Division of MoEF. The RAMC is according preference to Applied Research, which is largely

guided by the needs and problems posed by the users.

(b) The RAMC advises the Central Pollution Control Board regarding research to be undertaken. The illustrative and indicative list of thrust areas are indicated ahead:

- Prevention, abatement and control of water pollution in aquatic resources.
- Prevention, abatement and control of air pollution.
- Abatement and control of industrial pollution.
- Air/Water pollution and its affect on human health.
- Assessment and development of River basins and river pollution.
- Restoration of environmental quality in problem areas/polluted stretches of rivers.
- Bio-assessment, bio-monitoring and bio-remediation.
- Abatement of pollution from non-point sources.
- Environment Standards development (point / non point sources)
- Pollution Prevention and Resource Recycling.
- Environmental mapping and planning.
- Hazardous waste management, Clean Technology for Hazardous Waste Management.
- Bio-medical Waste Management.
- Pollution Control Technologies / Clean Technologies – ways and means for their adoption.
- Clean coal Technologies.
- Solid Waste Management.
- Alternate uses of fly ash
- Waste Minimization
- Treatability Studies.
- Development of Analytical/Monitoring methodology.
- Scientific R & D project to prevent and mitigate pollution control activities.
- Climate Change
- Ozone Depletion
- Sulfur dioxide emission control
- Chemical characterization of Fine Particulate Matter PM_{10} / $PM_{2.5}$
- Anthropogenic aerosol, particularly assessment of generation of Black Carbon.
- Ground Level Ozone formation, assessment and prevention aspect.
- Various technological solutions for reduction of Environmental Pollution and Green House Gas.
- Distillery Effluent Management (feasibility of technology, Evaporation cum Incineration / Power Generation).
- Mercury Waste Management from CFL Lamps.
- Assessment of Health effect due to use of Bio Fuel.
- Toxicological assessment of alternate transport fuel in India.
- Coliform standard and assessment of control technology for Sewage Treatment Plant.
- Utilization of Plastic waste in Cement Kiln and Blast Furnace.
- Conversion of plastic waste into liquid fuel – technology assessment.
- Odour monitoring and prevention technology.
- TDS management – New dimension.
- Use of high calorific value hazardous waste in cement kiln as partial fuel.

- Co-incineration of hazardous waste
- Secured land filling
- Waste utilization and e-waste management

(c) The RAMC provides directions to consolidate the ongoing pollution control activities and meet twice in a year for guidance of research activities as well as for monitoring of ongoing research activities.

(d) It will ensure that adequate resources and effective models are provided for interface between research proponent and user.

The list of RAMC Members during year 2008-2009 is provided at Annexure-V. During the year 2008-2009, two meetings of RAMC have been conducted respectively on 2nd August, 2008 and 26th March, 2009.

4.2 CONSTITUTION OF PEER & CORE EXPERT COMMITTEE – REAFFIRMATION OF EXPERT MEMBERS

The Peer & Core Expert Committee to evolve standards for effluents and emissions, ambient air and water quality – Age relation of Core Expert Members Prof. J. M. Dave, Prof. R. H. Siddiqui and Sh. P. C. Tyagi, who have been in their seventies has been considered in 147th meeting of the board and it has been discussed that the three Expert Core Group Members have in-depth knowledge in all environmental issues including standard setting for effluent and emission, thorough knowledge about various pollution control technologies as well they are residing in and around Delhi. The Board noted the informations and re-affirmed the power of Chairman to constitute /reconstitute various Committees / Task Force / Expert Group etc.

4.3 EXPERT COMMITTEE ON VEHICULAR POLLUTION CONTROL

An Expert Committee on Vehicular Pollution Control has been constituted by Central Pollution Control Board April 10, 2008. The Terms of Reference of the Committee are as follows:

- To propose/recommend policies, programmes & best practices related to Vehicular Pollution Control.
- To follow-up implementation of the existing interventions/regulations and identify options for better implementation framework.
- To advice/guide on thrust areas (related to Vehicular technology, Fuel quality, Alternate Vehicles & Fuels etc) wherein R&D activities should be undertaken for controlling Vehicular Pollution.
- To advice/guide on issues related to fiscal policies as well as administrative matters (I&M, Traffic management, land use planning etc.) for Vehicular Pollution Control.
- To scrutinize various matters those have been undertaken for Vehicular Pollution Control, which includes R&D work (Carried out internally as well as

outsourced), Formulation of technical guidelines etc.

- To organize seminars, symposiums/ workshops related to Vehicular Pollution Control.
- To guide CPCB/SPCB to formulate action plan for controlling Vehicular Pollution in non-attainment cities.

CHAPTER V

AIR AND WATER QUALITY MONITORING NETWORK

5.1 WATER QUALITY

5.1.1 National Water Quality Monitoring Programme (NWMP)

Water quality monitoring helps in evaluating the nature and extent of pollution control required effectiveness of pollution control measures already in existence, and drawing the water quality trends and prioritizing pollution control efforts. The Central and State Pollution Control Boards / Pollution Control Committees are responsible for restoration and maintenance of wholesomeness of aquatic resources. It is important that the Pollution Control Boards regularly monitor the water quality to ensure that the water quality is being maintained or restored at desired level and to achieve the following objectives.

- For rational planning of pollution control strategies and their prioritization;
- To assess nature and extent of pollution control needed in different water bodies or their part;
- To evaluate effectiveness of pollution control measures already is existence;
- To evaluate water quality trend over a period of time;
- To assess assimilative capacity of a water body thereby reducing cost on pollution control;
- To understand the environmental fate of different pollutants.
- To assess the fitness of water for different uses.

National Water Quality Monitoring Network

The Central Pollution Control Board (CPCB) has established National Water Quality Monitoring Network comprising 1429 monitoring stations in 27 states and 6 in Union Territories on various water bodies across the country. The monitoring is undertaken on monthly or quarterly basis in surface waters and on half yearly basis in case of ground water. The monitoring network covers 293 Rivers, 94 Lakes, 9 Tanks, 41 Ponds, 8 Creeks, 23 Canals, 18 Drains and 411 Wells. The new monitoring stations added during the year 2008 – 2009 are presented at Table 5.1. Among the 1429 stations 810 are on rivers, 102 on lakes, 18 on drains, 23 on canals, 9 on tank, 15 on creeks/seawater, 41 on pond, while 411 are groundwater stations. The water source wise numbers of water quality monitoring stations are summarized in Table 5.2. Presently the inland water quality-monitoring network is operated under a three-tier programme i.e. Global Environmental Monitoring System (GEMS), Monitoring of Indian National Aquatic Resources System and Yamuna Action Plan. Water samples are being analyzed for 28 parameters consisting of physico-chemical and bacteriological parameters for ambient water samples apart from the field observations. Besides this, 9 trace metals parameters and 28 pesticide residues are analyzed in selected samples. Biomonitoring is also carried out on specific locations. In view of limited resources, limited numbers of organic pollution related parameters are chosen for frequent monitoring i.e. monthly or quarterly and major cations,

anions, other inorganic ions and micro pollutants (Toxic Metals & POPs) are analyzed once in a year for assessment of water quality over large period of time.

Table 5.1: Details of Monitoring Stations included in National Water Quality Monitoring Network during the year 2008-09

STATE	NO. OF STATIONS
Andhra Pradesh	37
Kerala	55
Jharkhand	27
Uttar Pradesh	1 (Monitored by CPB Zonal Office)
Daman & Diu	19
Pondicherry	6
Orissa	39
TOTAL	**184**

Table 5.2: River Basin wise distribution of Water Quality Monitoring Stations

River (main stream), Tributaries and Sub-Tributaries, Lake, Ponds, Tanks, Canals, Creeks and Groundwater Stations	Total Stations
Baitarni (5) Tributaries- Kusei(1)	6
Brahmani (16) Tributaries-Karo (1), Koel (5), Sankh (1), Kharasrota(2)	25
Brahmaputra (10) Tributaries-Burhidihing (3), Dhansiri (7), Disang (2), Jhanji (1), Subansiri (1), Bhogdoi (1), Bharalu (1), Borak (2), Deepar Bill (1), Digboi (1), Mora Bharali (1), Teesta (5), Dickhu (1), Maney (2), Ranchu (2), Rangit (5), Jai Bharali (1), Kathakal (1), Kharsang (1), Kolong (2), Manas(1), Pagldia (1), Chathe (1), Dzu (1), Kapili(1), Beki(1), Kundli(1), Kushiara(1), Panchnai(1), Sankosh(1), Sonai(1), Kohara(1), Ranga(1), Boginadi(1), Dikhow(1)	66
Cauvery (20) Tributaries-Arkavati (1), Amravati (1), Bhawani (5), Kabini (4), Laxmantirtha (1), Shimsa (2), Hemavati (1), Yagachi (1)	36
Ganga (34) Tributaries-Alakananda-Upper Ganga (4), Mandakini-Upper Ganga (1), Barakar (2), Betwa (10), Chambal (8), Damodar (11), Gandak (1), Saryu-Ghaghra (3), Gomti (5), Hindon (3), Kali (West) (2), Kali Nadi (2), Khan (3), Kshipra (3), Mahananda (1), Mandakini (Madhya Pradesh) (1), Parvati (2), Ramganga (1), Rapti (1), Rihand (2), Rupanarayan (1), Sai (1), Sone (5), Tons (Madhya Pradesh) (2), Yamuna (23), Sindh (1), Johila (1), Sankh(1), Gohad (1), Kolar (1), Churni (2), Tons (Himachal Pradesh) (1), Sikrana (1), Daha (1), Sirsa (1), Dhous (1), Farmer (1), Kali sot(1), Bihar(1), Bichia(1), Ajay (1), Nalkari (1), Konar (3), Bokaro (1)	154
Godavari (35) Tributaries- Manjara (Manjira) (5), Maner (2), Nira (1), Wainganga (8), Wardha (3), Kolar (1), Kanhan (3), Purna (2), Indravati (2), Sankhani (1), Nakkavagu (1), Vamsadhara (1)	65
Indus Tributaries-Beas (19), Chenab (1), Jhelum (3), Largi (1), Parvati (3), Ravi (3), Sutlej (21), Tawi (1), Gawkadal (1), Chuntkol (1), Sirsa (3), Swan (1)	58
Krishna (22) Tributaries- Bhadra (3), Bhima (10), Ghataprabha (2), Malprabha (3), Muneru (1), Musi (3), Nira (2), Paleru (1), Tunga (1), Tungabhadra (6), Panchganga (4), Chandrabhaga (2), Kagina(1), Koyna(1), Mula(2), Mutha(1), Mula-Mutha(1), Venna(1), Pawana(1), Indrayani(1), Hundri (1), Kundu (1), Kinnersani (1), Sabari (1)	73
Mahi (9) Tributaries-Anas (1), Panam (1) , Jammer(1), Malei(1), Shivna(1), Chillar(1)	15

Mahanadi (22) Tributaries-Ib (4), Hasdeo (2), Kathajodi (1), Kharoon (4), Kuakhai (3), Sheonath (3), Birupa (1), Arpa (1), Kelo (2), Bheden(1), Tel(1), Serua(1), Daya(1), Sankha(1), Taladanda canal(3)	51
Narmada (21) Tributaries-Chhota Tawa (1), Gour(1), Katni(1), Kunda(1)	25
Pennar (5)	5
Sabarmati (9) Tributaries-Meswa (1), Shedhi (1), Khari (1)	12
Subarnarekha (12) Tributaries- Jumar (1)	13
Tapi (14) Tributaries-Girna (2), Rangavali (1), Denwa(1), Kim(1)	19
Medium rivers Ambika (1), Ulhas (3), Ulhas-Bhatsa (1), Ulhas-Kalu (1), Imphal (4), Mandovi (2), Palar (1), Pamba (3), Pariyar (7), Rushikulya (2), Tambiraparani (7), Achankoil (2), Chalakudy (1), Damanganga (14), Ghaggar (19), Kallada (1), Kali-Karnataka (1), Manimala (2), Mindhola (1), Nagavalli (4), Amlakhadi (2), Chaliyar (2), Iril (2), Kharkhala (1), Karmana (1), Kolak (2), Kundalika (2), Meenachil (1), Muvattupuza (1), Patalganga (2), Umtrew (1), Vamanpuram(1), Zuari(2), Gumti(2), Kalna (1),Valvant (1), Madai (1), Khandepar (2), Asanora (1), Bhadar (1), Neyyar (1), Ithikkara (2), Kadalundy (1), Kuttiyady (1), Mahe (2), Kuppum (1), Neelsvaram (2), Karingoda (1), Chandergiri (1), Chitrapuzha (1), Nambul (2), Ganol (1), Simsang (1), Myntdu (1), Arasalar (1), Kodra (1), Haora (1), Khuga (1), Khujairok (1), Sekmai (1), Markanda (1), Sukna (1), Baleshwar Khadi (1), Netravati (1), Kumardhara (1), Purna (1), Kaveri (1), Dhadar (1), Tlawng (2), Tuirial (2), Talpona (1), Bhogavo(1), Triveni sangam(1), Mapusa(1), Bicholim(1), Chapora(1), Kushawati(1), Sal(2), Meethi(1), Savitri(1), Vashisti(1), Neyyar (1), Mamom (1), Ayroor(1), Pallickal (1), Karuvannurr (1), Puzhackal (1), Keecheri (1), Thirur (1), Kadalundi (1), Kallai (1), Korapuzha (1), Thallassery (1), Ancharakandy(2), Kuppam (1), Ramapuram (1), Peruvamba (1), Kavvai (1), Pullur (1), Mogral (1), Shriya (1), Uppala (1), Manjeswar (1), Korayar (1), Bharathapuzha (2), Kadambayar (2), Gautami-Godavari(2), Coringa(1), Budhabalanga(2), Vanshadhara(2), Kerandi(1)	190
Lakes (102) Hussainsagar (1), Saroornagar (1), Himayatsagar (1), Pulicate (1), Salaulim (1), Kankoria (1), Chandola (1), Ajwah (1), Sursagar (1), Brahamsarovar (1), Sukhna (2), Govindsagar (1), Pongdam (1), Renuka (1), Wuller (1), Dal (1), Ulsoor (1), HebbalaValley (1), Oruvathikotta (1), Sasthamcotta (1), Ashthamudi (1), Paravur (1), Vembanad (1), Periyar (1), Kodumgallor (1), Kayamkula (1), Punnamadakayal (1), Pookotekayal (1), UpperLake (4), LowerLake (1), MultaiLake (1), Loktak (4), Umiam (1), Ward (1), Thadlaskena (1), Osteri (1), Bahour (1), Harike (2), Pichola (1), Udaisagar (1), Ramgarh Jaipur (1), Pushkar (1), Fatehsagar (1), Kalyana (1), Nakki (1), Udhagamadalam (1), Kodaikanal (1), Yercaud (1), Lakshminarayan Baridigh (1), Rudrasagar (1), Ramgarh-UttarPradesh (1), Naini (1), Rabindrasarovar (1), Nalsarovar (1), Bindusaraovar (1), Sahastrling Sarovar (1), Lakhota Talav (1), Narsimehta Talav (1), Nadiad city Lake (1), Ranjitnagar Talav (1), Ankleshwar reservoir(1), Dharoi dam(1), Kuwadava(1),Moticher lake(1), Mayem lake(1), Janunia talav(1), Yashwant sagar(1), Sirpur talav(1), Kali sindh reservoir(1), Periat tank(1), Shahpura (1), Madhav lake(1), Nagchun(1), Karwa dam(1), Khandari reservoir(1), Daloni Beel(1), Mer Beel(1), Govindgarh tank(1), Bilawali talav(1), Bhoothathankettu reservoir(1), Dimna lake(1), Edamalayar reservoir(1), Hazaribagh Meethajheel(1), Kondacharala- aava lake(1), Laxminarayan Chevuru(1), Malampuzha reservoir(1), Miralam lake(1), Noor Md. Kunta(1), Pazhassi reservoir(1), Ranchi lake(1), Topchachi lake(1), Vembanadu lake(1), Chilka lake(1), Anshupa lake(1) **Tanks (9)** Dharamsagar (1), Bibinagar (1), Kistrapetrareddy (1), Goysagar (1), Thol (1), Gandigudem(1), Kajipally Tank(1), Mallapur Tank(1), Premajipet Tank(1) **Ponds (40)** Elangabeel System (1), Lakshadweep (1), Olpad village pond (1),Bishnu Pushkar pukhuri(1), Bor Beel(1), Bor pukhuri(1), Botodriva pond(1), Chand dubi Beel(1), Deepar Beel(1), Dighali pukhuri(1), Dhudia talav(1), Baskandi pond(1), Galabeel(1), Ganga pukhuri(1), Gaurisagar(1), Gopur tank(1), Padum pukhuri(1), Hordai pukhuri(1), Jaipal pukhuri(1), Mahamaya mandir pukhuri(1), Rajadinia pukhuri(1), Raja pukhuri(1), Rajmaw pukhuri(1), Saranbeel(1), Sivasagar tank(1), Subhagya kund(1),Sai Chevuru(1), Asani Kunta(1), Durgam Chevuru(1), Pedda Chevuru(1), Nalla Chevuru(1), Bhadrakali Chevuru(1), Shiv Ganga Pond(1), Padmanabha Swamy Temple Pond(1), Bindusagar(1), Narendra pokhari(1), Markanda pokhari(1), Indradyumna (1), Swetaganga(1), Parvatisagar(1)	151
Creeks, Canals and Drains Creeks (8),Sea Water(7), Agra Canal (1), Gurgaon Canal (1), Western Yamuna Canal (11), Agartala Canal (1), Cuncolim canal(2),Panoli canal(1), Narmada canal(1), Cumbarjua canal(1), Samarla Kota Canal (1), Tulje Bagh Canal (1), Drains (18)	54
Groundwater	411
GRAND TOTAL	**1429**

Water Quality Trend

The water quality monitoring results obtained between years 1995 to 2008 indicate that the organic and bacterial contamination are continued to be critical in water bodies. This is mainly due to discharge of domestic wastewater mostly in untreated form from the urban centres of the country. The municipal corporations at large are not able to treat the increasing load of municipal sewage because of which sewage may flow into the water bodies without treatment. Secondly the receiving water bodies also do not have adequate water for dilution, therefore, the oxygen demand and bacterial pollution is consistently increasing and may be the cause of water borne diseases.

The water quality monitoring results were analysed with respect to indicator of oxygen consuming substances (Bio-chemical Oxygen Demand) and indicator of pathogenic bacteria (Total coliform and Faecal coliform). The result indicates that there is gradual degradation in water quality. The numbers of observation having high BOD and Coliform density have increased between the years 1995 to 2008. The water quality status for the period 1995 to 2008 in terms of BOD, Total and Faecal Coliforms are presented in Fig. 5.1 to 5.3.

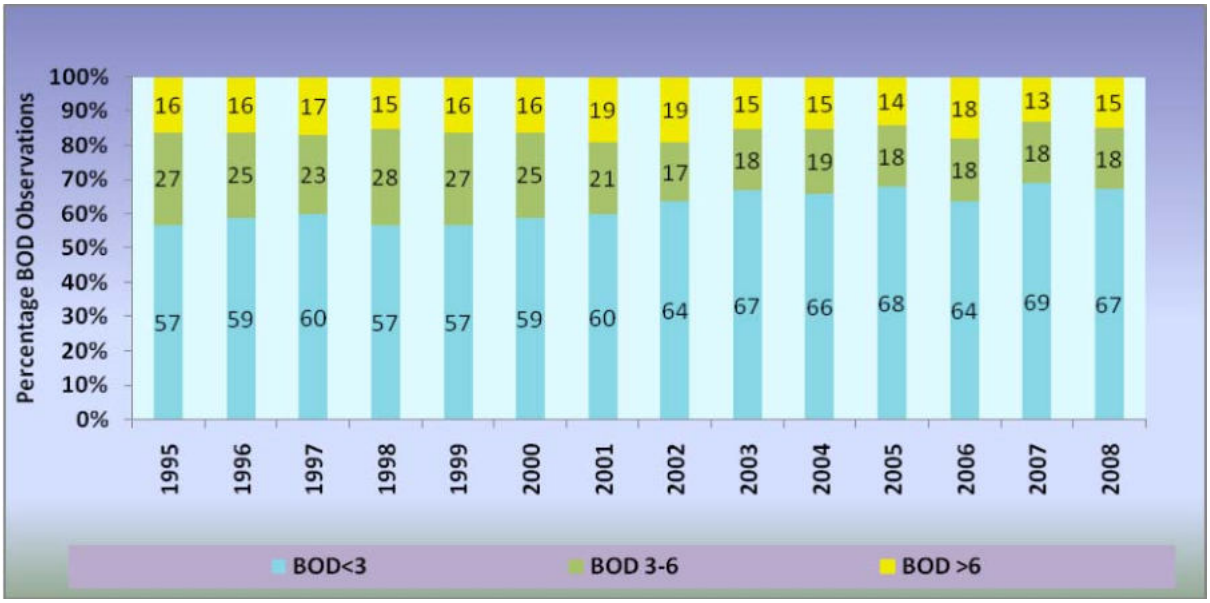


Fig. 5.1: Water Quality Trend (BOD, mg/l)

The numbers of observed BOD values less than 3 mg/l were between 57-69% during year 1995 to 2008. The maximum value of 69% was observed during year 2007. It was observed that there was a gradual decrease in number of observations having BOD < 3. The number of observed BOD values ranges from 3-6 mg/l was between 17-28% during year 1995 to 2008, the maximum value of 28% was observed in the year 1998. It was observed that the number of observations remain unchanged and followed static trend in percentage of observations having BOD levels between 3-6 mg/l. The numbers of observed BOD value> 6 mg/l were between 13 and 19% during year 1995-2008 and the maximum value of 19% was observed in the year 2001 and 2002. It was observed that there was a gradual decrease and during year 2008 the percentage observation was 15 % having BOD >6.

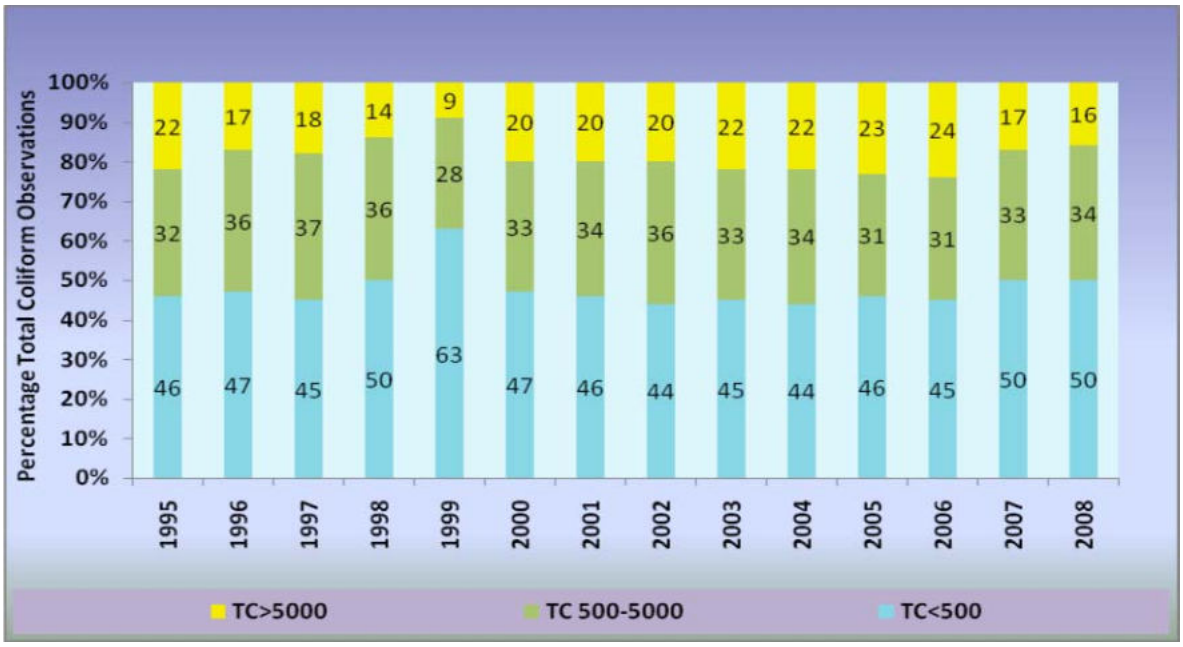


Fig. 5.2: Water Quality Trend of Total Coliform, MPN/100 ml

The numbers of observed TC values < 500 MPN/100 ml were between 44-63% during 1995-2008. The highest percentage of observations was observed as 63% in year 1999 which decreases to 50% during 2008.The numbers of observed TC values ranges from 500-5000 were between 28-37% during years 1995-2008 the maximum value of 37% was observed in 1997 and this % was decreased to 34% in 2008.The numbers of observed TC values > 5000 were between 9-24% between years 1995-2008. Minimum value of 9% was observed during the year 1999. The maximum value of 24% was observed in the year 2006. During 2008 it was observed as 16% indicating decreasing trend.

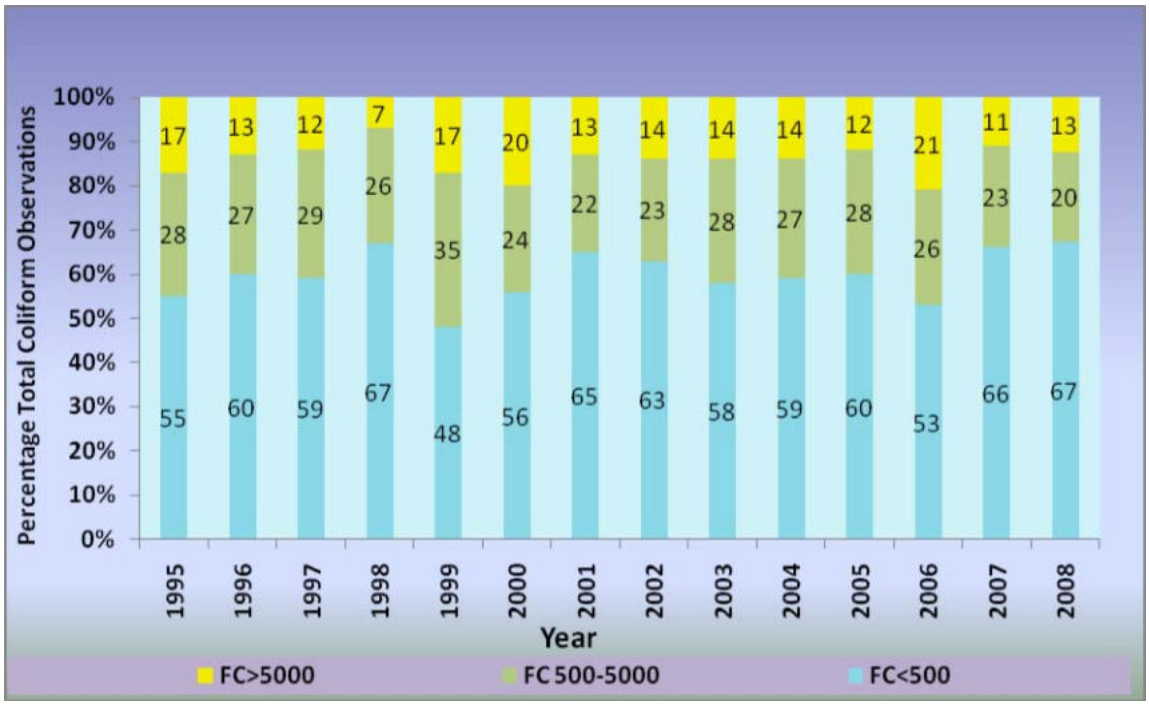


Fig. 5.3: Water Quality Trend of Faecal Coliform, MPN/100 ml

The numbers of observed Faecal Coliform values <500 MPN/100 ml was between 48-67% between years 1995-2008. The maximum value of 67% was observed in the year 1998 and similar trend is followed in year 2008. The numbers of observed FC values ranges from 500-5000 MPN/100 ml was between 22-35% between years 1995-2008. The maximum value of 35% was observed in the year 1999, which decreases to 20% in the year 2008. The numbers of observed FC values > 5000 MPN/100 ml was between 7-21% between years 1995-2008. The maximum value of 21% was observed in 2006, which gradually decreases to 11% in the year 2007 and again increased to 13% in 2008 indicating degradation in quality.

Water Quality at a Glance

Water quality of 293 rivers in major, medium and minor basins is observed in the country. There are significant numbers of stations on main streams of the major river basins. The water quality data of rivers monitored under the network is evaluated against the water quality criteria and the monitoring locations in exceedence with respect to BOD is assessed and action plan for restoration of water quality are formulated.

During year 2008 the highest level of BOD observed at major rivers/canals in descending order was in River Markanda D/s Kala Amb (590 mg/l) followed by Kali (Western) D/s Muzaffarnagar (364 mg/l), River Amlakhadi at Ankleshwar(353 mg/l), Western Yamuna Canal D/s Yamuna Nagar (247 mg/l), River Kali (Eastern) at Gulawati (183 mg/l), River Yamuna at Okhla after meeting Shahdara drain(70 mg/l), River Betwa at Nayapur D/s (58 mg/l) and River Yamuna at Nizamuddin Bridge (55 mg/l).

Water Quality of River Ganga

- Water quality monitoring of the river Ganga and its tributaries is carried out in the State (s) of Uttaranchal, Uttar Pradesh, Bihar and West Bengal at 39 locations by Central Pollution Control Board North Zonal Office - Lucknow. The ranges of water quality observed in rivers Ganga with respect to BOD, Dissolved Oxygen (DO), Total Coliform and Faecal Coliform are calculated and presented as minimum, maximum and mean value to assess the extent of water quality variation throughout the year.

- The Water quality of river Ganga indicates that DO are meeting the water quality criteria at almost all the locations except d/s of Kanpur.

- The BOD exceeds the standard criteria at Haridwar D/s, Narora, Garhmukteshwar, Kannauj U/s and D/s, Bithoor, Kanpur U/s and D/s, Dalmau (Raibareilly), Allahabad (Rasoolabad) and D/s, Varanasi U/s, Varanasi D/s (Malviya Bridge), Ghazipur (Trighat), Beharampore, Dakshineshwar, Garden reach, Uluberia, Palta and Diamond Harbor.

- The Faecal Coliforms (FC) violates the water quality criteria at most of the locations.

The status of water quality of river Ganga is presented State wise for Biochemical Oxygen Demand in Fig. 5.4 to 5.8.

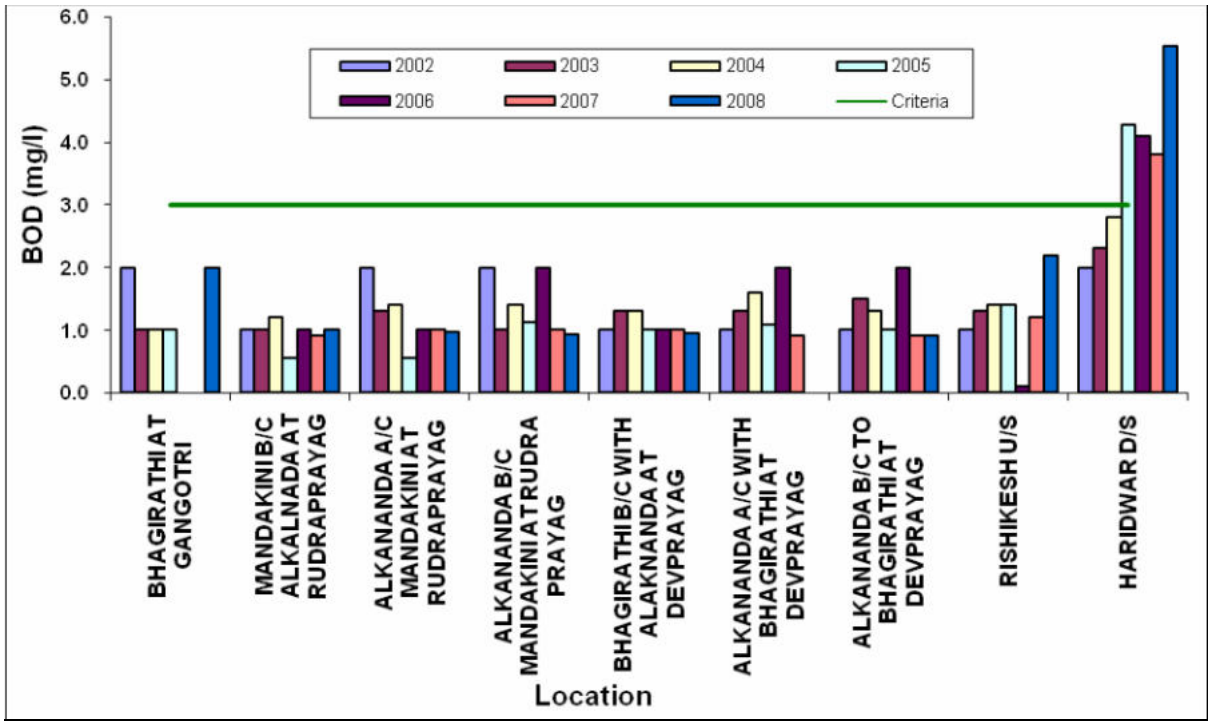


Fig. 5.4: Water Quality of River Ganga (Uttaranchal Segment)

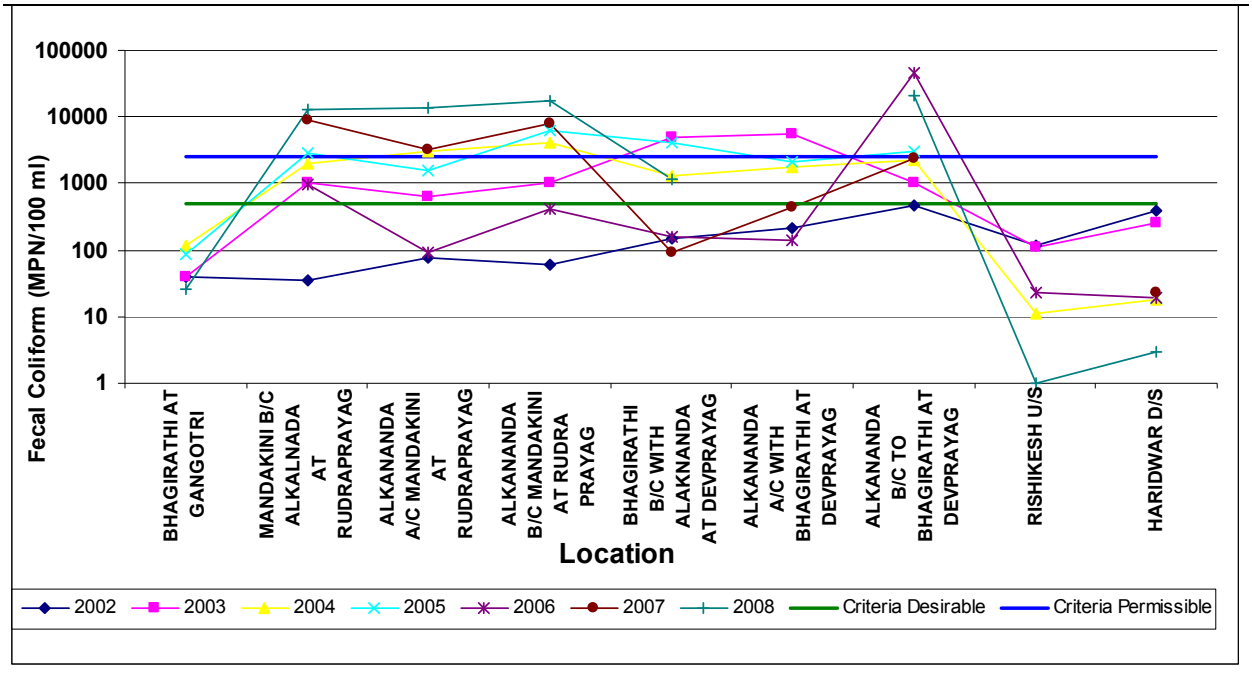


Fig. 5.5: Water Quality of River Ganga (Uttaranchal Segment)

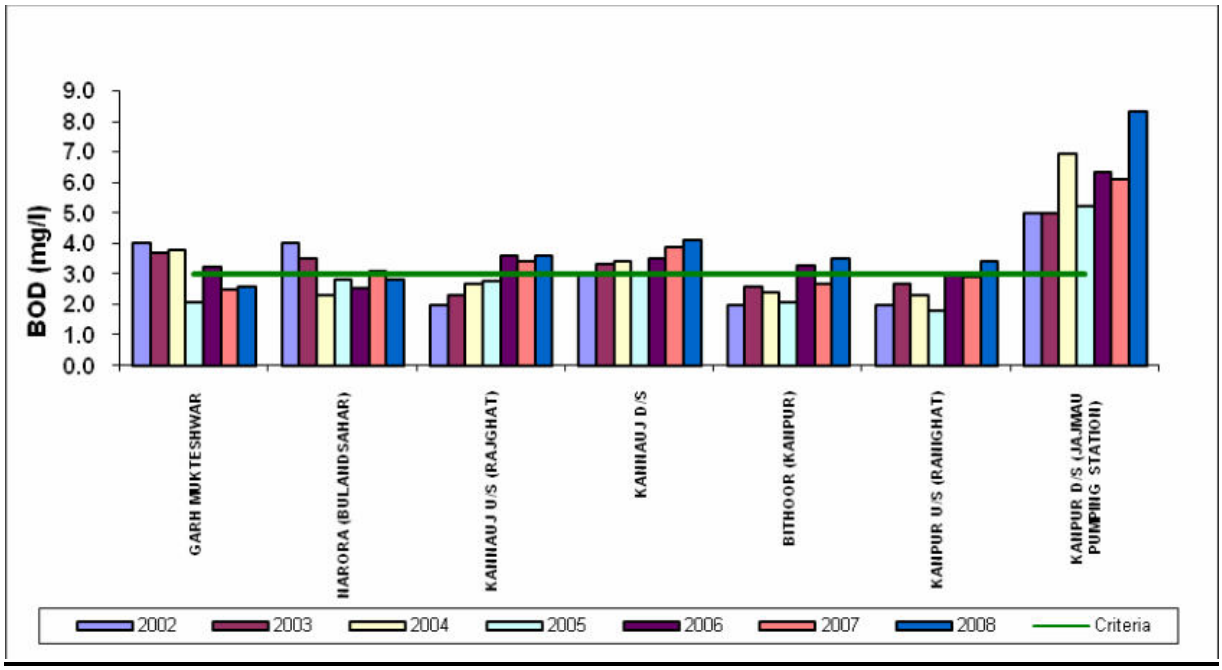


Fig. 5.6: Water Quality of River Ganga (U. P. Upper Segment)

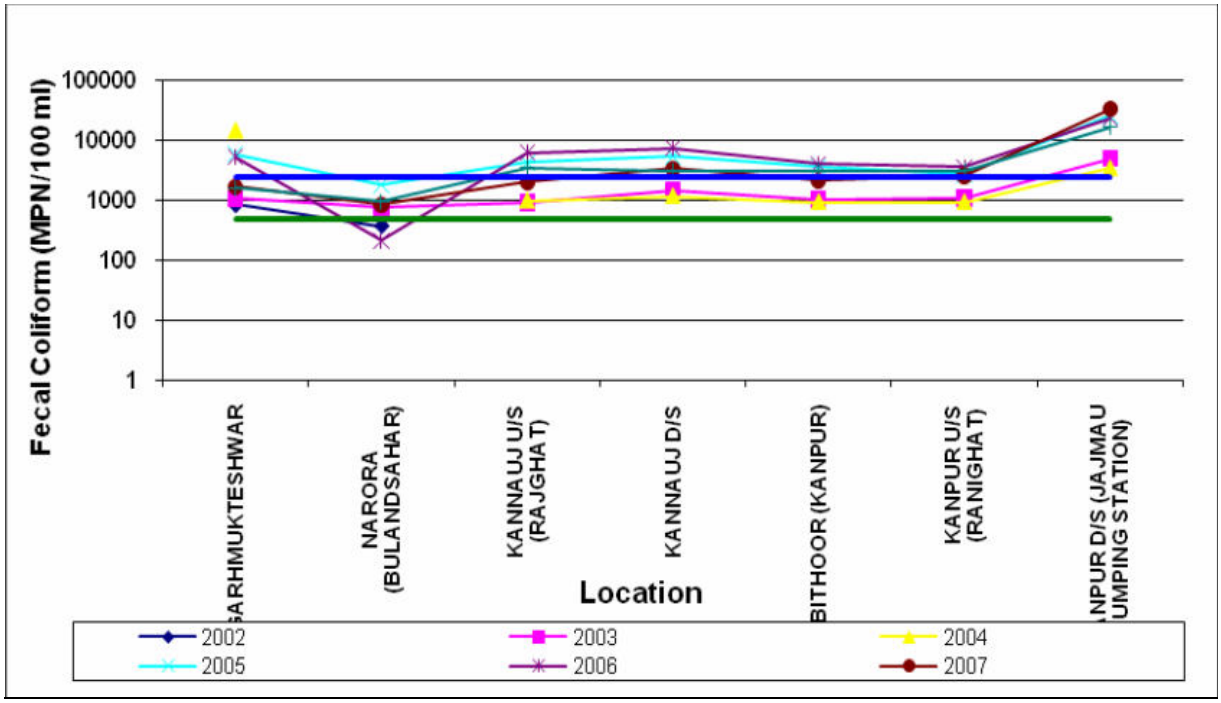


Fig. 5.7: Water Quality of River Ganga (U. P. Upper Segment)

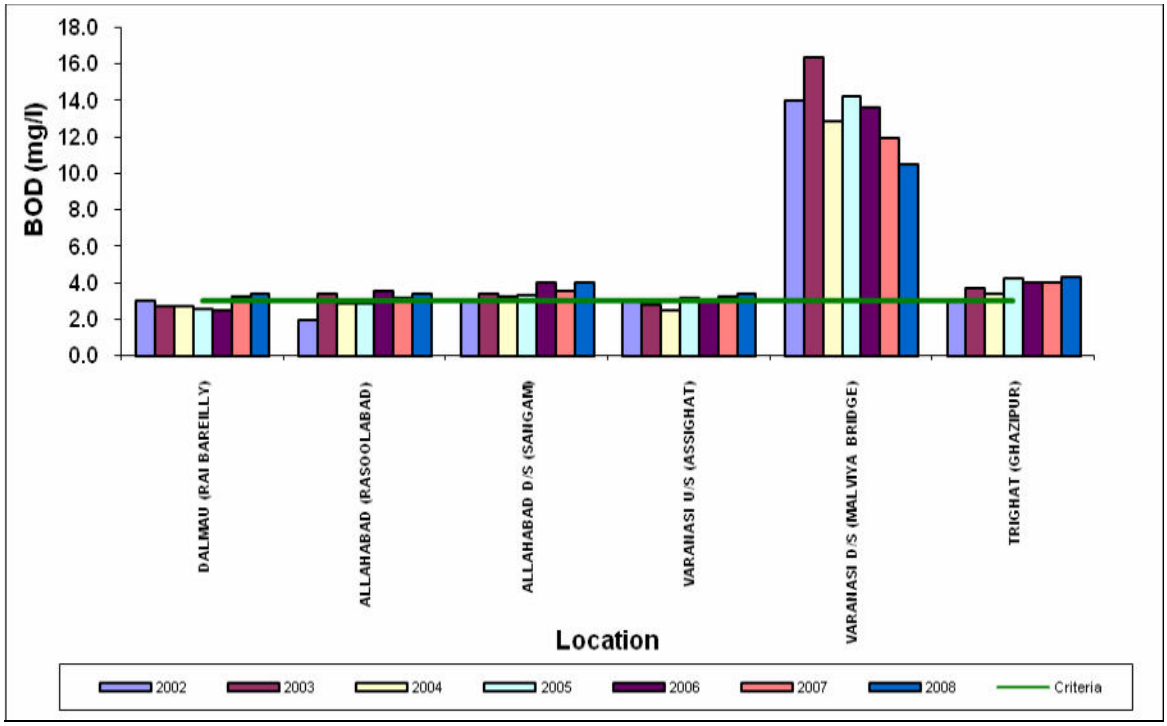


Fig. 5.8: Water Quality of River Ganga (U. P. Lower Segment)

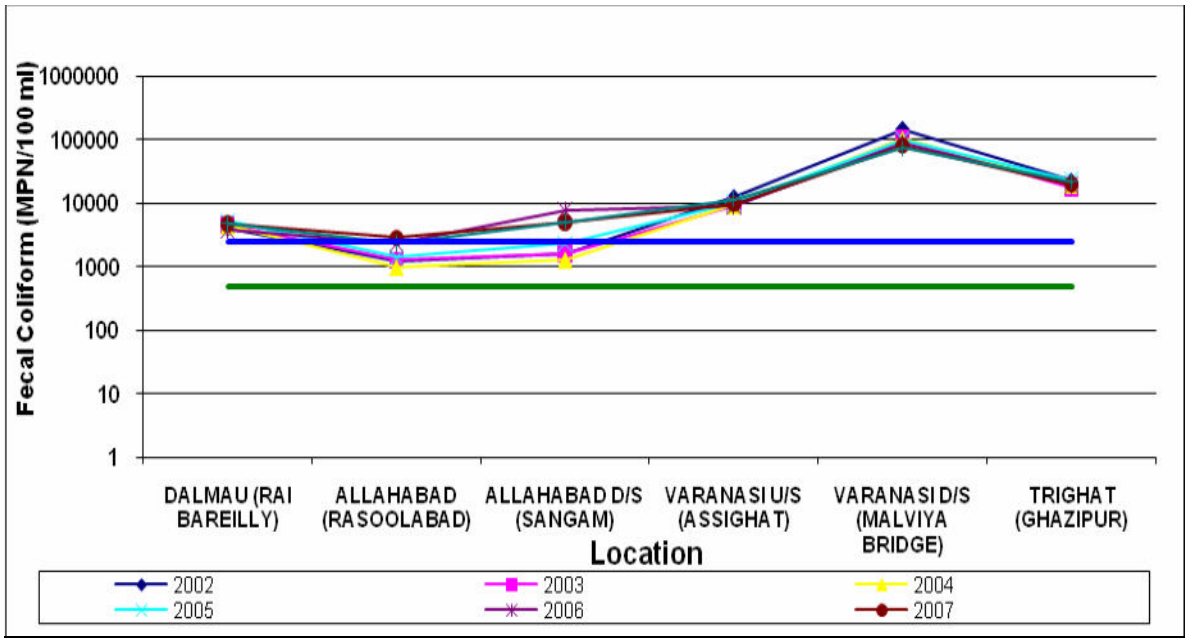


Fig. 5.9: Water Quality of River Ganga (U. P. Lower Segment)

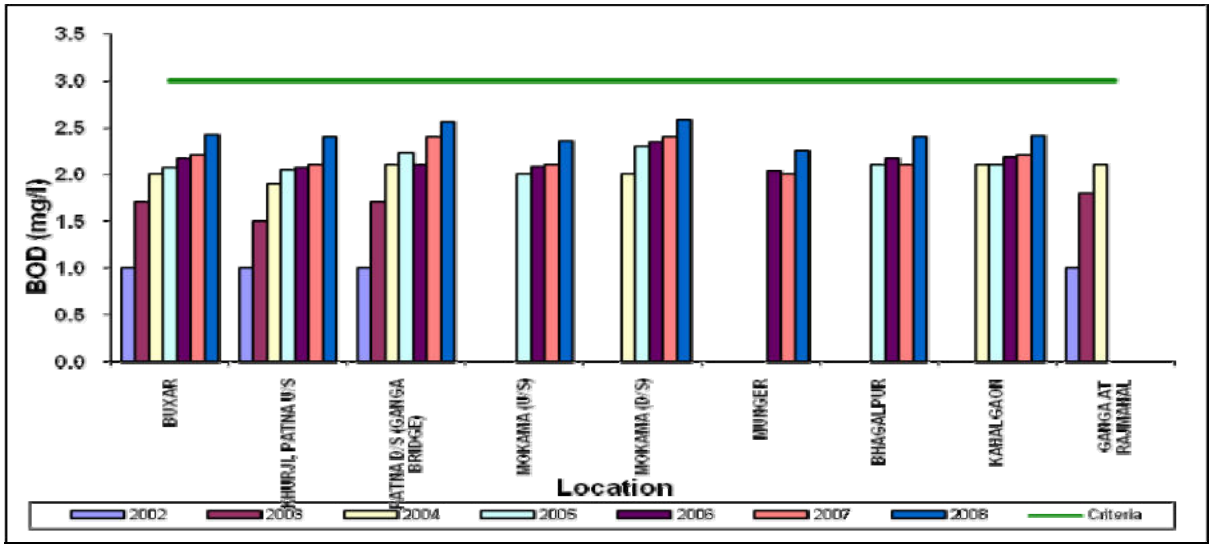


Fig. 5.10: Water Quality of River Ganga (Bihar Segment)

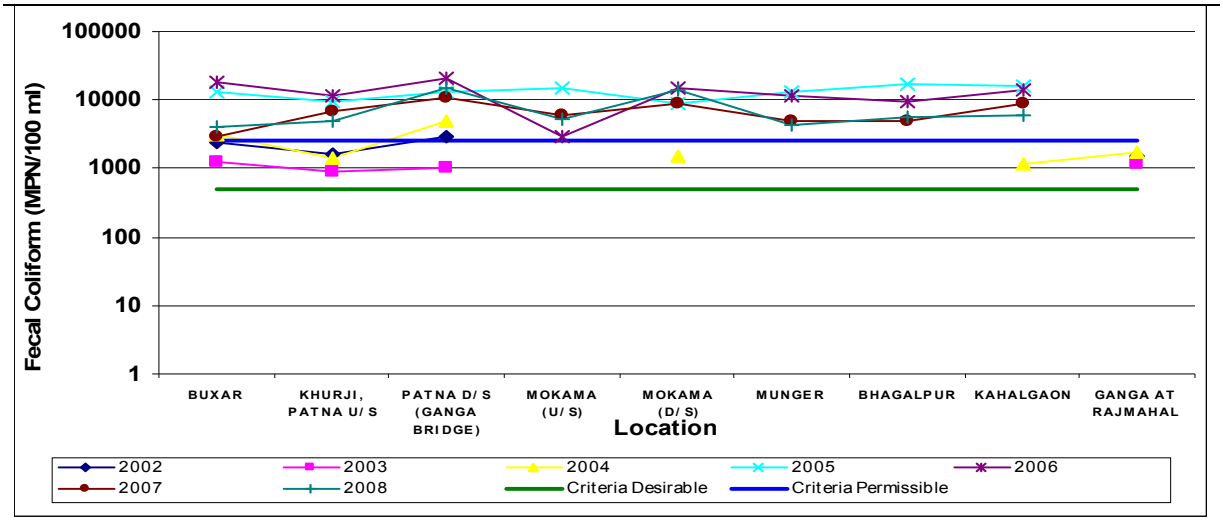


Fig. 5.11: Water Quality of River Ganga (Bihar Segment)

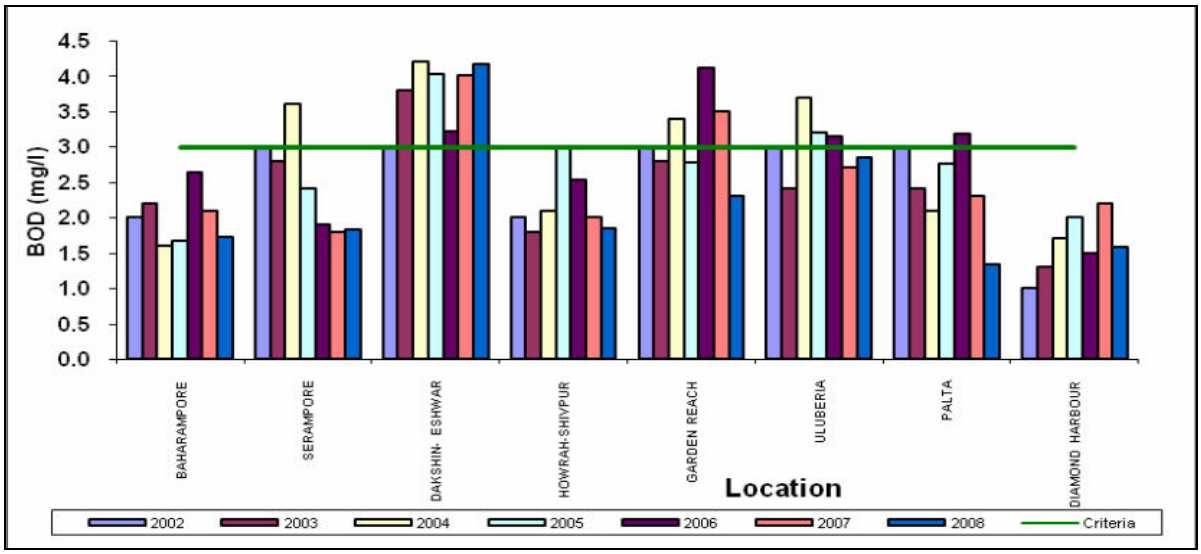


Fig. 5.12: Water Quality of River Ganga (West Bengal Segment)

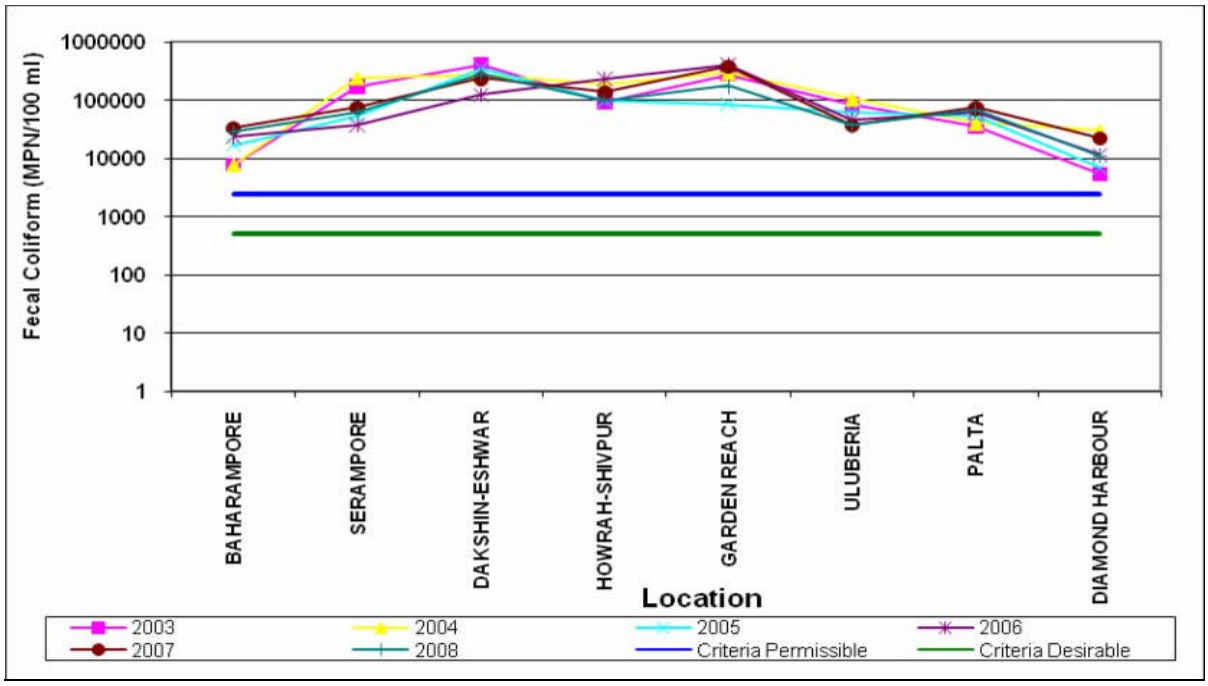


Fig. 5.13: Water Quality of River Ganga (West Bengal Segment)

Constraints in improvement of Ganga River water quality

- River Ganga is dammed at Tehri and flow is virtually reduced drastically.
- All the dry weather flow is diverted to the Upper Ganga Canal at Haridwar.
- Regenerated flow is again diverted to the lower Ganga canal near Aligarh.
- Because of above reasons, there is very little dry weather flow in Ganga at Kannauj, Kanpur, Allahabad & Varanasi and heavy inflow of wastewater in the river.
- Sewage Treatment Plants commissioned under Ganga Action Plan are not operating to its design capacity. These are either under loaded or over loaded.
- Wastewater increased considerably after launching of Ganga Action Plan due to increase in population and development of sewerage system.
- Dedicated power for operation of STPs is not available.

Strategies for Improvement of Ganga Water Quality

- Augmentation of river flow.
- Renovate all the existing sewage pumping stations and sewage treatment plants.
- Installation of new sewage treatment plants (STPs) in all the towns discharging sewage to bridge the gap between generation and treatment.
- Intercept all the drains not yet covered and divert to STPs.
- Treated wastewater should be used in irrigation only except for rainy period.
- Ownership of assets by State Public Health Departments.

- Tightening of standards for sewage treatment and industrial effluents in view of reduced flow.
- Alternatives to be explored for geogenic/non-point sources of contamination either through piped surface water supplies or improved onsite treatment technology for Arsenic and Fluoride removal in rural areas.

5.1.2 Water Quality Status of River Yamuna

The entire stretch of river Yamuna (1376 km) is being regularly monitored by Central Pollution Control Board on yearly frequency at 20 locations, quarterly frequency at three locations, while on monthly frequency at other locations. The water quality trend of the river during the last five years (2004-2008) in terms of Dissolved Oxygen (DO) Bio chemical Oxygen demand (BOD), Total Coliform (TC) and Faecal Coliform (FC) is presented in Fig. 5.14 to 5.17. During the year 2008 slight improvement in river water quality was observed probably due to prolonged rainfall. However, significant water quality deterioration was observed during year 2008 in 580 km long river stretch from downstream Wazirabad barrage till Chambal river confluence at Panchnada with very high BOD and Coliforms contents even during the monsoon seasons. In the entire river stretch the annual average of Dissolved Oxygen reflects large variations. At Nizamuddin bridge and Agra canal the DO was almost absent, whereas at Dakpatthar, Etawah and Auraiya it was at super saturation level because of eutrophication (excess growth of algae caused by release of nutrients on large scale). The Total coliform counts were violating the designated best use water quality guidelines classification in the entire stretch of the river. The monitoring reveals that Nizamuddin bridge at Delhi is the most polluted location among all the monitored locations at River Yamuna. The reason of pollution in the river is the continuous discharge of domestic and industrial waste and availability of little or no fresh water, which is necessary to maintain self purification capacity in the river.

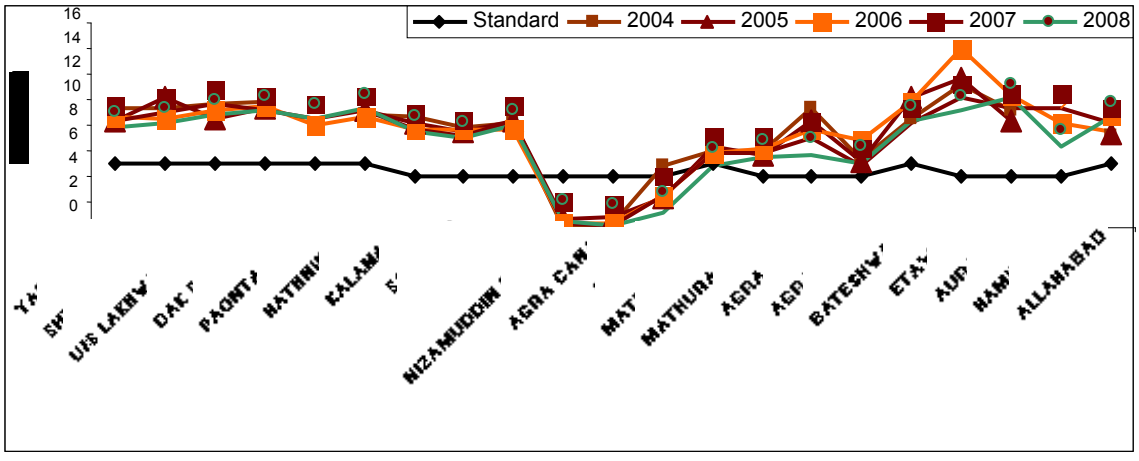


Fig. 5.14: Water Quality Trend of River Yamuna in Terms of Dissolved Oxygen (DO)

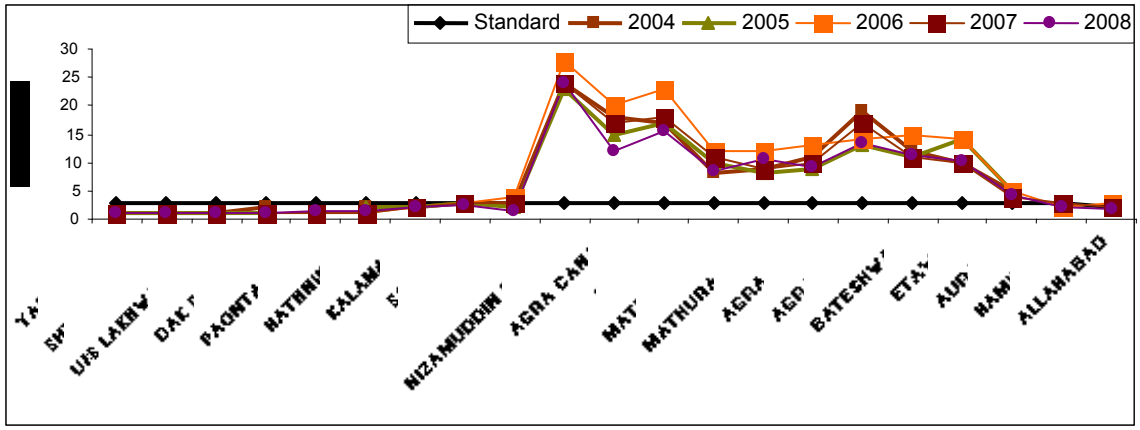


Fig. 5.15: Water Quality Trend of River Yamuna in Terms of BOD

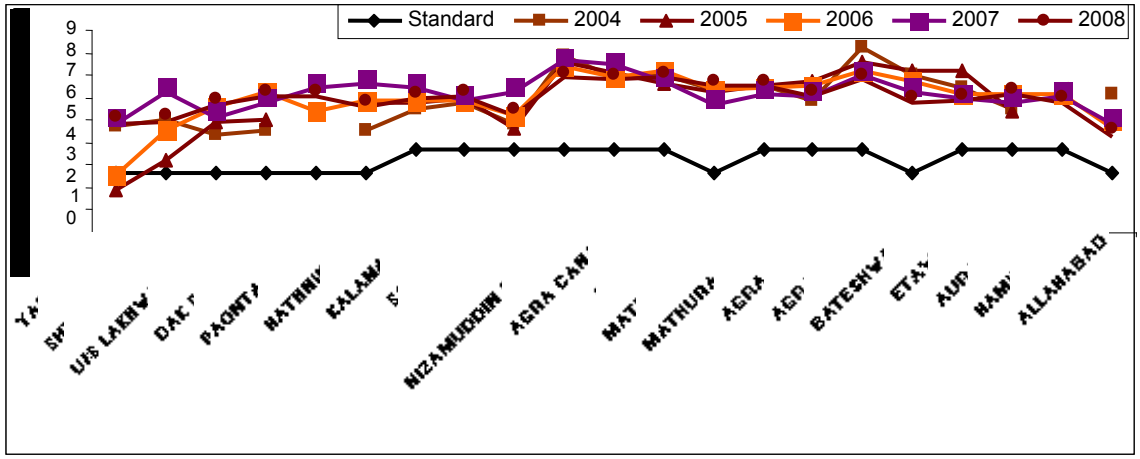


Fig. 5.16: Water Quality Trend of River Yamuna in Terms of Total Coliform

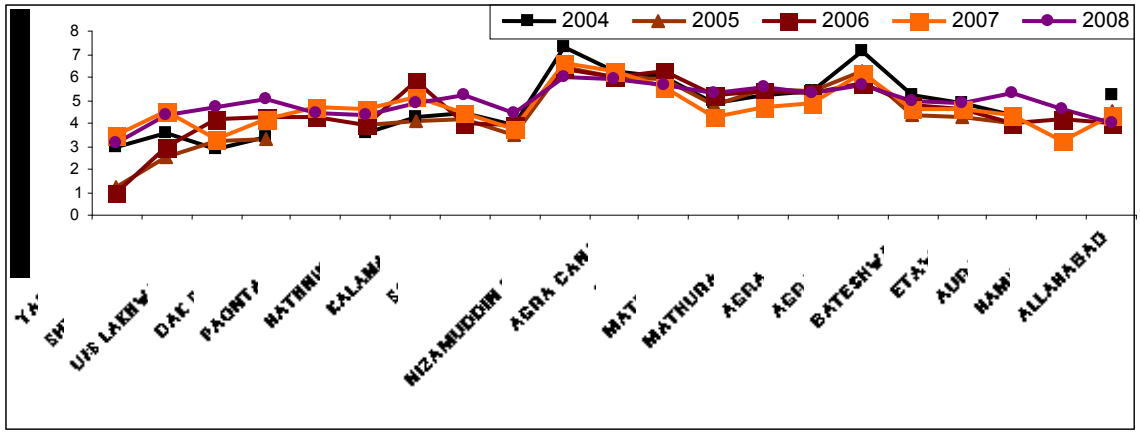


Fig. 5.17: Water Quality Trend of River Yamuna in Terms of FC

5.1.3 Water Quality of River Gomti

Gomti River is a tributary of the river Ganga and contributes about 15 % flow of Ganga. The average dry weather flow of the river is 1500 MLD, which become as high as 55000 MLD during monsoon season and as low as 500 MLD during the summer.

Water quality of River Gomti was monitored from Sitapur upto confluence of river Ganga. Monitoring results are depicted in Table 5.3 and Fig. 5.18.

Table 5.3: BOD and DO Profile for entire stretch of River Gomti (from u/s Sarayan to d/s Sai)

S. No	Monitoring Location	COD mg/l	BOD mg/l	Dissolved Oxygen mg/l	Total Coliform MPN/100 ml	Faecal Coliform MPN/100 ml
1.	River Gomti b/c to River Sarayan (Koda Vill. Distt. Hardoi)	6	0.9	7.95	$1.7x10^4$	1.4x104
2.	River Gomti a/c to River Sarayan	18	2.5	6.93	$2.7x10^4$	$2.2x10^4$
3.	River Gomti u/s at Lucknow	19	3.1	6.69	$3.4x10^4$	$2.7x10^4$
4.	River Gomti u/s Lucknow at water intake(Gaughat)	20	2.2	6.02	$5x10^3$	$3x10^3$
5.	River Gomti d/s at University bridge	18	2.6	3.00	$3x10^3$	$2.3x10^3$
6.	R. Gomti d/s at Pipraghat Lucknow	37	5.5	2.06	$2.3x10^4$	$1.3x10^4$
7.	River Gomti b/c to River Reth at Tirgaon	15	2.4	3.89	$8x10^4$	$5x10^4$
8.	River Gomti a/c to River Reth 7 Loni (at Salempur)	27	2.9	4.11	$5x10^4$	3x104
9.	River Gomti b/c to Kadu Nala at Bahadur -Dadar	11	2.3	5.34	$1.1x10^5$	$8x10^4$
10.	River Gomti a/c to Kadu Nala	11	2.2	5.70	$8x10^4$	$5x10^4$
11.	River Gomti u/s at Sultanpur (Kunwar bridge)	12	2.6	5.97	$1.3x10^5$	$8x10^4$
12.	River Gomti d/s at Sultanpur (Kunwar bridge)	20	3.7	6.04	$7x10^4$	$5x10^4$
13.	River Gomti u/s Jaunpur (Badalpur)	13	2.8	7.57	$1.3x10^5$	$8x10^4$
14.	River Gomti d/s Jaunpur (at Railway bridge)	14	1.2	7.83	$8x10^4$	$3x10^4$
15.	River Gomti b/c to River Sai (Raje pur)	13	1.0	8.47	2.3x104	$1.3x10^4$
16.	River Gomti a/c to River Sai (Sirkoni)	17	1.0	8.01	$5x10^4$	$2.3x10^4$
17.	River Gomti b/c to River Ganga (Gajipur road)	13	1.4	7.80	$5X10^3$	$3X10^3$

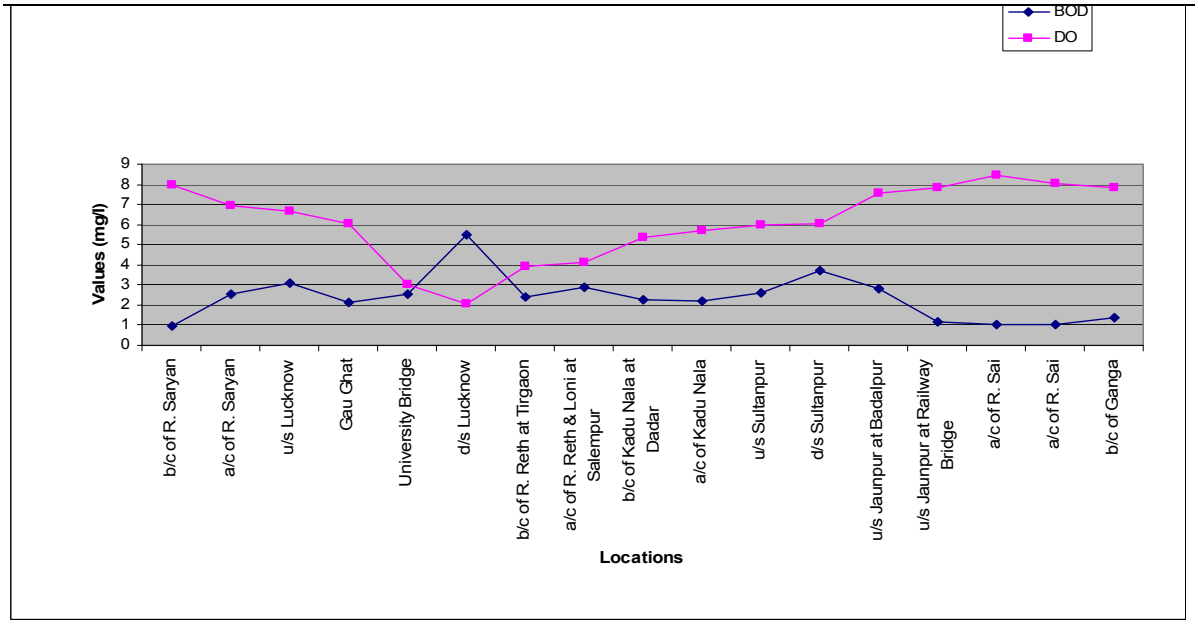


Fig. 5.18: DO and BOD profile of River Gomti

The BOD and DO Profile indicates that water quality of River Gomti is mostly affected in the stretch of Lucknow due to discharge of 360 MLD of city sewage (treated and untreated) and industrial effluent. The DO level was observed above 6 mg/l at all the places except Lucknow, which is sufficient to support aquatic life .High coliform concentration was observed in the entire stretch of River Gomti.

5.2 INTER STATE RIVER WATER QUALITY MONITORING

One of the function of the Central Pollution Control Board, under the Section 16 2(b) of the water (Prevention and Control of Pollution) Act, 1974 is to “coordinate the activities of the State Boards and resolve disputes among them”. Accordingly to resolve the water quality dispute at the interstate boundaries, CPCB is monitoring the water quality of rivers at these disputed locations since year 2005. At present, the monitoring is carried out 4 times in a year at 76 locations spread over 36 rivers. Observations in terms of Dissolved Oxygen (DO) and Bio-Chemical Oxygen Demand (BOD) are summarized in Table 5.4.

It has been observed that 24 rivers at 36 locations (Table 4) out of 76 monitored locations are polluted with respect to Bio-Chemical Oxygen Demand (BOD), one of the most important indicators of water quality. The concerned SPCBs/ PCCs were requested and pursued to take remedial measures to restore the water quality of the identified polluted rivers at Interstate borders.

Table 5.4: Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) Concentrations at various points located at Interstate Boundaries

S. No.	River	Location	Duration of Observations year	BOD (mg/l)			DO (mg/l)		
				Min	Max	Avg	Min	Max	Avg
1.	Yamuna	Paonta Sahib, (H.P.)	2005-2008	1	3.64	1.26	6.6	10.6	8.7
		Sonipat Baghpat Road, (Haryana)	2005-2008	1	5	2.55	6.1	8.2	7.13
		Palla, (Delhi)	2005-2008	1	6	2.84	5.5	10.7	7.9
		Asgarpur Village, (U.P.)	2005-2008	6	50	30	0	0	0
		Dak Pather (Uttrakhand)	2005-2008	1	2	1.16	9.01	10.2	8.9
		Buriya U/S Jagadhari (Haryana)	2005-2008	1	2	1.28	7	10.5	8.27
		Mohena Palwal Road (Haryana)	2005-2008	8	37	21	0	12.1	3.2
		Shergarh (U. P.)	2005-2007	2	10	4.84	6.6	18.6	10.3
2.	Ghaggar	Parwanoo,(H.P.)	2006-2008	1	27	6	3.8	11.2	8.05
		Sirsa Dabwali Road, (Haryana)	2006-2008	2	128	36.8	4.2	12.2	6.7
		Mubarakpur, (Punjab)	2006-2008	3	24	11.8	3.4	7.4	5.2
		Tiwana Village, (Punjab)	2006-2008	3	46	17	1.7	19.8	6.3
		Chandrapur Siphon, (Haryana)	2006-2008	4	95	26	0	4.2	2.1
		Sirdulgarh, (Punjab)	2006-2008	1	4.0	2.14	0.1	10.2	5.06
		Parwanoo D/S , Amravati, (Haryana)	2006-2008	1	27	6	3.8	11.2	7.9
		Ottu Weir (Haryana)	2005-2008	2	70	26.5	1.3	7	4.7
		Sirsa Hanumangarh Road (Rajasthan)	2005-2008	1	4	2.5	1.57	6.3	4.5
3.	Chambal	Eklingpura village, Rawatbhata, (Rajasthan)	2006-2009	1	26	4.71	6.13	9.82	7.35
		Udi , (U.P.)	2005-2008	1	4	2	6.7	11	8.37
4.	Mahi	Bajna,R., Ratlam, (M.P.)	2006-2009	1	20	4.14	4.7	9.72	7.13
		Bajaj Sagar, near Bansawara, (Rajasthan)	2006-2009	1	6	2.58	4	8.65	6.65
		Kadana Dam (Gujarat)	2005-2008	0.7	3	1.5	4.5	9.3	6.17
5.	Vardha	Pandhurana Village, (M.P.)	2006-2008	2	6	3.1	62	9.1	7.3
		Belur Dharmadabad & Karwar (Mosi) village (Maharashtra)	2006-2007	<1	2.1	1.1	6.6	9.2	7.7
6.	Churni	Bijoypur, (West Bengal)	2005-2009	2	12	5.71	0.7	5.8	2.62
7.	Betwa	D/S Dukwan Dam at Babina,Birdha Road,Distt. Lalitpur, (U.P.)	2005-2008	<1	6	2.22	5.3	10.8	6.98
		Kanjia bridge sagar, (M.P.)	2005-2008	<1	4	1.77	2.8	10.4	6.68
8.	Ganga	Tarighat, Gazipur, (U.P.)	2005-2008	1	6	3.2	6.9	8.72	7.95
		Sultanpur (Uttrakhand)	2005-2008	1	2	1.42	6.8	12	8.90
		Bijnor Deoband Road (U. P.)	2005-2008	1	4	1.85	7	9	8

S. No.	River	Location	Duration of Observations year	BOD (mg/l)			DO (mg/l)		
				Min	Max	Avg	Min	Max	Avg
		Dari Ganj, Sonepur, (Bihar)	2008	2	3	2.33	5.81	5.81	5.81
9.	Thenpennai	Mugalur Bridge, (Karnataka)	2005-2008	5.2	33	16.9	1	3	2
10.	Beas	Narainpur (Talwara), (Punjab)	2006-2008	1	5	1.8	6.1	17.1	10.5
		Talwara U/S (Pong Dam) Distt. Kangra, (H.P.)	2005-2008	1	3	1.5	6.4	9	7.68
11.	Markanda	Naraingarh, (Haryana)	2005-2008	1	2340	443	0	6.7	4.4
		Kala Amb U/S (H. P.)	2005-2008	1	3	1.57	6.4	10.8	7.64
12.	Sone	Chopan, (D/S before Reservoir Rihand), (U.P.)	2005-2008	1	3	1.77	5.5	5.58	5.4
		Deora (U/S before Reservoir Rihand), (M.P.)	2005-2008	<1	3	1.18	5.74	8.3	7.02
13.	Tapi	Prakasha, (Maharashtra)	2006-2008	<1	8	4.03	7	8.8	7.63
		Nizhar, (Gujarat)	2006-2008	1	1.5	1.25	7.1	8.1	7.6
		Ajnad (Maharashtra)	2006-2008	<1	3	2.03	7.1	14.5	9.93
14.	Manjara	Aurad Shahajani, (Maharashtra)	2006-2007	4	4	4	7.3	7.3	7.3
15.	Satluj	Nangal (H. P.)	2006-2008	1	2	1.33	6	8.7	1.66
16.	Bhima	Takli, Solapur, (Maharashtra)	2005-2008	1	6	2.5	6.8	10.4	8.6
		Jewargi, (Ganagapur),(Karnataka)	2005-2008	<1	2	1.03	6.2	8	7.2
17.	Krishna	Khurundward, Kolhapur, (Maharashtra)	2005-2008	<1	5	1.7	5.4	11.5	8.4
		Deodurg (Karnataka)	2005-2008	<1	2	0.61	7	7.8	7.8
18.	Damanganga	Jerry Causways, D/S of CETP, (Gujarat)	2007-2008	3	15	7.7	1.5	6.4	3.3
		U/S of CETP discharge GIDC Weir	2007-2008	<1	2	1.46	6.1	7.4	7
19.	Dhansiri	Bokajan, (Assam)	2005-2008	2	5	3.07	4.8	9	7.6
		Ganeshnagar, (Nagaland)	2005-2008	<1	2.8	1.23	5.2	10	8.6
		Nagarjan Bridge, (Nagaland)	2005-2008	<1	10	2.92	1	10	7.4
		Khatkati Gate, (Nagaland)	2005-2008	<1	13	2.88	5.8	10.5	7.9
		Numaligarh, (Assam)	2005-2008	<1	3	1.74	0.6	9.5	7.33
20.	Damodar	Sindri (Jharkhand)	2005-2009	1	3	2.16	6.9	8.2	7.48
		Dishergarh (West Bengal)	2005-2009	1	3	2.17	6.5	8.2	7.38
21.	Indravati	Nowrangpur (Orissa)	2005-2009	1	3	2.02	6.8	8	7.25
22.	Dhela	Kashipur-Muradabad Road, Adampur Village(U.P.)	2008	20	20	20	0	0	0
23.	Bahela	Lohia Bridge, Kashipur-Bazpur Road, (Uttrakhand)	2008	9	9	9	0	0	0

S. No.	River	Location	Duration of Observations year	BOD (mg/l)			DO (mg/l)		
				Min	Max	Avg	Min	Max	Avg
24.	Kosi	Dadyal Bridge(U.P.)	2008	2	2	2	7.4	7.4	7.4
25.	Cauvery	Satyagala Bridge, Narsipur (Karnataka)	2005-2008	<1	2	0.92	6.9	8.6	7.56
26.	Tungabhadra	Hochchelli (Karnataka)	2005-2008	2	2	1.6	7.3	9	8.1
27.	Pennar	Mothukapalli (Karnataka)	2005	1	1	1.1	5.3	5.3	5.3
		Hindupur (Andhra Pradesh)	2005-2008	1	2	1.05	0.8	4	2.9
28.	Manjira	Janwada (Karnataka)	2005-2008	<1	4	2.11	6.3	6.6	6.4
29.	Godavari	Basra Kavalguda, (Maharashtra)	2005-2008	1	3	2.03	4	568	192.9
30.	Ramganga	D/S Kalagarh, Dam (Uttrakhand)	2005-2008	1	2	1.64	7.58	8.4	7.99
		D/S Sherkot, Kalagarh (U. P.)	2005-2008	1	2	1.85	7	8.5	7.9
31.	Mahanadi	Hirakud (Orissa)	2005-2009	1	3	2.33	7	7.4	7.22
32.	Subarnarekha	Bheragora (Jharkhand)	2005-2009	1	3	2	6.8	8.5	7.58
		Gopiballavpur (West Bengal)	2005-2009	2	3	2.25	6.4	8.5	7.57
		Lakhannath (Orissa)	2005-2009	2	2	2	6.8	8.2	7.5
33.	Sabarmati	Khedbrahma (Gujarat)	2005-2007	1	1	1.1	6.7	10.5	8.6
34.	Narmada	Navagam (Gujarat)	2006-2008	<1	2	1.4	4.8	9	7.06
35.	Wainganga	Bapera, Bhandara (Maharashtra)	2006-2008	<1	2	1.06	5.8	8.2	6.95
36.	Kitchha	Pull Bhatta, Bareli road, (Uttrakhand)	2008	6	6	6	4.3	4.3	4.3

5.3 AIR QUALITY

5.3.1 National Air Quality Monitoring Programme (NAMP)

Central Pollution Control Board is executing a nation-wide National Air Quality Monitoring Programme (NAMP). The air quality network has 346 operating Air Quality Monitoring Stations (inclusive of 4 stations, added during year 2008-2009) covering 130 cities / towns in 26 States and 4 Union Territories. The growth of National ambient air quality monitoring stations is depicted in Fig. 5.19 since the initiation of programme during year 1982. The various objectives of the NAMP are:

- To determine the status and trends of ambient air quality
- To ascertain whether the prescribed ambient air quality standards are violated;
- To identify non-attainment cities with respect to national standards and;
- To obtain the knowledge and understanding necessary for developing preventive and corrective measures.

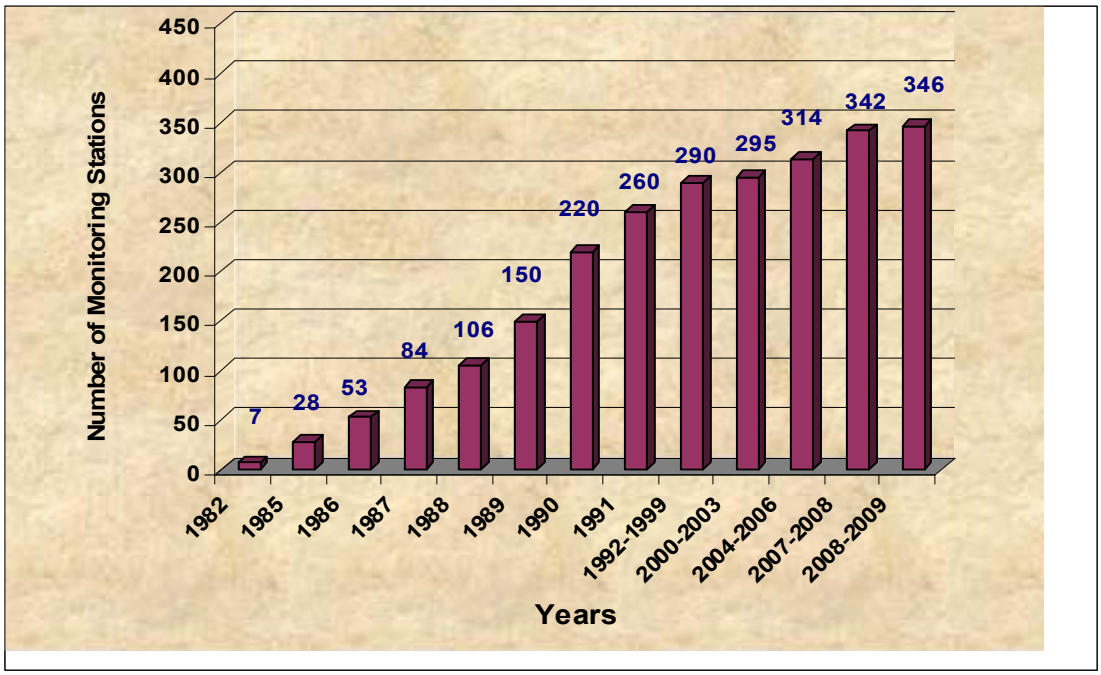


Fig. 5.19: Growth of Ambient Air Quality Monitoring Stations under NAMP

The monitoring under the NAMP is being carried out with the help of Zonal Offices of Central Pollution Control Board, State Pollution Control Boards, Pollution Control Committees, National Environmental Engineering Research Institute (NEERI). 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.

Under NAMP, four criteria air pollutants *viz*., Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM/PM_{10}), have been identified for regular monitoring at all the locations. The meteorological parameters such as wind speed, wind direction, relative humidity and temperature had also been integrated with the monitoring of air quality. The monitoring is undertaken for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) to days a week frequency to have 104 observations in a year.

5.3.2 Air Quality Assessment for Criteria Pollutants (2008)

Assessment of air quality has been made based on the data received from various air quality monitoring stations. Data for air quality parameters have not been received from few monitoring stations. Because of which the actual number of operational monitoring stations are not matching with the total number of stations during air quality assessment.

5.3.2.1 Sulphur Dioxide (SO_2)

Status of SO_2 with respect to Annual Average

The number of stations in residential and industrial areas in various ranges of annual average concentration is depicted in Fig. 5.20. Annual average of SO_2 was not exceeded at any monitoring station in residential and industrial areas. SO_2 levels at 80% of the monitoring stations in industrial areas and 93% of the monitoring stations in residential areas were less than 20 μg/m^3.

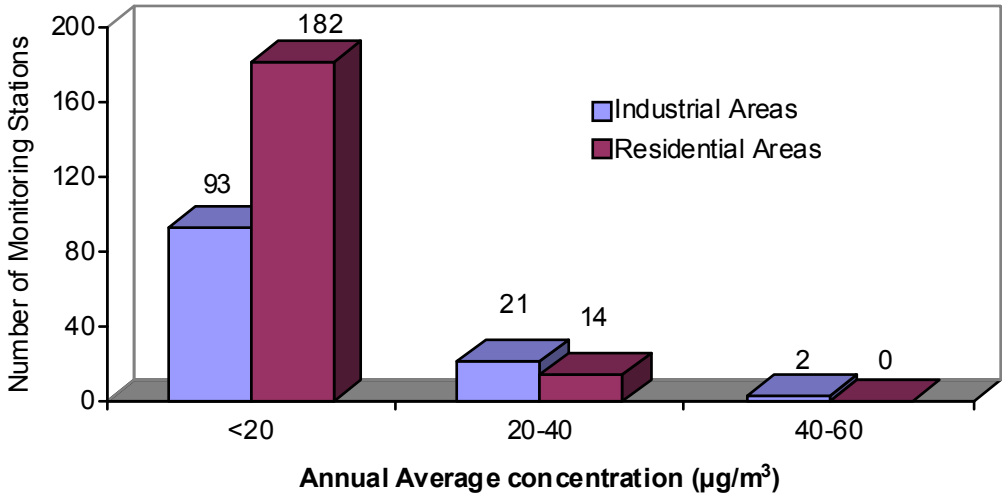


Fig.5.20: Number of Monitoring Stations in various ranges of annual average concentration of SO_2

Status of SO_2 with respect to 24 hourly average

Number of monitoring stations in various ranges of percentage violation (24 hourly average) of SO_2 is depicted in Fig. 5.21. It is observed that with respect to all monitoring stations in industrial and residential areas, the percentage violation were less than 2%.

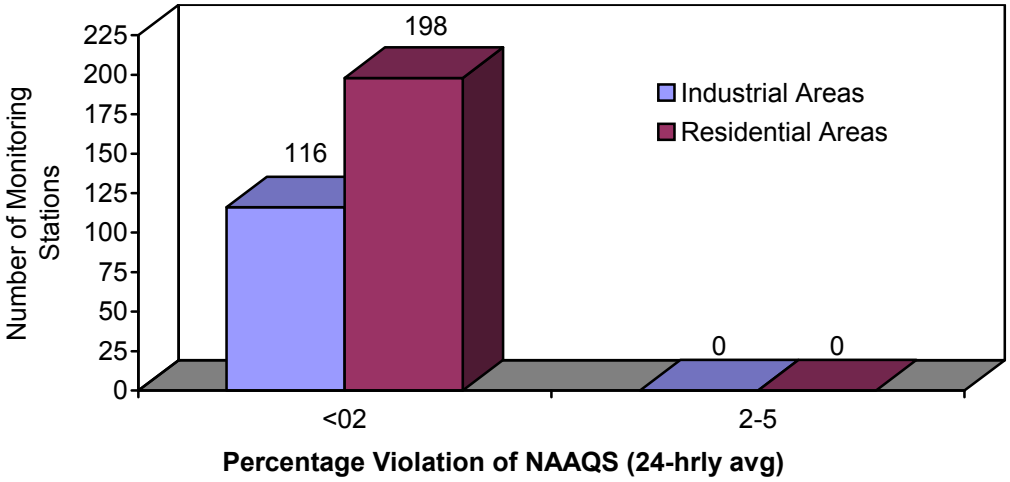


Fig. 5.21: Number of monitoring stations in various ranges of percentage violation of NAAQS (24-hourly avg.) of SO_2

Trends in Annual Average concentration of SO_2

Trend in annual average concentration of SO_2 levels at various cities is depicted in Fig. 5.22 A decreasing trend has been observed in Sulphur dioxide levels in residential areas of cities like Delhi, Lucknow, Pune etc., during last few years. The decreasing trend in Sulphur dioxide levels may be due to various pollution control measures undertaken such as reduction of Sulphur in diesel, use of LPG instead of coal as domestic fuel conversion of diesel vehicles to CNG etc.

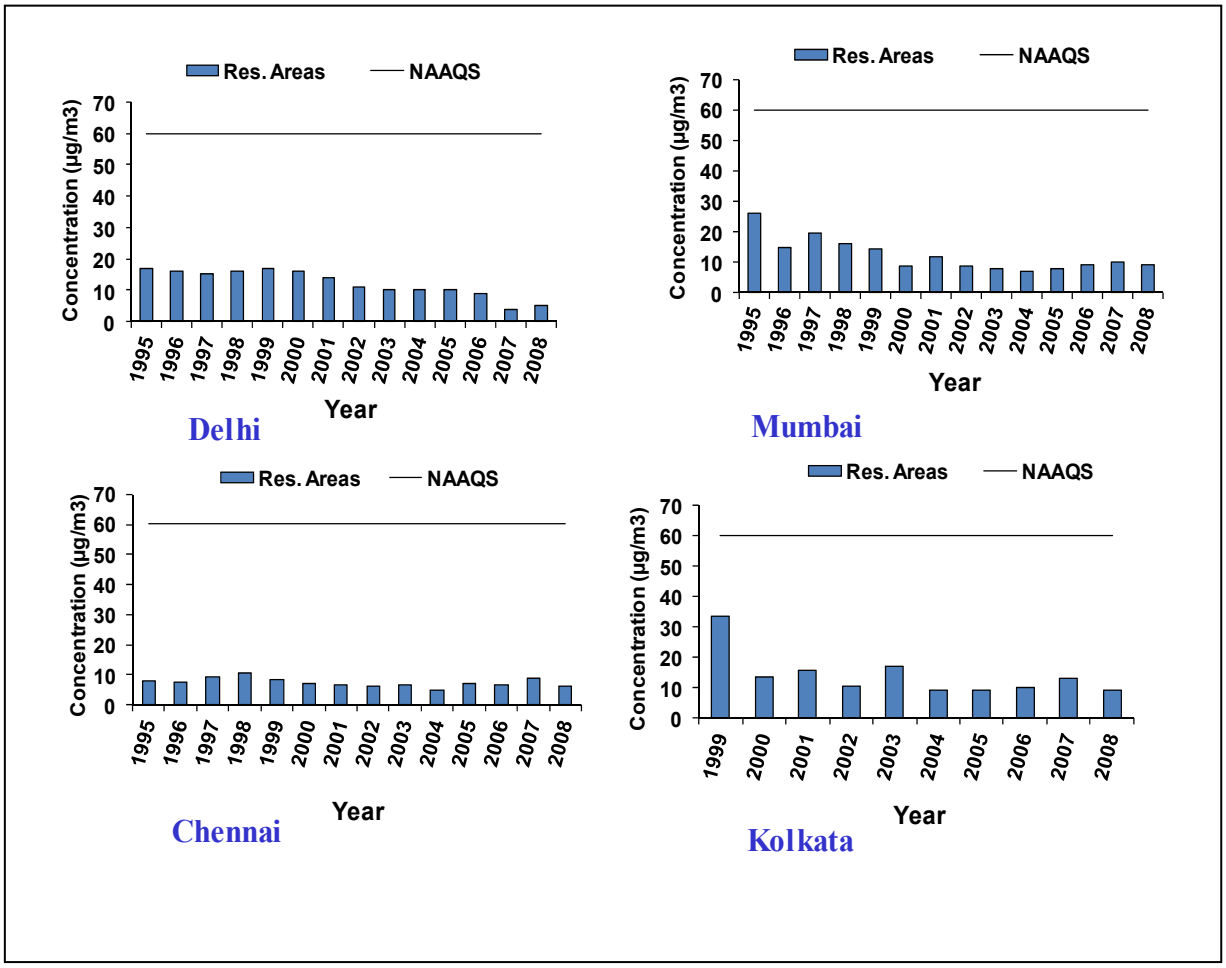


Fig. 5.22: Trends in SO_2 in residential areas in various Metropolitan cities

5.3.2.2 Nitrogen Dioxide (NO_2)

Status of NO_2 with respect to annual average

The number of monitoring stations in residential and industrial areas in various ranges of annual average concentration is depicted in Fig. 5.23. NO_2 levels at nine monitoring stations exceeded the National ambient air quality standard (NAAQS) in residential areas and at two monitoring stations in industrial areas. NO_2 levels at remaining monitoring stations were less than the NAAQS. NO_2 levels at 71% of the monitoring stations in industrial areas and 81% of the monitoring stations in residential areas were less than 40 µg/m^3. The highest concentration of Nitrogen Dioxide among residential area was observed at monitoring station located at Town

Hall, Delhi and among industrial areas at monitoring station located at Bandhaghat, Howrah during year 2008.

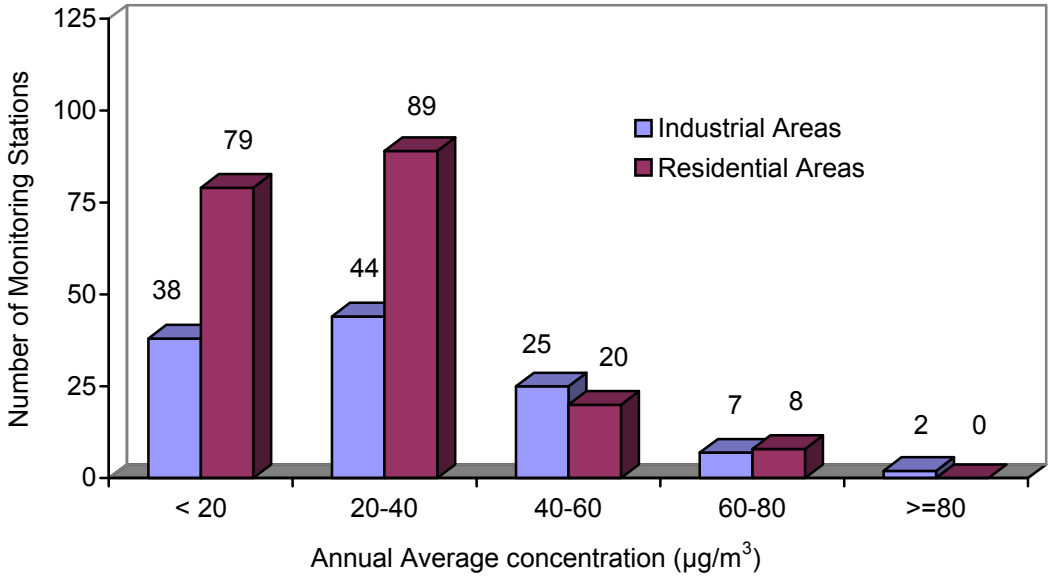


Fig. 5.23: Number of Monitoring Stations in various ranges of annual average concentration of NO_2

Status of NO_2 with respect to 24 hourly average

Number of monitoring stations in various ranges of percentage violation of NAAQS based on 24 hourly average of NO_2 is depicted in Fig. 5.24. In industrial areas, the percentage violation of NAAQS was 2% or more at five monitoring stations. In residential areas, the percentage violation of NAAQS was 2% or more at twenty five monitoring stations.

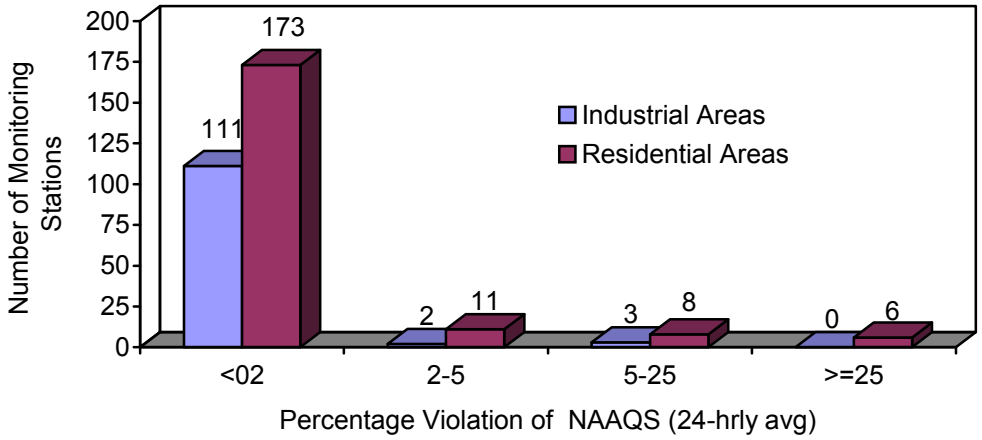


Fig. 5.24: Number of Monitoring Stations in various ranges of percentage violation of NAAQS (24-hourly avg.) of NO_2

Trends in Annual Average Concentration of NO_2

Trend in annual average concentration in NO_2 levels in various Metropolitan cities is depicted at Fig. 5.25. Fluctuating trends have been observed in NO_2 levels but its level was well within the National Ambient Air Quality Standards.

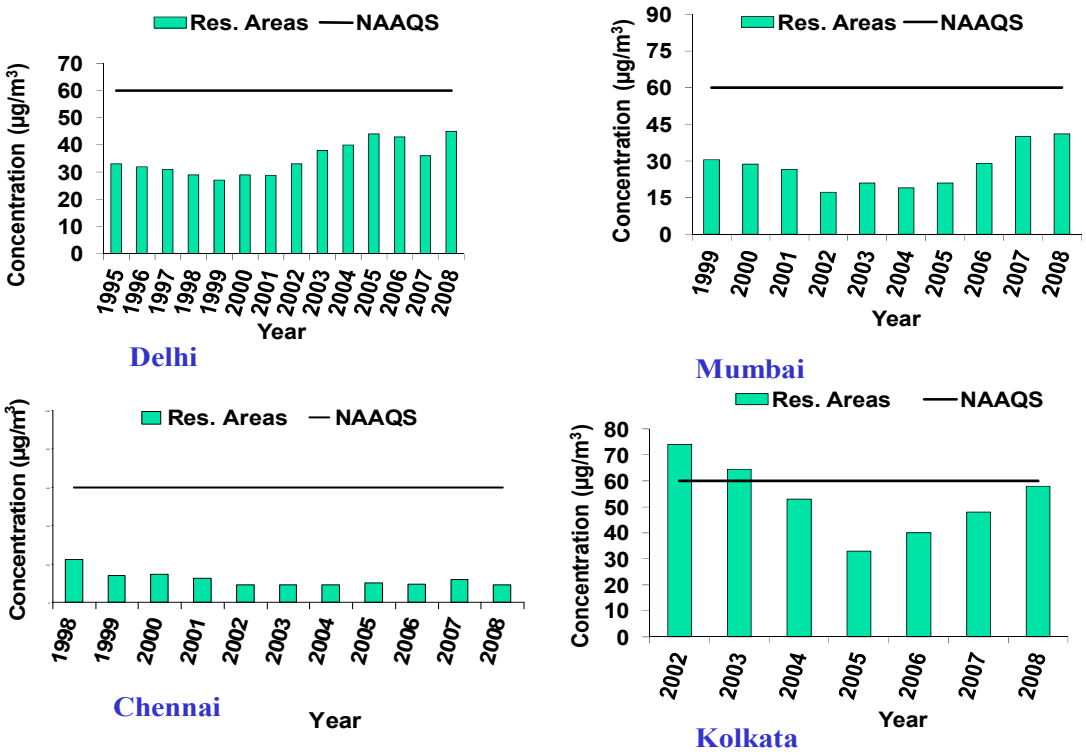


Fig. 5.25: Trends in NO_2 in residential areas in various Metropolitan cities

5.3.2.3 Suspended Particulate Matter (RSPM)

Status of RSPM with respect to Annual Average

Number of monitoring stations in industrial and residential areas in various ranges of annual average concentration is depicted in Fig. 5.26 and 5.27 respectively. Annual average of RSPM levels were equal to or exceeded NAAQS at 55 monitoring stations in industrial areas and 166 monitoring stations in residential areas. The highest concentration in residential area was observed at monitoring station located at Town Hall, Delhi and highest concentration in industrial area was observed at monitoring station located at Rita Sewing Machines, Ludhiana.

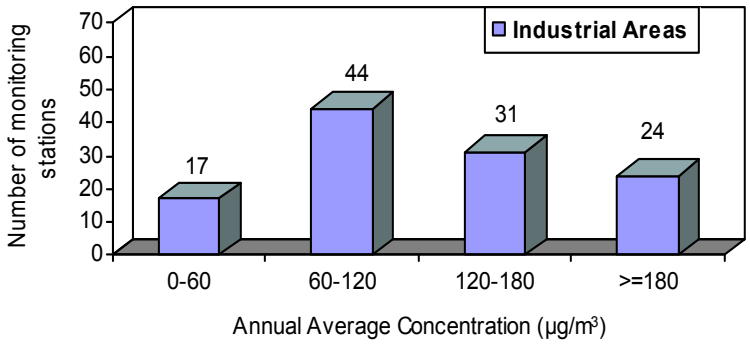


Fig. 5.26: Number of monitoring stations (industrial areas) in various ranges of annual average concentration of RSPM

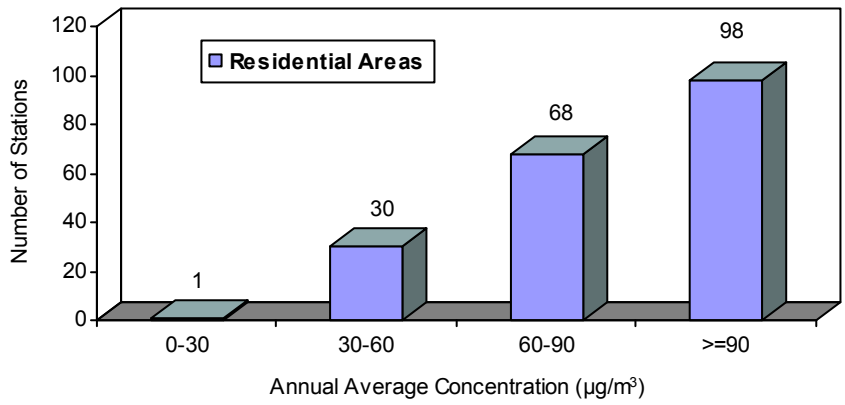


Fig. 5.27: Number of monitoring stations (residential areas) in various ranges of annual average concentration of RSPM

Status of RSPM with respect to 24 hourly average

The numbers of monitoring stations in various ranges of percentage violation of NAAQS (24 hourly average) of RSPM is depicted in Fig. 5.28. The percentage violation of NAAQS (24 hourly Avg.) was less than 2% at 28 monitoring stations in industrial areas and 32 monitoring stations in residential areas. At all other monitoring stations, the percentage violation of NAAQS was 2% or more.

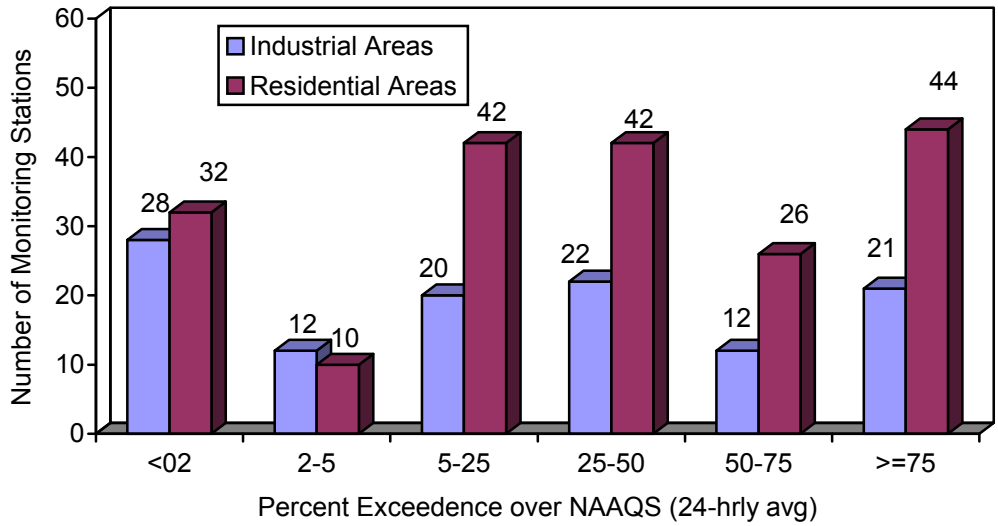


Fig. 5.28: Number of monitoring stations in various ranges of percent violation of NAAQS of RSPM

Trends in Annual Average Concentration of RSPM

Trend in annual average concentration in RSPM levels in residential areas of various cities is depicted in Fig. 5.29. Fluctuating trends have been observed in RSPM levels but indicates increasing trend in Delhi, Mumbai and Kolkata but for Chennai it is decreasing. Various measures such as implementation of Bharat Stage-III norms etc have been taken to mitigate ambient RSPM which have been correlated with the exponential increase in number of vehicles. The reason for high particulate matter levels may be attributed to vehicular traffic, Diesel/Kerosene generator sets, small scale industries, biomass incineration, resuspension of traffic dust, commercial and domestic use of fuels etc.

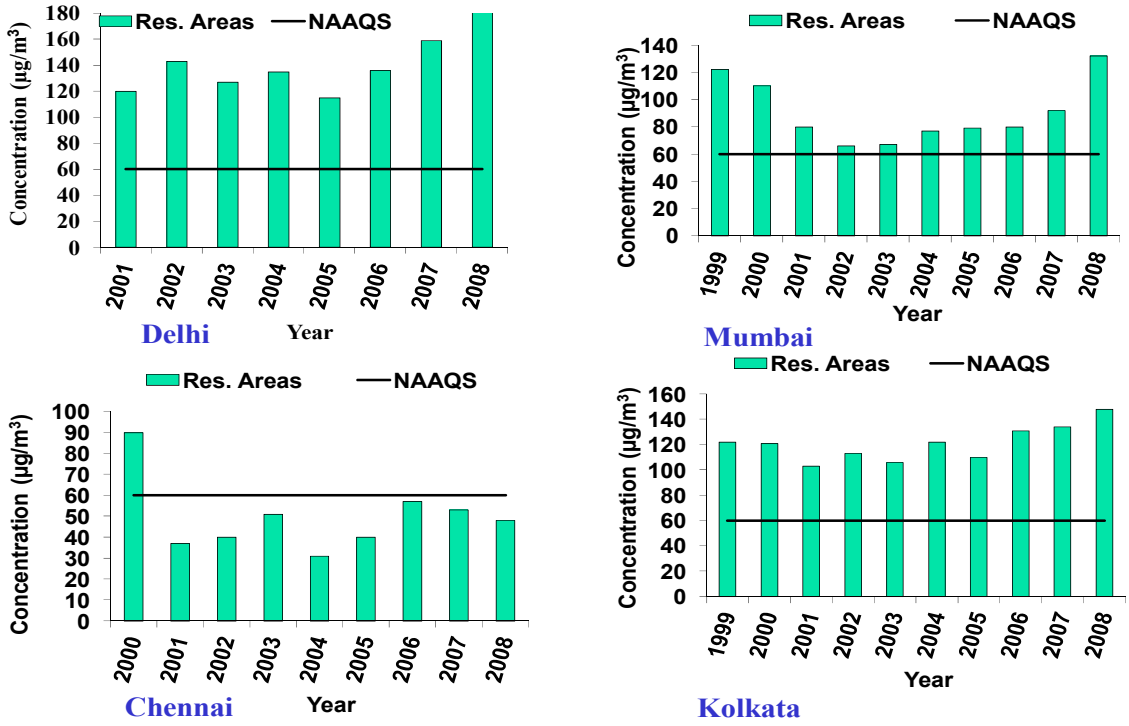


Fig. 5.29: Trends in RSPM in Residential Areas in various Metropolitan Cities

5.3.2.4 Suspended Particulate Matter (SPM)

Status of SPM with respect to Annual Average

Number of monitoring stations in industrial and residential areas in various ranges of annual average concentration of SPM is depicted in Fig. 5.30 and 5.31 respectively. National Ambient Air Quality Standard (NAAQS) (annual average) was equal to or exceeded at 23 monitoring stations in industrial areas and 145 monitoring stations in residential areas. The highest concentration in residential area was observed at monitoring station located at Begum Bridge, Meerut and highest concentration in industrial area was observed at monitoring station located at Mayapuri Industrial Area, Delhi.

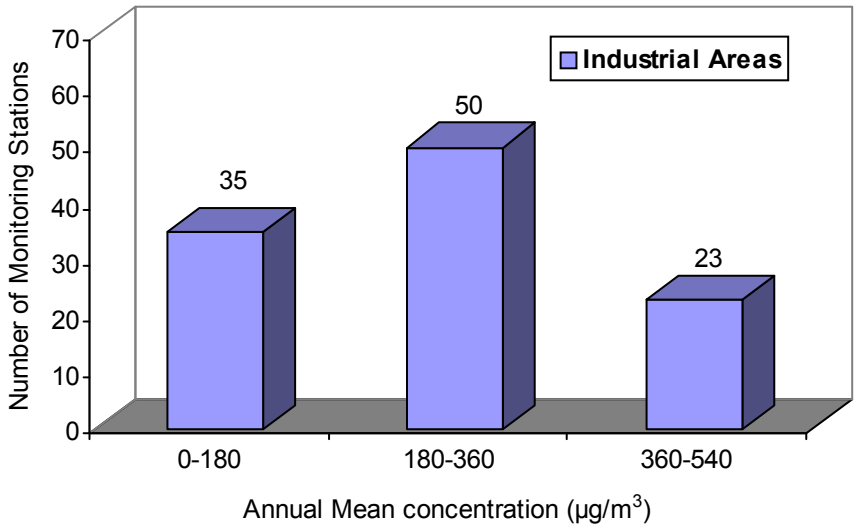


Fig. 5.30: Number of monitoring stations (industrial areas) in various ranges of annual average concentration of SPM

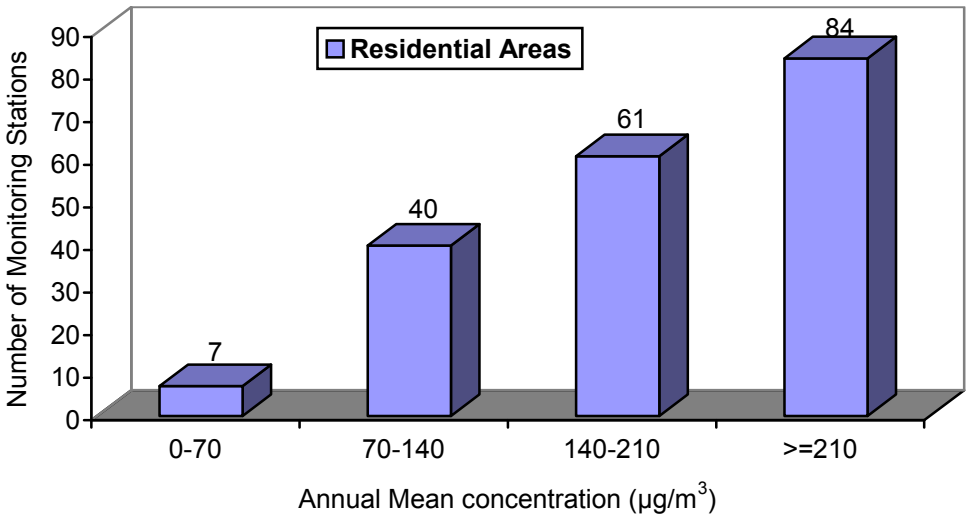


Fig. 5.31: Number of monitoring stations (residential areas) in various ranges of annual average concentration of SPM

Percentage Violation of SPM with reference to 24 hourly average

The number of air quality monitoring stations in various ranges of percentage violation of SPM NAAQS on 24 hourly average bases is depicted in Fig. 5.32. The percentage violation of NAAQS was less than 2% at 65 monitoring stations among industrial areas and 38 monitoring stations among residential areas. At other air quality monitoring stations, the percentage violation of NAAQS was 2% or more.

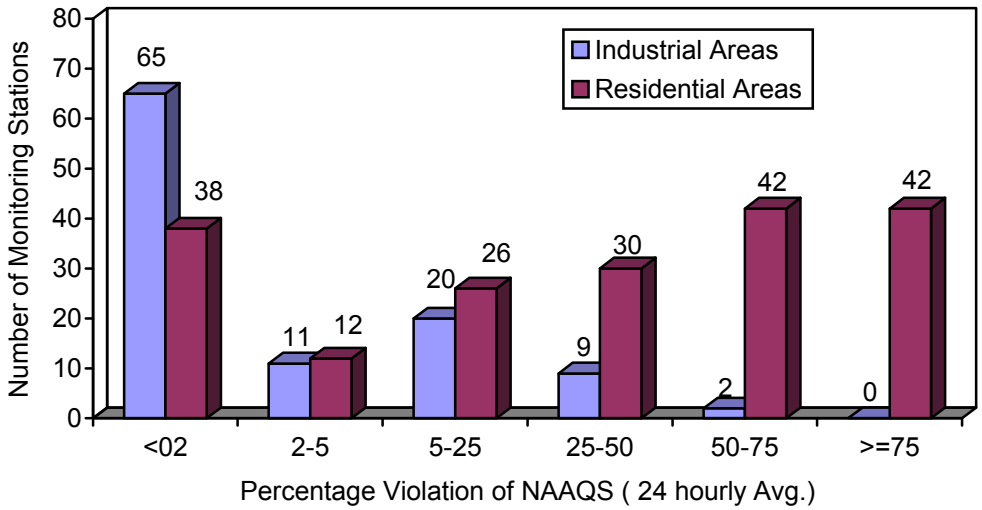


Fig. 5.32: Number of monitoring stations in various ranges of percent violation of NAAQS of SPM

Air Quality with respect to SPM

Number of monitoring stations with low, moderate, high and critical levels of SPM is depicted in Fig. 5.33. SPM levels at 46 % of the monitoring stations in residential areas were critical.SPM levels exceed the prescribed NAAQS in many cities especially in residential areas. Northern cities like Delhi, Jodhpur, Varanasi, Lucknow experiences dust storms and hazy conditions during summer months. These dust storms build up particulate matter in ambient air resulting in high SPM levels. The possible reasons for high Suspended Particulate Matter levels may be the natural dust, resuspension of dust, vehicles, commercial and domestic use of fuel, vehicular traffic Diesel / Kerosene Generator sets, small scale industries, biomass incineration, emissions from boilers and power plants, resuspension of traffic dust and commercial and domestic use of fuels etc.

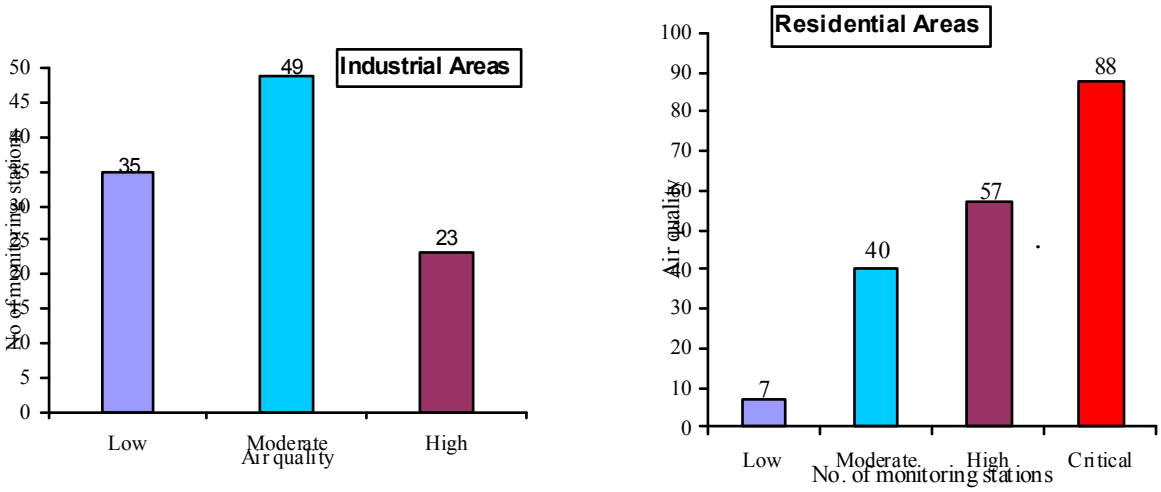


Fig. 5.33: Number of Monitoring Stations with low, moderate, high and critical levels of SPM

5.3.3 Ambient Air Quality Status of criteria pollutants

Five years Trend for four Metro cities of India

The five year trend of three criteria pollutants viz. Sulphur Dioxide, Nitrogen Dioxide and Respirable Suspended Particulate Matter in four Metro cities has been depicted in Fig. 5.34. It is evident from the figure that Chennai Metro City had shown all three criteria pollutants within the National Ambient Air Quality Standards. Other three cities such as Mumbai, Kolkata, and Delhi had depicted SO_2 and NO_2 annual concentration well within the NAAQS, while RSPM indicated increasing trend during last five consecutive years.

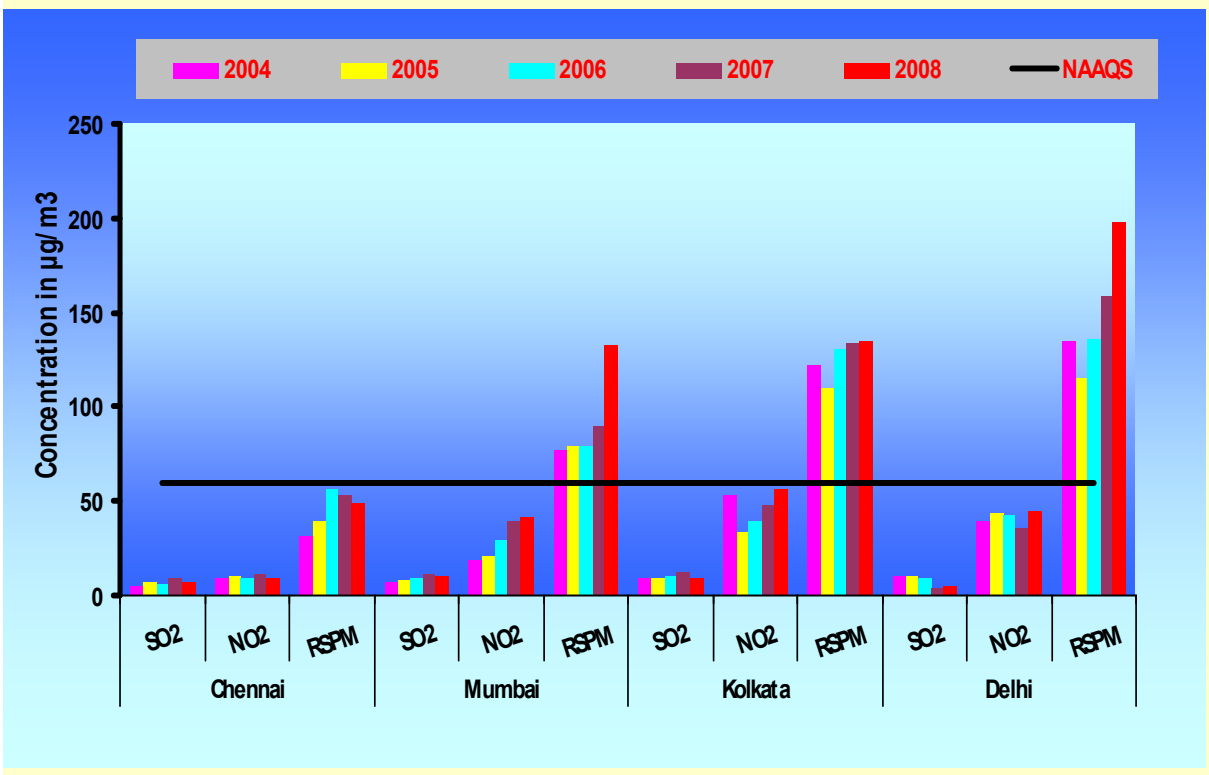


Fig. 5.34: Five years Trend of Air Quality at Four Metro Cities of India

Pollution levels under different Air Quality Categories in various cities

The ambient air quality is represented by Central Pollution Control Board in various cities in terms of Low (L) with exceedence factor (EF) is<0.5, Moderate (M) when EF ranges between 0.5 - 1.0, High (H) with EF varies from 1.0 - 1.5 and Critical (C), when EF is > 1.5, levels. The ambient air quality status of various cities/towns in the country is presented in Table 5.5. The exceedence factor is calculated as follows:

$$\text{Exceedence Factor (EF)} = \frac{\text{Observed annual mean concentration of criteria pollutant}}{\text{Annual Air Quality Standard for the respective pollutant and area class}}$$

Table 5.5: Ambient Air Quality at various cities during year 2007 in terms of Pollution Level

STATE / UT / CITY	SO_2		NO_2		RSPM		SPM	
AREA CLASS	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Andhra Pradesh								
Hyderabad	L	L	L	L	M	H	M	C
Visakhapatnam	L	L	L	M	M	H	L	H
Vijayawada	L	L	L	L	M	C	M	H
Ramagundum	-	L	-	L	-	H	-	C
Kurnool	-	L	-	L	-	H	-	H
Patencheru	-	L	-	L	-	C	-	C
Assam								
Guwahati	-	L	-	L	-	C	-	H
Bongaigaon	-	L	-	L	-	H	-	M
Tezpur	-	L	-	L	-	H	-	M
Dibrugarh	-	L	-	L	-	M	-	M
Sivasagar	-	L	-	L	-	H	-	M
Hailakandi	-	L	-	L	-	H	-	M
Bihar								
Patna	-	L	-	M	-	C	-	C
Chattisgarh								
Bhilai	L	L	L	L	H	H	M	H
Korba	-	L	-	L	-	C	-	C
Raipur	L	L	M	M	C	C	H	C
Chandigarh								
Chandigarh	L	L	L	L	H	H	M	M
Dadra & Nagar Haveli								
Silvassa	L	L	L	L	M	H	M	H
Daman & Diu								
Daman	L	L	L	L	M	H	M	H
Delhi								
Delhi	L	L	M	M	C	C	H	H
Gujarat								
Ahmedabad	L	L	L	L	M	H	M	H
Ankleshwar	L	L	L	L	M	H	M	H
Jamnagar	-	L	-	L	-	C	-	H
Rajkot	L	L	L	L	M	H	M	H
Surat	L	L	L	L	M	H	M	H
Vadodara	L	L	M	L	M	M	M	H
Vapi	L	L	L	L	M	H	L	H

STATE / UT / CITY	SO_2		NO_2		RSPM		SPM	
AREA CLASS	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Goa								
Panjim	-	L	-	L	-	M	-	M
Vasco	L	-	L	-	L	-	L	-
Murmugao	L	-	L	-	L	-	L	-
Himachal Pradesh								
Damtal	-	L	-	L	-	M	-	M
Parwanoo	L	L	L	L	M	H	L	M
Paonta Sahib	L	L	L	L	H	C	M	H
Shimla	-	L	-	L	-	H	-	M
Baddi	L	-	L	-	H	-	M	-
Kala Amb	L	L	L	L	C	C	H	H
Haryana								
Faridabad	L	L	L	M	H	C	M	C
Jharkhand								
Dhanbad	-	L	-	M	-	C	-	H
Sindri	L	-	M	-	H	-	M	-
Jamshedpur	L	-	M	-	H	-	M	-
Ranchi	-	L	-	M	-	C	-	C
Karnataka								
Bangalore	L	L	M	M	M	H	M	H
Mysore	L	L	L	L	L	M	L	M
Hubli-Dharwad	L	L	L	L	M	C	M	C
Belgaum	L	-	L	-	L	-	L	-
Hassan	L	-	L	-	M	-	M	-
Mangalore	L	-	L	-	L	-	L	-
Kerala								
Kochi	L	L	L	L	M	M	L	M
Kottayam	L	L	L	L	L	M	L	L
Kozhikode	L	L	L	L	L	M	L	M
Thiruvananthapuram	L	L	L	L	M	M	L	L
Palakkad	L	-	L	-	L	-	L	-
Maharashtra								
Mumbai	L	L	L	M	M	H	M	M
Chandrapur	L	L	M	M	H	H	M	M
Dombivali	L	-	M	-	M	-	-	-
Kolhapur	-	L	-	L	-	M	-	H
Nagpur	L	L	L	M	M	C	M	H
Nashik	L	L	L	L	M	H	L	H
Pune	L	L	L	L	M	H	M	H

STATE / UT / CITY	SO_2		NO_2		RSPM		SPM	
AREA CLASS	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Solapur	L	L	L	M	M	H	M	C
Thane	L	L	L	L	L	M	L	M
Aurangabad	-	L	-	L	-	H	-	C
Navi Mumbai	L	L	M	M	H	C	M	C
Lote	L	L	L	L	M	H	L	H
Amravati	L	L	L	L	M	H	-	-
Madhya Pradesh								
Bhopal	-	L	-	L	-	C	-	C
Indore	L	L	L	L	C	C	M	H
Jabalpur	-	L	-	L	-	C	-	C
Nagda	L	L	L	L	M	C	L	M
Satna	L	L	L	L	C	C	H	H
Gwalior	-	L	-	L	-	C	-	C
Dewas	L	L	L	L	M	H	M	H
Ujjain	L	L	L	L	H	H	M	H
Meghalaya								
Shillong	-	L	-	L	-	M	-	L
Mizoram								
Aizwal	-	L	-	L	-	L	-	M
Nagaland								
Dimapur	-	L	-	L	-	H	-	M
Orissa								
Angul	L	L	L	L	H	H	M	H
Bhubaneshwar	-	L	-	L	-	H	-	H
Cuttack	-	L	-	L	-	H	-	C
Rourkela	-	L	-	L	-	C	-	H
Talcher	L	-	L	-	M	-	M	-
Rayagada	L	L	L	L	M	H	L	M
Sambalpur	-	L	-	L	-	M	-	M
Berhampur	-	L	-	L	-	H	-	H
Balasore	-	L	-	L	-	H		
Pondicherry								
Pondicherry	L	L	L	L	L	M	L	M
Punjab								
Gobindgarh	L	L	L	L	C	L	-	-
Jalandhar	L	L	L	L	H	C	-	-
Ludhiana	L	L	M	M	C	C	-	-
Naya Nangal	-	L	-	L	-	C	-	-
Amritsar	L	L	L	M	C	C	-	-

STATE / UT / CITY	SO_2		NO_2		RSPM		SPM	
AREA CLASS	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Khanna	L	L	M	M	C	C	-	-
Derabassi	L	-	L	-	C	-	-	-
Bhatinda	L	-	L	-	-	-	-	-
Rajasthan								
Alwar	L	L	L	M	H	C	H	C
Jaipur	L	L	L	M	H	C	M	C
Kota	L	L	L	L	H	C	M	C
Jodhpur	L	L	L	L	H	C	H	C
Tamil Nadu								
Chennai	L	L	L	L	M	M	L	M
Coimbatore	L	L	L	L	M	M	M	M
Madurai	L	L	L	L	L	M	L	M
Salem	-	L	-	L	-	H	-	M
Tuticorin	L	M	L	L	H	H	M	M
Uttar Pradesh								
Anpara	L	-	L	-	C	-	C	-
Kanpur	L	L	L	L	C	C	H	C
Firozabad	L	L	L	L	C	C	H	C
Lucknow	L	L	L	M	C	C	H	C
Varanasi	-	L	-	L	-	C	-	C
Ghaziabad	L	-	L	-	C	-	H	-
Jhansi	-	L	-	L	-	C	-	C
Khurja	M	M	L	M	C	C	H	C
Meerut	-	L	-	M	-	C	-	C
West Bengal								
Asansol	L	-	M	-	H	-	M	-
Durgapur	L	L	M	M	H	H	M	M
Haldia	L	-	M	-	M	-	L	-
Howrah	L	L	H	H	M	C	M	C
Kolkata	L	L	M	H	M	C	M	C

Legend: I (Industrial), R (Residential,) L (Low), M (Moderate), H (High) and C (Critical)

National Mean Concentration

The annual average concentration of SO_2, NO_2, RSPM and SPM at various cities are published by Central Pollution Control Board as annual status reports. The Mean 90^{th} percentile and 10^{th} percentile of annual average concentrations are calculated

considering all the ambient air quality monitoring stations under NAMP. Trend in Mean value, 90th percentile and 10th percentile of annual average concentration are depicted in Fig. 5.35 and 5.36 for SO_2, NO_2, RSPM and SPM. National mean SO_2 concentration has decreased over the years indicating that there has been decline in SO_2 levels. National mean NO_2 and RSPM concentration remain stable over the years despite increase in line pollution sources such as vehicles. The reason for decline in SO_2 levels may be various pollution intervention measures implemented such as improvement in vehicle technology alternate transport fuel etc. National mean SPM concentration has been fluctuating over the years and no definite trend has been observed as sources of SPM are mainly natural dust, re-suspension of dust etc.

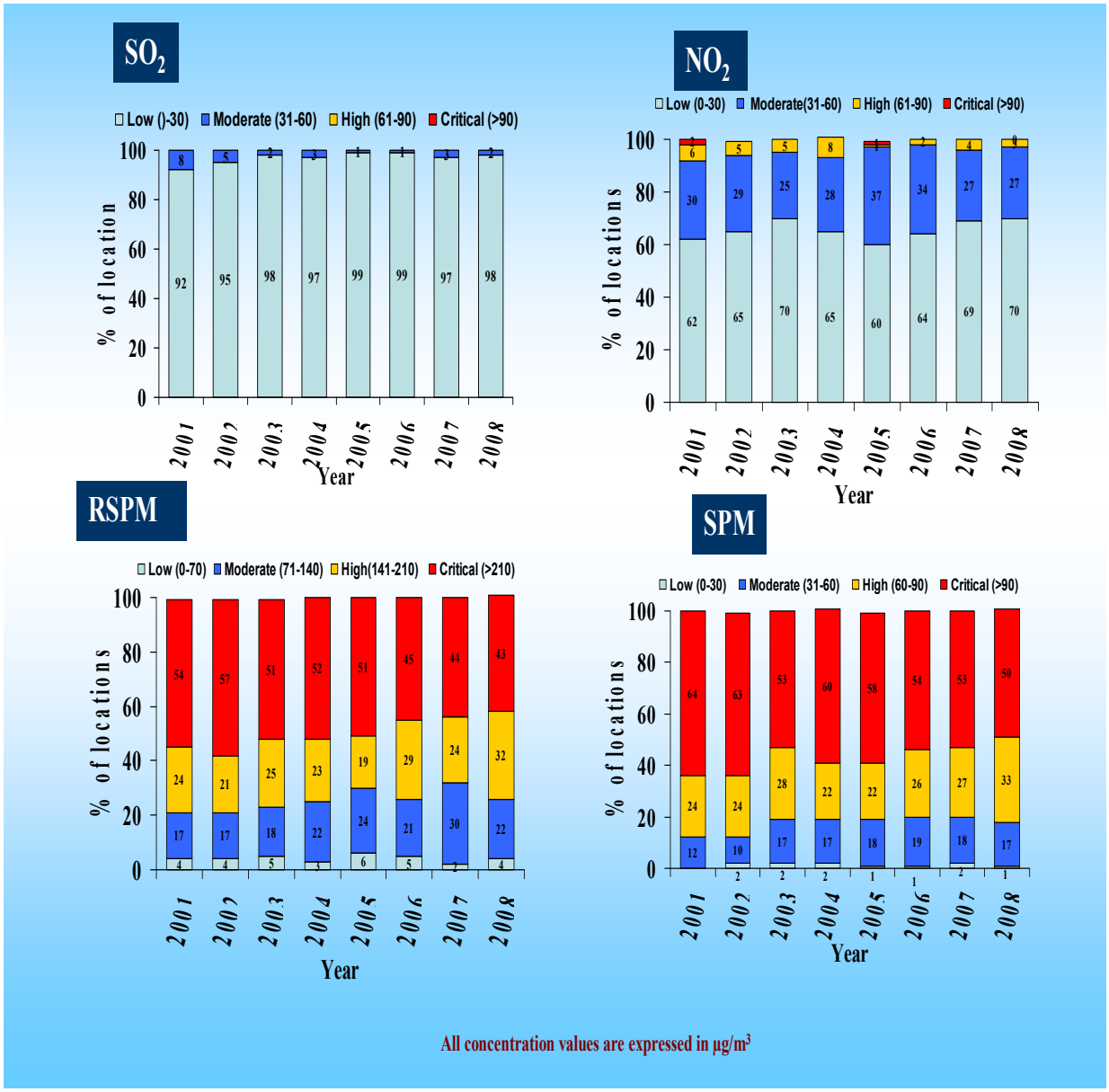


Fig. 5.35: Pollution levels of different locations of cities fall under different categories of Air Quality in India

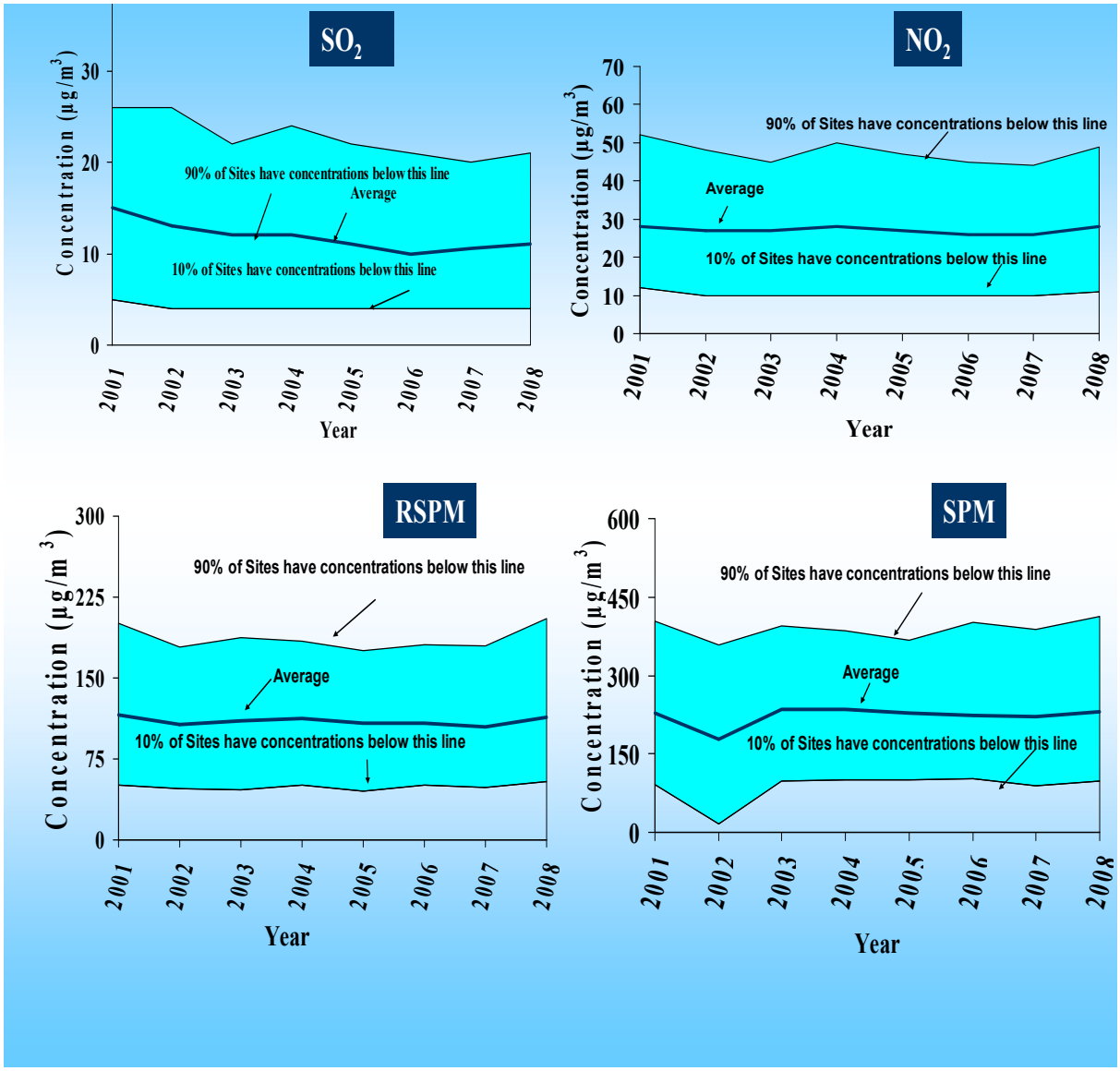


Fig. 5.36: National Mean concentrations of different locations fall under 10 and 90 percentile of Criteria Pollutants in India

5.4 AMBIENT AIR QUALITY IN VARIOUS CITIES

5.4.1 Ambient Air Quality Status at Agra

Central Pollution Control Board is regularly monitoring ambient air quality at Agra at four monitoring locations since year 2002. Ambient air quality data of Agra also submitted to Hon'ble Supreme Court of India under Writ Petition (C) No. 13381/1984 M.C. Mehta Vs Union of India. The annual average concentration and standard deviation of the studied parameters for the year 2008-09 is depicted in Table 5.6. It may be observed that least violation was observed for SO_2, followed by NO_2, while major violation was observed for both RSPM and SPM in ambient air.

Table 5.6: Ambient Air Quality Monitoring Status at Agra City (Year 2008 – 2009)

Parameters	Location	Annual Average	Standard Deviation
SO_2	Taj Mahal	6	2
NO_2		20	7
RSPM		142	82
SPM		294	130
SO_2	Itmad ud daulah	6	1
NO_2		28	8
RSPM		183	105
SPM		383	166
SO_2	Rambagh	6	2
NO_2		24	5
RSPM		165	65
SPM		399	141
SO_2	Nunhai	5	2
NO_2		38	10
RSPM		216	108
SPM		543	242
Note: All the values are in $\mu g/m^3$ of Ambient Air			

The monthly variation in ambient air quality as observed during the year is presented in Fig 5.37. The influence of rainy months (particularly June to September) on all four parameters may be observed at all locations, while winter peaks may be se12en during December to January. The least pollutant profile was observed at Tajmahal among all the monitoring stations at Agra likewise proceeding year.

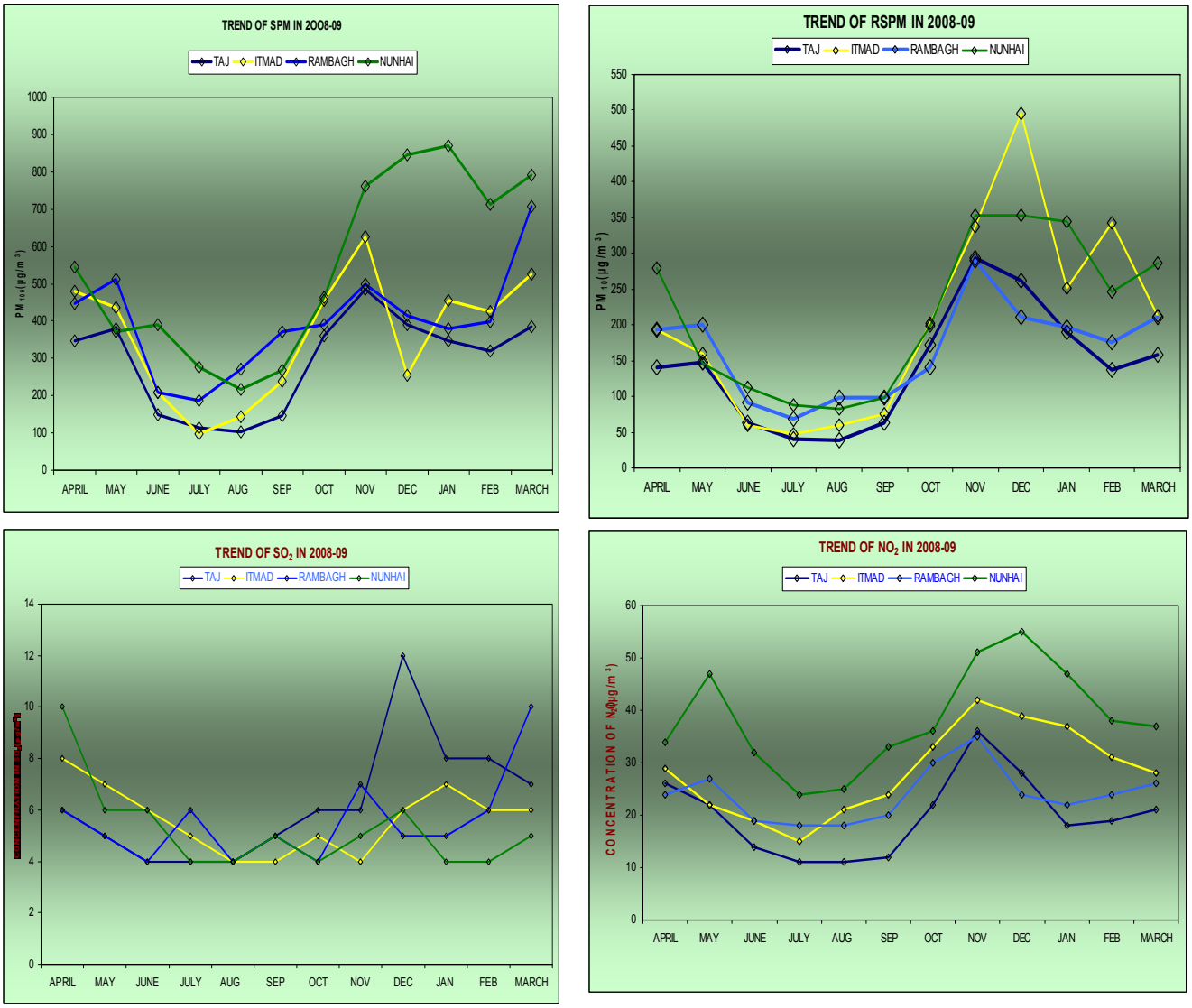


Fig. 5.37: Air Quality Trend (monthly) at Agra in terms of SPM, RSPM, SO_2 & NO_2

The Non-Respirable Particulate Matter (NRSPM) is the fraction of particulate size ranges between less than PM_{100} to more than PM_{10} and these are largely contributed in the ambient air as transported dust / wind blown dust. The approximation of non-respirable particulate matter is generally undertaken by subtraction of RSPM concentration from total SPM concentration. There has been an improvement in NRSPM profile during year 2008-2009 in comparison to year 2002 at all four locations in Agra. The reduction of NRSPM constituent in SPM at all the monitoring locations was to the tune of about 100 $\mu g/m^3$, which might be due to strict regulations, various pollution prevention actions and other implementation measures initiated at TTZ areas over the years.

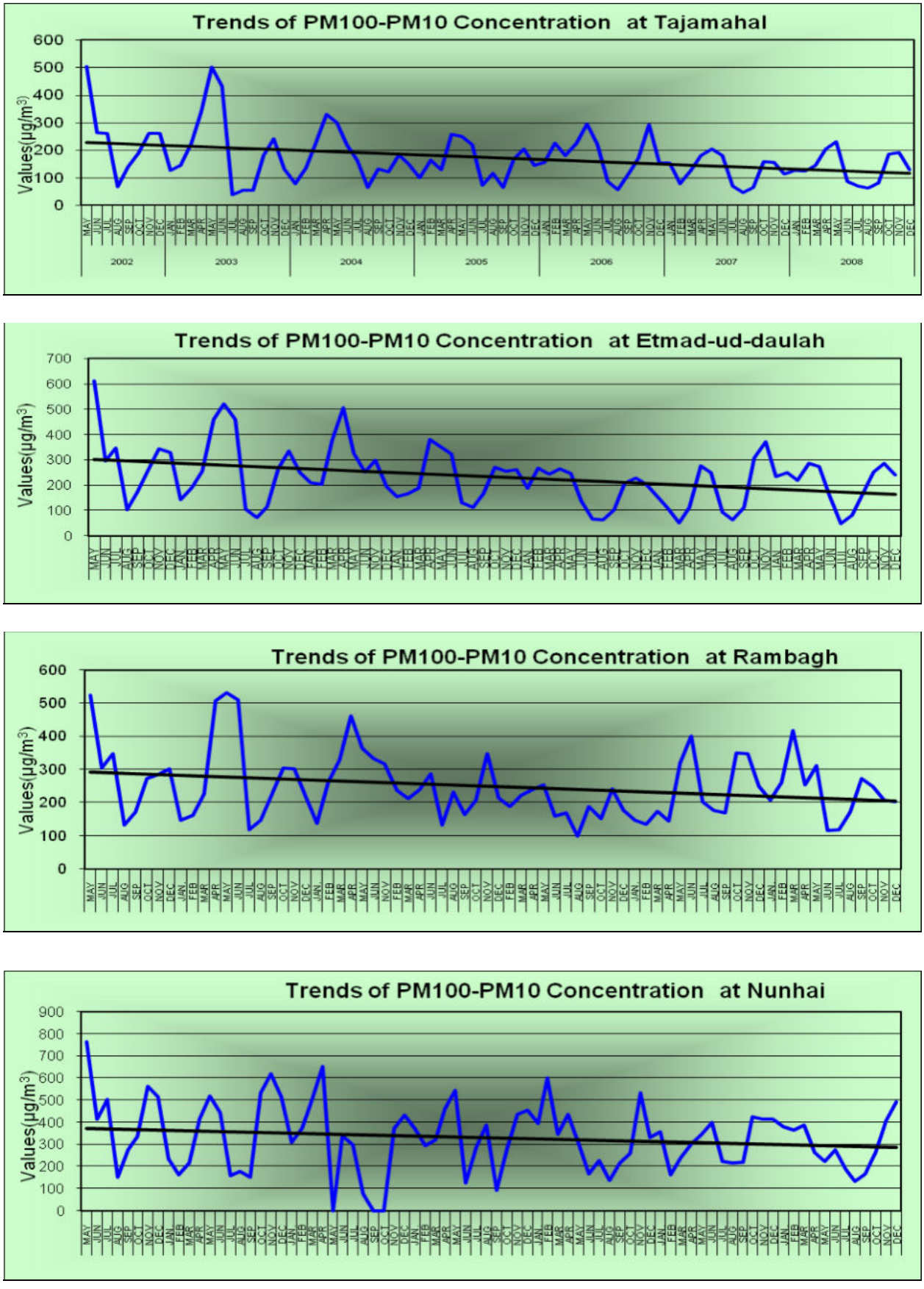


Fig. 5.38: Non-Respirable Suspended Particulate Matter (NRSPM) Trend at various locations in Agra

Pollution Dispersion Rose at Agra

The dispersion of pollution is largely dependant on the meteorological parameters viz. wind speed, wind direction, temperature, humidity profile etc. Using these principal meteorological parameters and software “wind rose plots for meteorological data” (version: 5.3, developed by Lakes Environmental Software, UK); the pollution rose has been prepared for the city of Agra. The pollution rose as obtained for the criteria pollutant RSPM, the most critical pollutant at Agra (said to be originated locally, mostly due to anthropogenic activity, besides re-suspended dust) has been presented for two distinct months viz. February, 2009 (winter, the most stable month) and June, 2008 (the rough weather month). It is reflected from pollution dispersion roses that meteorological condition brings pollutants from North and North-West direction during winter months, while influence on ambient air quality from all the directions may be observed in the month of June (Fig. 5.49).

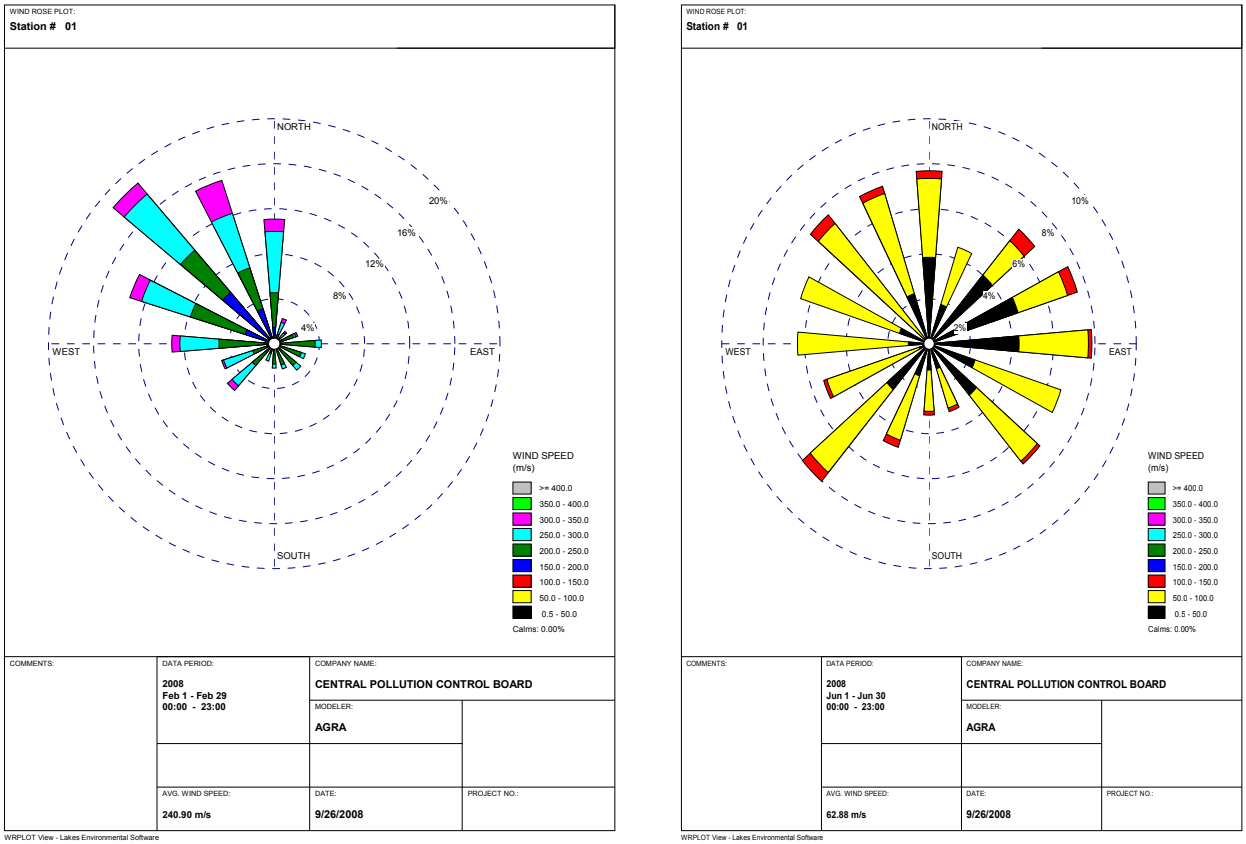


Fig. 5.39: Pollution Dispersion Rose for the month of February and June at Agra

Physical fractional composition of Particulate Matter at Agra

Physical analyses of particulate matter composition profile at Agra indicate that there is no significant improvement in the criteria pollutants except SPM, which is recognized to have originated from natural source (mainly long range transportation). The overall fractional composition of SPM as calculated from the monitoring of SPM,

RSPM and FPM, was recorded to be Course particle fraction (SPM-RSPM~ PM100 – PM10) had an average of 47%, NRSPM (RSPM-FPM ~ PM10-PM2.5) had an average of 22% and Fine particulate matter ($PM_{2.5}$) had an average of 31%. The overall particulate matter profile at Agra is presented in Fig. 5.40.

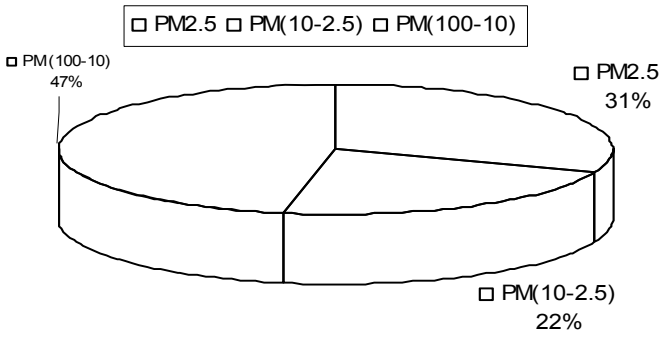


Fig. 5.40: Particulate Matter Profile at Agra

Ambient Air Quality Trend at Tajmahal

Air Quality Data generated from the monitoring station at Tajmahal, Agra since year 1991 have been compared and analyzed for trend analyses. The annual air quality trend from year 1991 to 2008 of four critical pollutants at Tajmahal is depicted in Figs. 5.41a & 5.41b. There has been declining trend of SPM, practically no change in the RSPM since year 2002 (monitoring initiated in year 2002), steady decrease in SO_2 concentrations attributed to supply of Ultra Low Sulphur Diesel (0.005%) and initiation of other measures including ban on the use of coke / coal towards prevention and control of acidic anthropogenic pollution at Agra and continuation of no-change trend of NO_2 due to increased number of CNG vehicles and industries around the city.

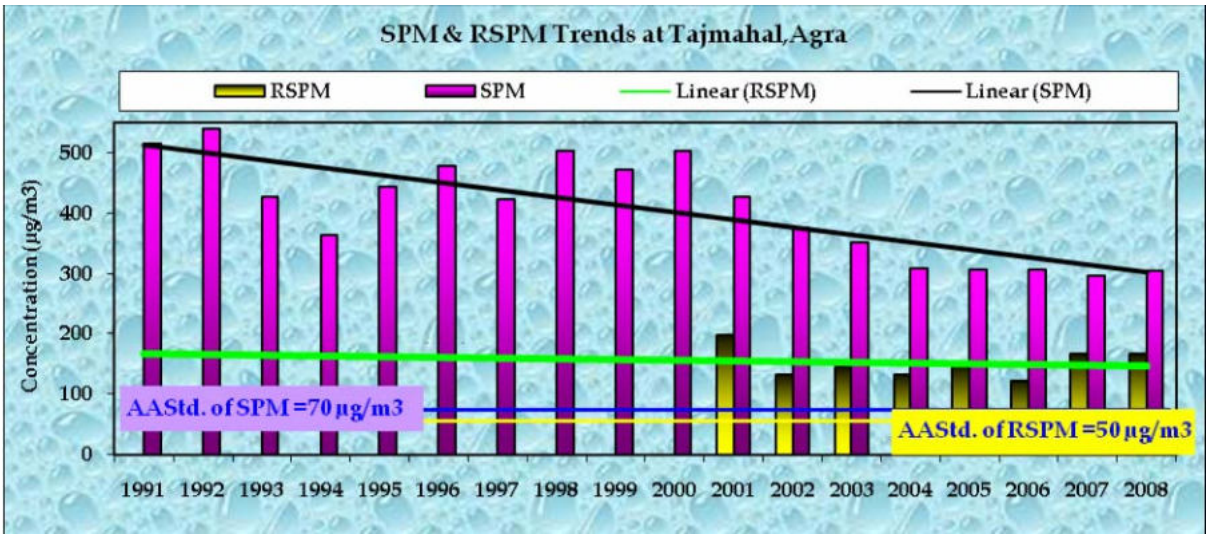


Fig. 5.41a: Ambient Air Quality Trend at Tajmahal, Agra

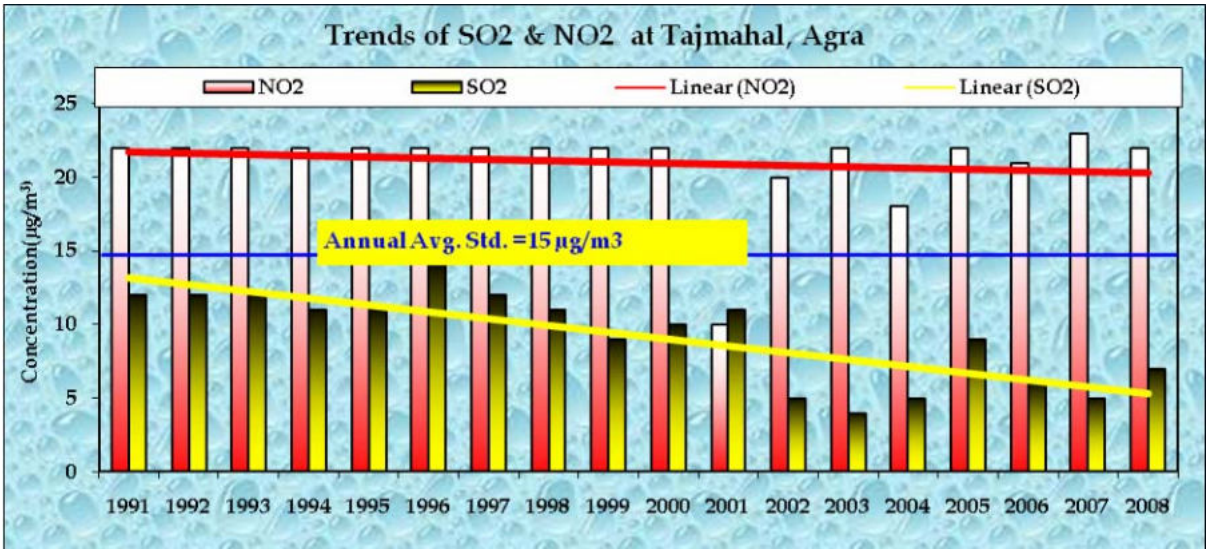


Fig. 5.41b: Ambient Air Quality Trend at Tajmahal, Agra

Ambient Air Quality at Taj-Trapezium Zone (TTZ)

Taj-Trapezium Zone is one of the air pollution sensitive zones in the country. To generate the ambient air quality profile in this ecologically sensitive zone, Central Pollution Control Board Project Office-Agra has undertaken monitoring ambient air quality at three districts of Uttar Pradesh viz. Agra (6 locations), Mathura (3 locations), Firozabad (total 3 locations) and one district of Rajasthan viz. Bharatpur (3 locations). The monitoring has been carried out in pre and post winter months for three most important primary criteria pollutants (SPM, SO_2 and NO_2) and also for organic soluble fraction in SPM. The average data profile for these locations is presented in Table 5.7.

Table 5.7: Ambient Air Quality in Selected Districts of Taj Trapezium Zone

City-->	Mathura			Agra		
Types -->	Residential	Industrial	Sensitive	Residential	Industrial	Sensitive
Parameters	Krishna Nagar	Industrial Area	Sri Krishna Janamsthan	It-mad-uddaulla	Nunhai	Tajmahal
SPM	720	862	510	514	814	463
SO_2	26	51	13	17	BDL	34
NO_2	44	35	34	46	51	51
TSOF in SPM	18	9	27	31	70	24
City-->	Firozabad			Bharatpur		
Types -->	Residential	Industrial	Sensitive	Residential	Industrial	Sensitive
Parameters	Mahavir Nagar	Industrial Area	Coal Sites	Jila Parishad	REECO	RTDC Hotel
SPM	971	936	776	389	438	398
SO_2	10	29	83	8	13	24
NO_2	47	81	56	29	15	38
TSOF in SPM	23	36	68	101	109	154
Note: All values are in µg/m^3; BLD = Below Detection Limit						

In addition to the above, the monitoring data generated during pre and post winter for TOSF, RSPM, $PM_{2.5}$, SPM, SO_2 and NO_2 in Taj Trapezium Zone at Agra, Bharatpur, Mathura, Firozabad and Hathras are depicted at Fig. 5.42 and 5.43. It may be seen that there had been increase in levels of all parameters during winter months because of low mixing height, calm conditions at all places.

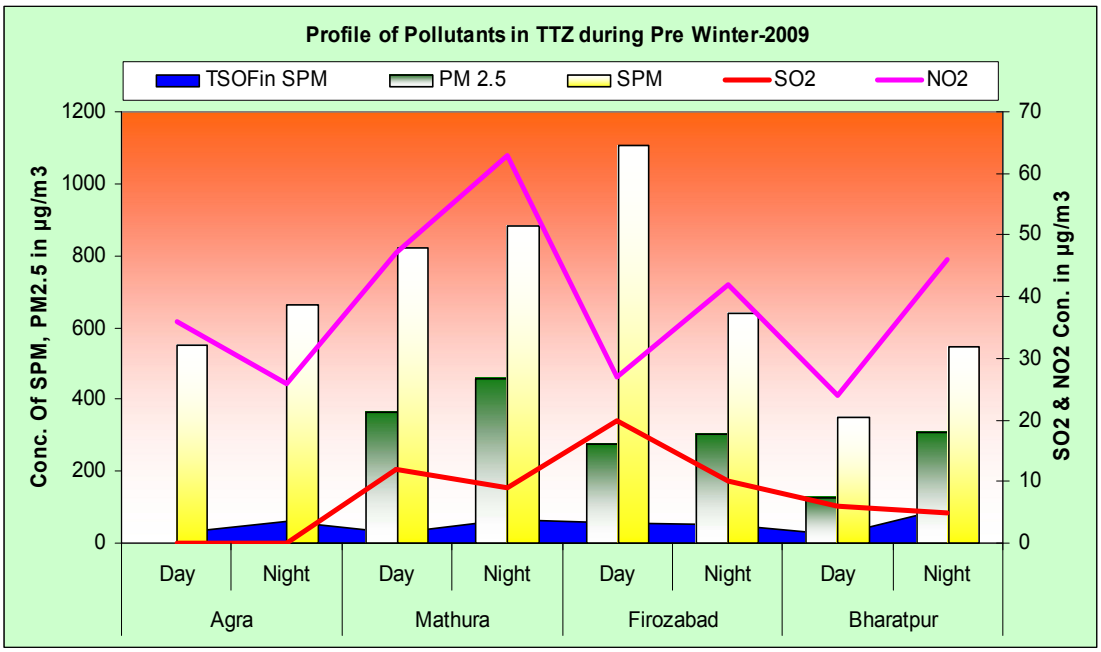


Fig.5.42: Profile of Pollutants in TTZ during Pre Winter-2009

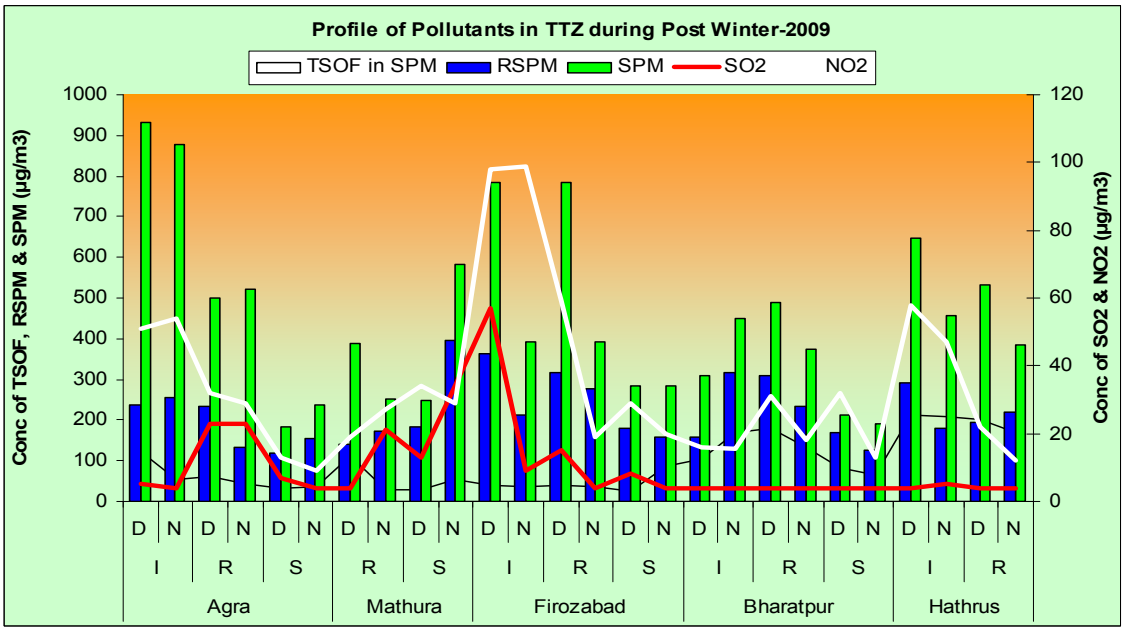


Fig. 5.43: Profile of Pollutants in TTZ during Post Winter-2009

Toluene soluble organic fraction in PM_{10} at Taj-Trapezium Zone (TTZ)

Toluene soluble organic fraction (TSOF) largely represents organic fraction present in the ambient particulate matter. A study was undertaken at selected towns in Taj Trapezium Zone during December, 2008 to assess the level of TSF fraction in total suspended particulate matter. The TSF concentration was attributable to burning of organic constituents at night besides low mixing height and less dispersion. It may be seen that the Bharatpur had the maximum concentration of organic matter in SPM due to operation of large number mustard oil expeller in the city and also due to less dispersion at night hours, however the situation was noted to be uniform during day and night at Firozabad, wherein large amount of coal is used in glass units.

Table 5.8: Suspended Particulate Matter and Toluene Soluble Organic Fraction (TSOF) in Taj Trapezium Zone

Location	Period	SPM (µg/m^3)	TSOF in SPM (µg/m^3)
Agra	Day	553	28
	Night	661	59
Mathura	Day	822	27
	Night	883	67
Firozabad	Day	1108	57
	Night	642	51
Bharatpur	Day	351	23
	Night	546	96

Diurnal Variation of $PM_{2.5}$ at Tajmahal Monitoring Station, Agra

The diurnal variation of fine particulate matter ($PM_{2.5}$) at Tajmahal, Agra with reference to real time clock is presented in Fig. 5.44. The direct correlation of vehicular movement vis-à-vis diurnal variation had been observed. The study indicates that there is intrusion of fine particulate matter in ambient air around Tajmahal, in spite of having significant green buffer area around Tajmahal except on its southern side. Movement of vehicles needs to be restricted in this area besides control on other urban activities generating air pollutants.

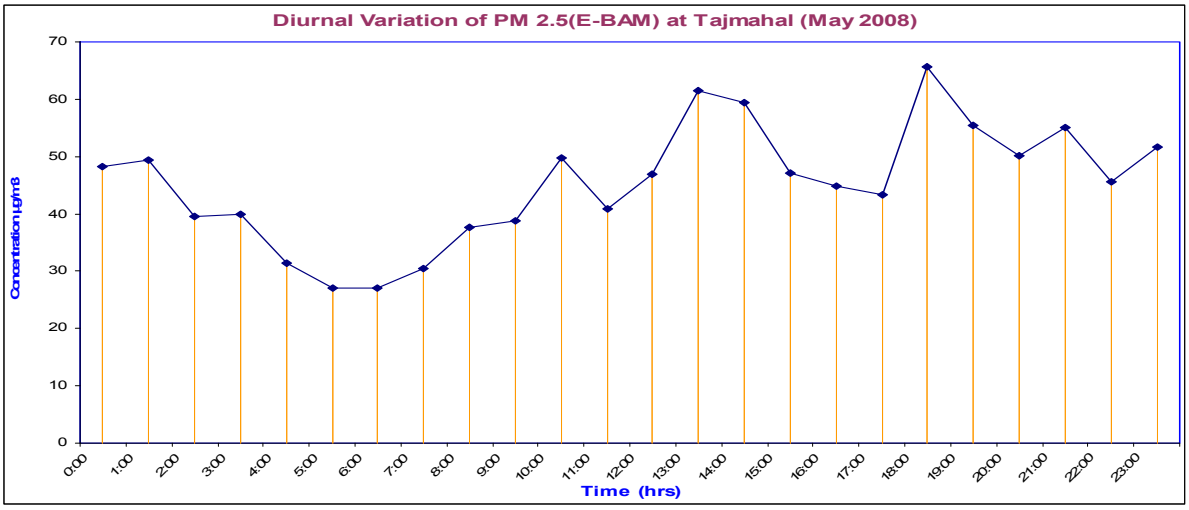


Fig. 5.44: Diurnal Variation of PM 2.5(E-BAM) at Tajmahal (May 2008))

Study of Meteorological Conditions at Agra

Meteorological information is important towards prediction and interpretation of climate change. With the objective to know the trend of climatic parameters viz. monthly average values of ambient air temperature and relative humidity at Agra urban area, the collected meteorological data during the period May, 2004 to March, 2008 have been compiled and analysed. The findings are presented in Fig. 5.45. Analysis of linear trend in these two parameters indicate decreasing tendency in case of temperature (from about 30°C to 27°C), which influence increasing tendency of humidity (about 52% to 57%). The seasonal data variation, variation in the wind rose pattern, rain-fall is under processing.

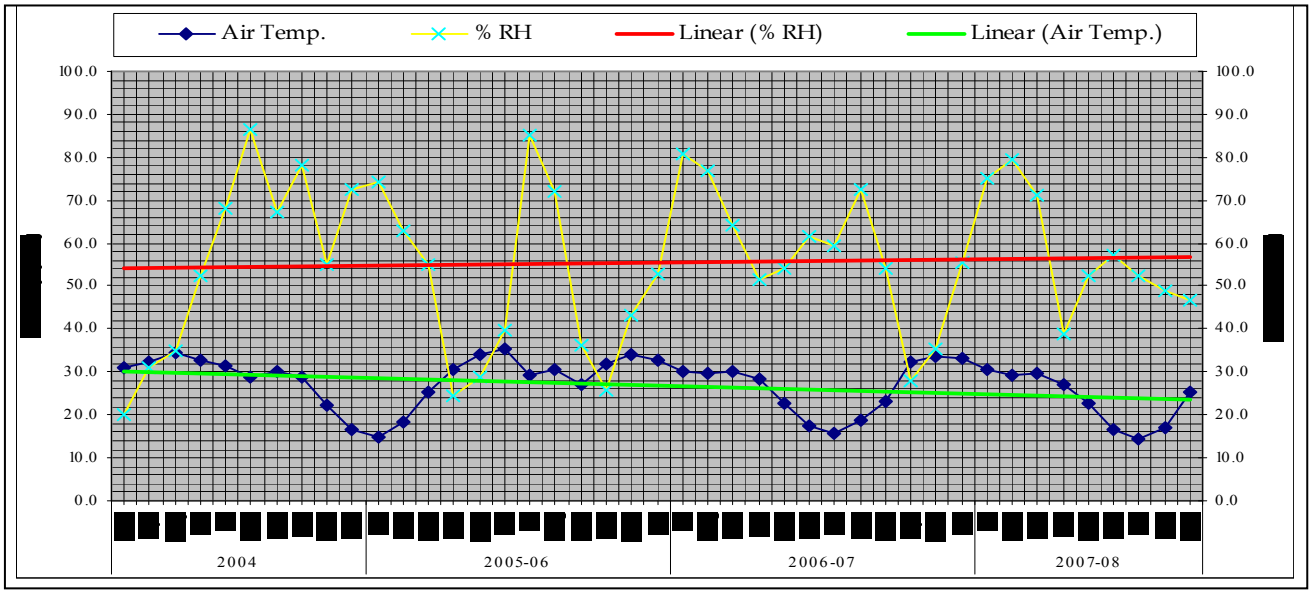


Fig. 5.45: Profile of Air Temperature & Relative Humidity at Agra

5.4.2 Ambient Air Quality at Delhi

Air Quality Status

The Central Pollution Control Board has been monitoring ambient air quality at seven locations in Delhi for the past several years. The locations have been categorized based on land use, viz. residential, industrial and traffic intersection. The ambient air quality status has been compared with the air quality status during year 2007 and presented at Fig. 5.46 & 5.47 and Table 5.9. The sulphur dioxide concentrations have shown an increasing trend at residential and industrial areas during year 2008 and decreasing trend at traffic intersection with respect to air quality status during year 2007. All the values recorded have been well below the prescribed National Standard. Annual average concentration of nitrogen dioxide during year 2008 decreased in traffic intersection, whereas increased in residential and industrial areas in comparison to year 2007 and all the values have been within the prescribed National Ambient Air Quality Standard. Annual average SPM concentration during year 2008 registered a decrease of approximately 3 percent at traffic intersection, whereas increase at residential areas and industrial areas. RSPM recorded an increasing trend at residential and industrial areas during year 2008 but no change at

traffic intersection. Carbon Monoxide levels measured at Bahadur Shah Zafar Marg traffic intersection during year 2008 was found as 2249 µg/m^3 as against 2463 µg/m^3 recorded during 2007, thus indicating a decline of 8.7 percent.

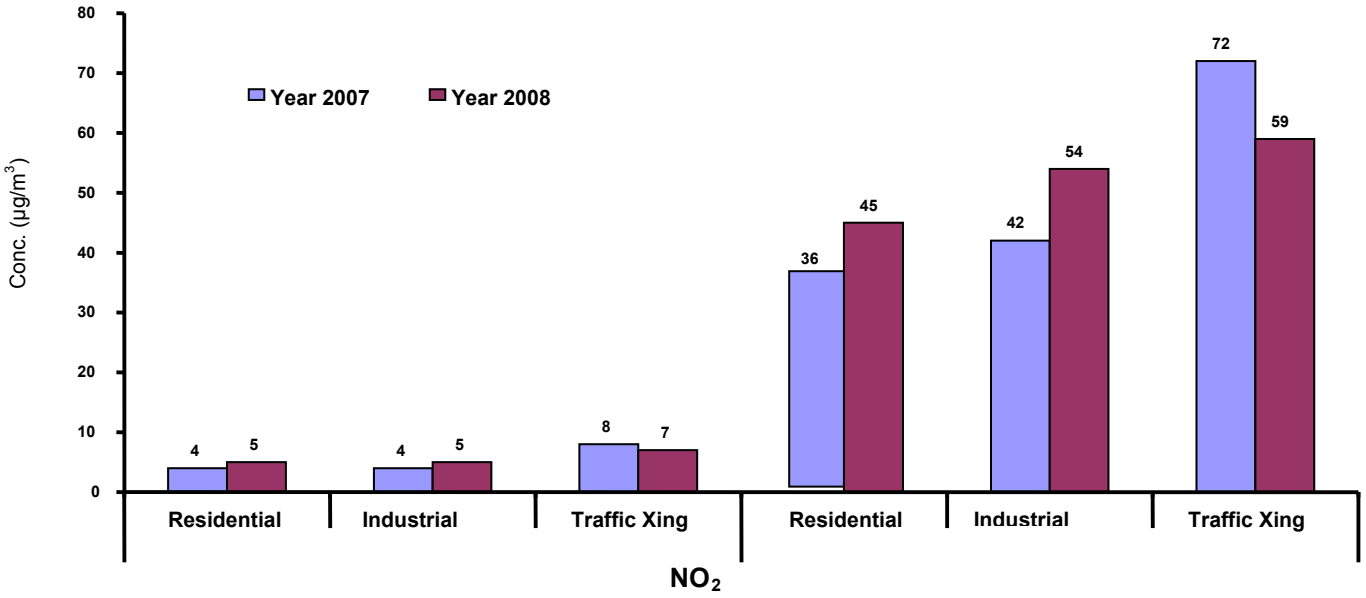


Fig. 5.46: Ambient Air Quality Profile for Sulphur Dioxide and Nitrogen Dioxide at Delhi during year 2007-08

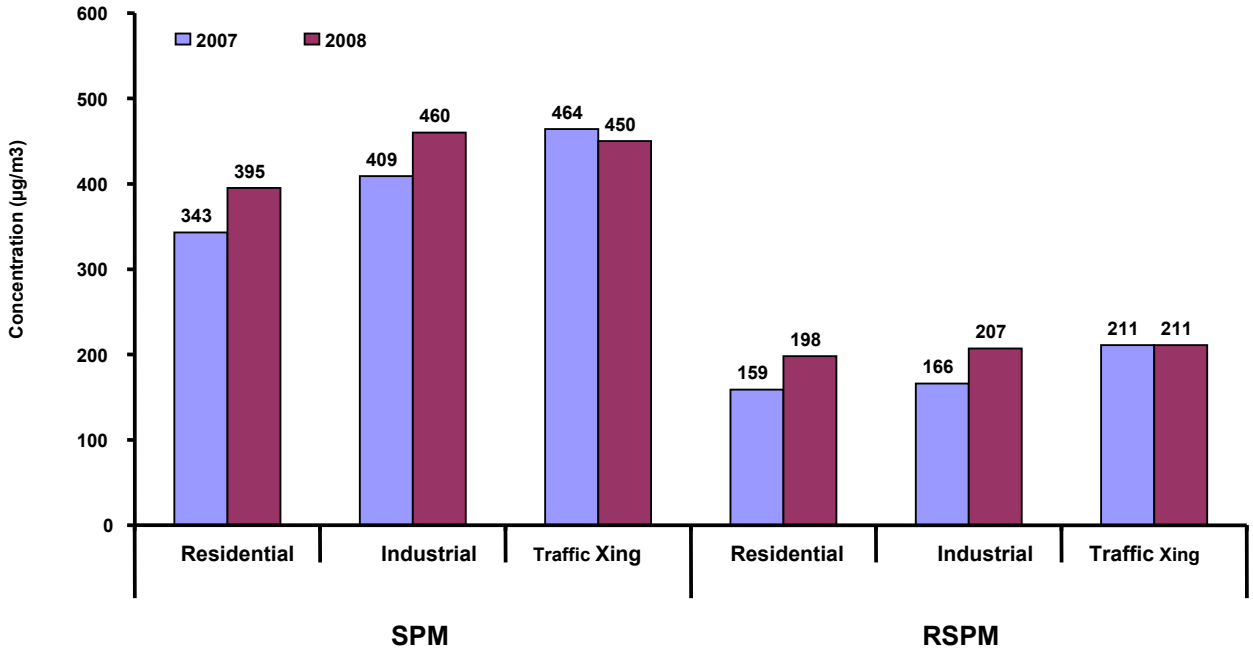


Fig. 5.47: Ambient Air Quality Profile in Delhi for Suspended Particulate Matter (SPM) & Respirable Suspended Particulate Matter (RSPM) during 2007-2008

Table 5.9: Ambient Air Quality Trends in Delhi

Parameter	Percent increase/decrease during year 2008 with respect to year 2007	
	Area	Increase / Decrease
Sulphur Dioxide (SO_2)	Residential	(+) 25%
	Industrial	(+) 25%
	Traffic Intersection	(-) 12.5%
Nitrogen Dioxide (NO_2)	Residential	(+) 25%
	Industrial	(+) 28.6%
	Traffic Intersection	(-) 18.1%
Suspended Particulate Matter (SPM)	Residential	(+) 15.2%
	Industrial	(+) 12.5%
	Traffic Intersection	(-) 3%
Respirable Suspended Particulate Matter (RSPM)	Residential	(+) 24.5%
	Industrial	(+) 24.7%
	Traffic Intersection	No change
Carbon Monoxide (CO)	Traffic Intersection	(-) 8.7%

Particulate Lead levels in the Ambient Air of Delhi

Central Pollution Control Board is regularly monitoring Particulate Lead in the ambient air of Delhi at residential areas (Pitampura, Sirifort, Nizamuddin and Janakpuri), industrial areas (Shahdara and Shahzada Bagh) and traffic intersection (BSZ Marg, ITO).The annual mean concentration of particulate lead in the ambient air of Delhi during year 2008 is presented in the Fig.5.48.

The annual mean concentration of particulate lead in ambient air of Delhi was observed in the range of 69 ng/m^3 to 149 ng/m^3. The annual mean concentrations of particulate lead in the residential and industrial areas were observed between 69 ng/m^3 (Janakpuri) to 101 ng/m^3 (Pitampura) and 96 ng/m^3 (Shahzada Bagh) to 149 ng/m^3 (Shahdara) respectively. The maximum concentration was observed at Shahdara industrial area (149 ng/m^3).

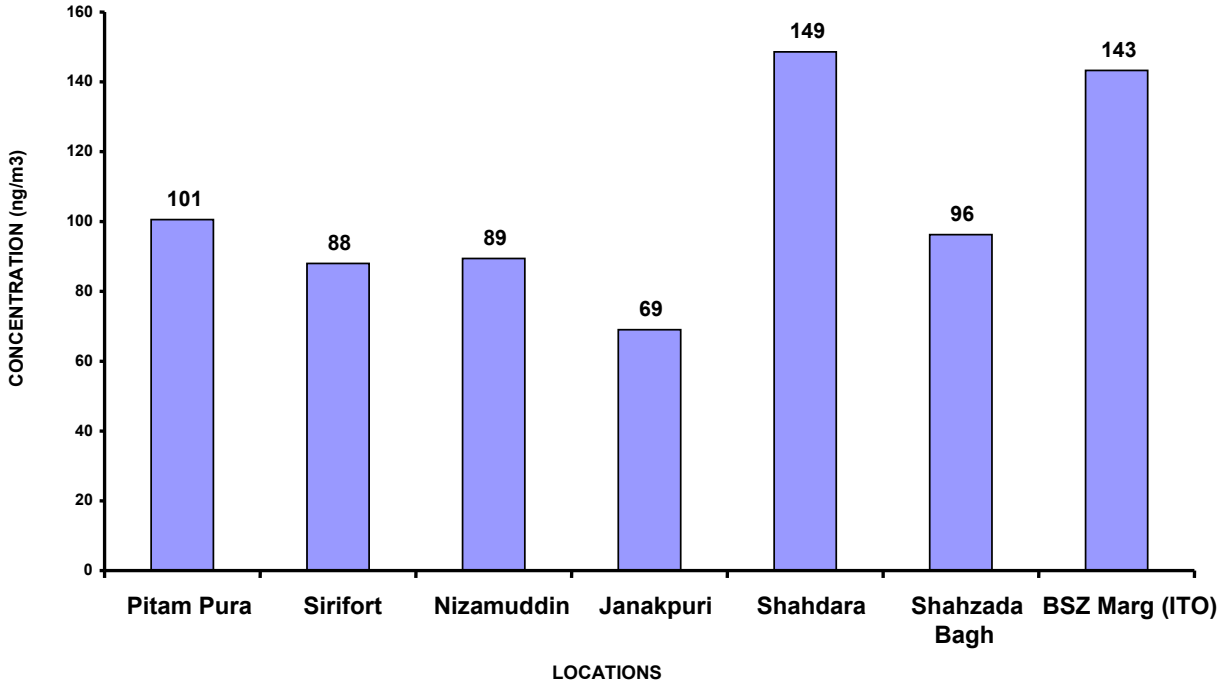


Fig. 5.48: Particulate Lead Concentration in Ambient Air of Delhi (2008)

Benzene Soluble Organic Fraction (BSOF) in PM_{10} at Traffic Intersection Bahadur Shah Zafar Marg, Delhi

Benzene Soluble Organic Fraction (BSOF) is being sporadically measured in RSPM at Bahadur Shah Zafar Marg Traffic Intersection, Delhi. BSOF mainly comprises of particulate bound organic compounds present in the ambient air. Some of the important BSOF compounds include Polycyclic Aromatic Hydrocarbons (PAHs), Oxidized Hydrocarbons (aldehydes, ketones, oxyacids etc.), Dioxin and Furan etc. Measurement of BSOF provides an idea about the anthropogenic emissions originating from the combustion of fossil fuels. The levels of BSOF in PM_{10} during the year 2005 to 2008 is presented in Table 5.10. The concentration of BSOF in PM_{10} ranged between 08 – 70 µg/m^3. Results indicate that BSOF during the winter months were higher ranging from 34 – 70 µg/m^3, while the lowest values (08 µg/m^3) were observed during monsoon month. The percent BSOF in PM_{10} ranged between 4 and 24. The highest percentage was observed during the month of December, 2006.

Table 5.10: Benzene Soluble Fraction (BSOF) Levels in RSPM at Bahadur Shah Zafar, Delhi

Period	BSOF µg/m^3	RSPM µg/m^3	Percent BSOF in RSPM
November, 2005	34	258	13%
December, 2005	42	283	15%

Period	BSOF µg/m^3	RSPM µg/m^3	Percent BSOF in RSPM
March, 2006	26	160	16%
December, 2006	70	288	24%
April, 2007	9	169	5%
August, 2007	9	113	8%
December, 2007	35	225	15%
March, 2008	9	224	4%
August, 2008	8	135	6%
December, 2008	34	401	8%

Benzene Toluene and Xylene (BTX) Levels in the Ambient Air of Delhi

Volatile Organic Compounds is a collective name for a large group of organic compounds having saturation vapor pressure greater than 10^{-1} Torr at 25^0C and 760 mm Hg. The BTX (Benzene Toluene and Xylene) compounds represent aromatic category of volatile organic compounds. BTX are mainly released from anthropogenic activities such as transportation (from vehicle exhaust, filling and evaporative losses), industrial processes, combustion etc. BTX are harmful pollutants causing exposure-related health affects in human beings.

Central Pollution Control Board has been undertaking BTX monitoring using diffusive samplers (passive sampling method) on fortnightly basis at nine locations (Pitampura, Delhi College of Engineering (DCD) Campus, Jawahar Lal Nehru University (JNU) Campus, East Arjun Nagar, Town Hall, Siri Fort Shahdara, Dhaula Kuan and Bahadur Shah Zafar Marg Traffic Intersection in Delhi. After the sampling period the diffusive tubes are transported to the laboratory. The activated charcoal of the tube is extracted with Carbon disulphide (CS_2) and analyzed using Gas Chromatograph with Flame Ionisation Detector (FID).

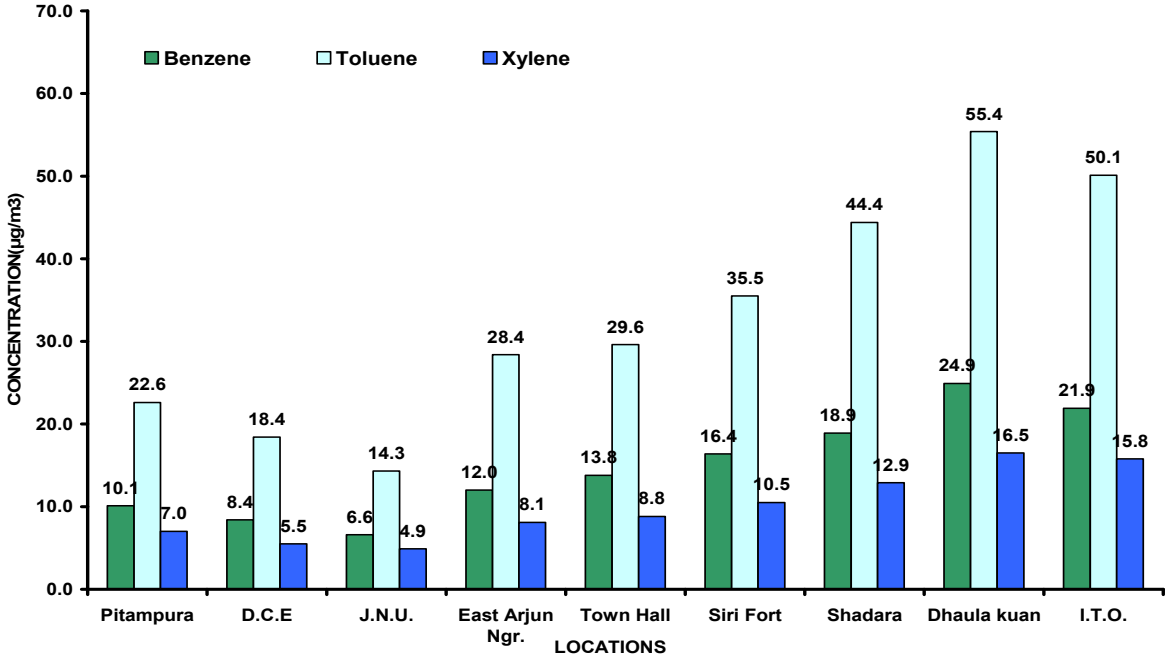


Fig. 5.49: Levels of BTX Ambient Air of Delhi (2008)

Annual mean concentration of BTX (Benzene, Toluene and Xylene) recorded at different locations in Delhi is presented in Fig. 5.49. The mean concentration of Benzene ranged between 6.6 µg/ m^3 (J.N.U) and 24.9 µg/ m^3 (Dhaula Kuan). The maximum (55.4 µg/ m^3) and minimum (14.3 µg/m^3) concentration of Toluene were observed at Dhaula Kuan and J.N.U. respectively. The Annual mean concentration of Xylene ranged between 4.9 µg/ m^3 at J.N.U. Campus and 16.5 µg/ m^3 at Dhaula Kuan.

Monitoring of Particulate Poly Aromatic Hydrocarbon (PAHs) in Delhi

Central Pollution Control Board is regularly monitoring Poly Aromatic Hydrocarbon (PAH) at traffic intersection Bahadur Shah Zafar Marg and six NAMP stations at Sirifort, Janakpuri, Nizamuddin, Pitampura, Shahzada Bagh and Shahdara. The exposed filter-papers (half portions of each filter paper of three shifts per day) are shredded and pretreated through Ultrasonication with Toluene, filtered and extract is concentrated using Rotary Evaporator. The Poly Aromatic Hydrocarbons are measured on GC-FID instruments.

The levels of total particulate PAH are presented in Fig. 5.50, which varies from 18.9 – 79.6 ng/m^3 (Bahadur Shah Zafar Marg), 21.2-85.9 ng/m^3 (Sirifort), 26.6-64.9 ng/m^3 (Janakpuri), 14.8-71.9 ng/m^3 (Nizamuddin), 24.5-106.7 ng/m^3 (Pitampura), 33.5-66.0 ng/m^3 (Shahzada Bagh) and 39.9-74.7 ng/m^3 (Shahadara). The benzo (a) pyrene in Suspended Particulate Matter at Bahadur Shah Zafar (BSZ) Marg have been found in the range of 1.3-14.03 ng/m^3 with average value of 7.21 ng/m^3, whereas, at NAMP stations it varies between 2.46 and 17.26 ng/m^3 with average value 10.45 ng/m^3 (Fig. 5.50).

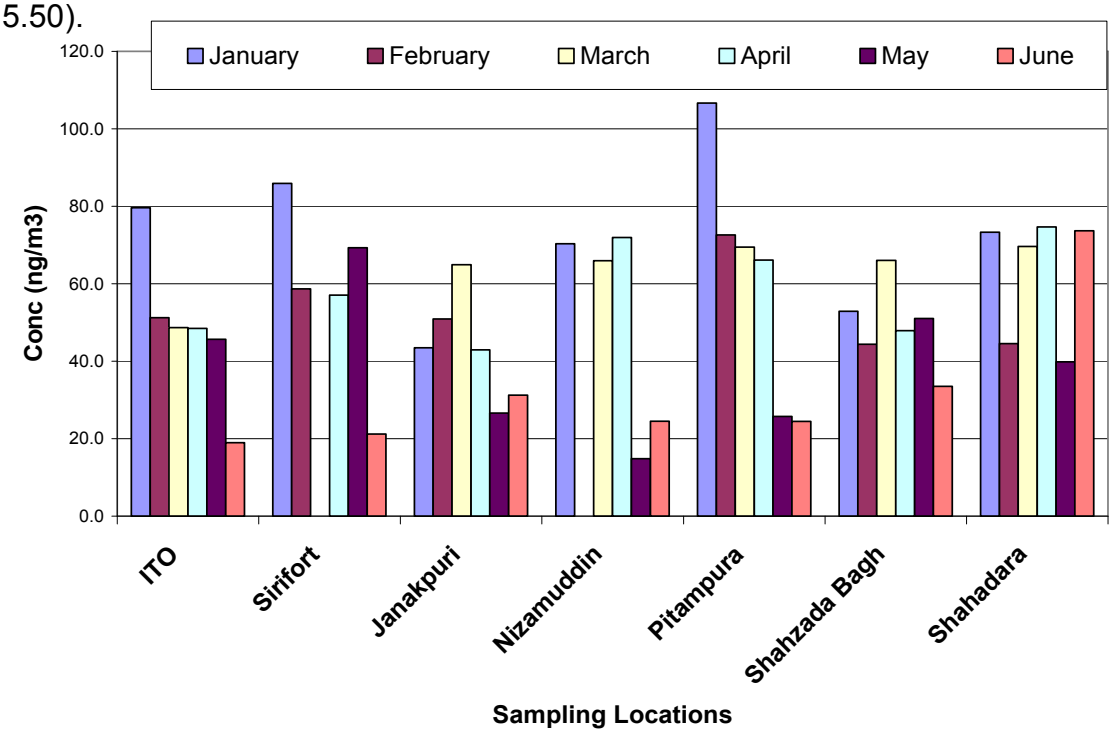


Fig. 5.50: Ambient Air Total Particulate Poly Aromatic Hydrocarbons in Delhi

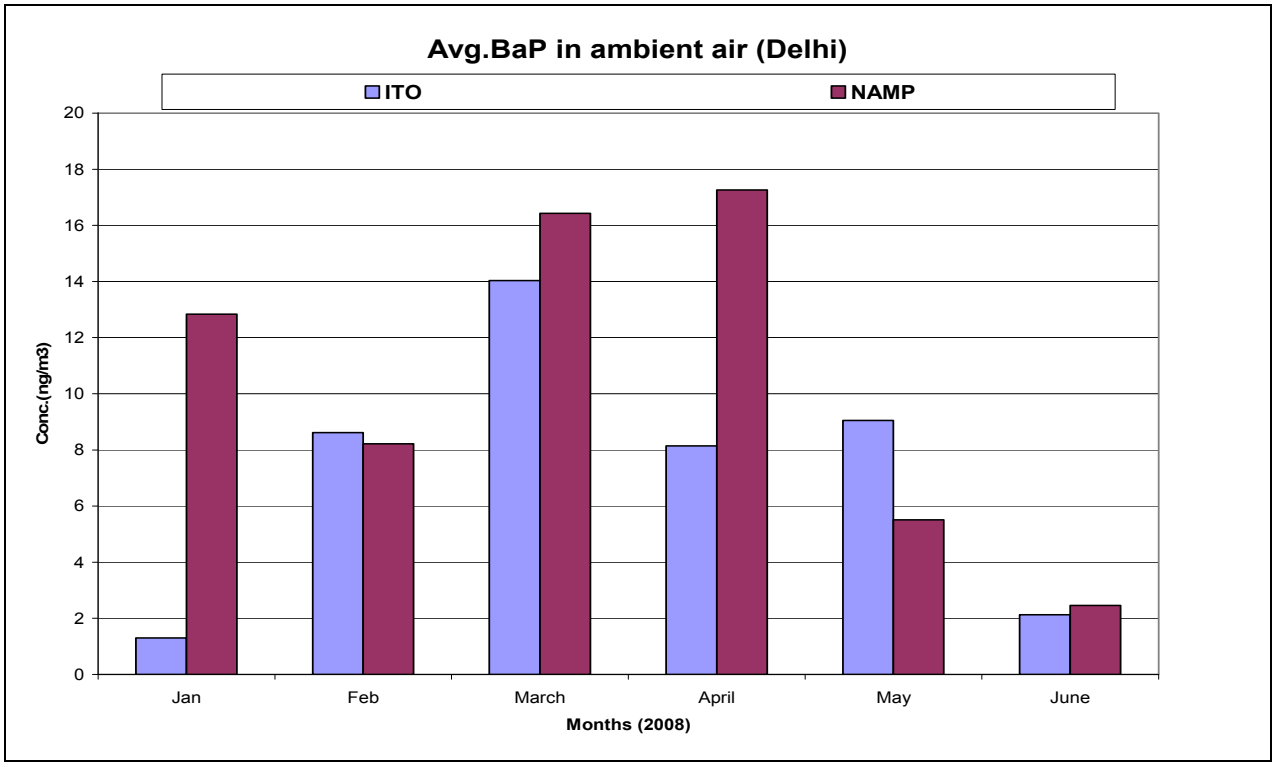


Fig. 5.51: Ambient Air Particulate Benzo-a-pyrene in Delhi

5.4.3 Ambient Air Quality Monitoring At Kanpur

Central Pollution Control Board is operating an ambient air quality monitoring station, located at Vikas Nagar, a residential area of Kanpur, for assessing the level of pollution in the city to formulate the control strategy. Monthly variations over 24-hour average for PM_{10} (Respirable suspended particulate matter), Total suspended particulate matter (TSPM), Nitrogen Oxide (NOx) levels and Sulphuric Dioxide (SO_2) are presented in Fig.5.52 to 5.55.

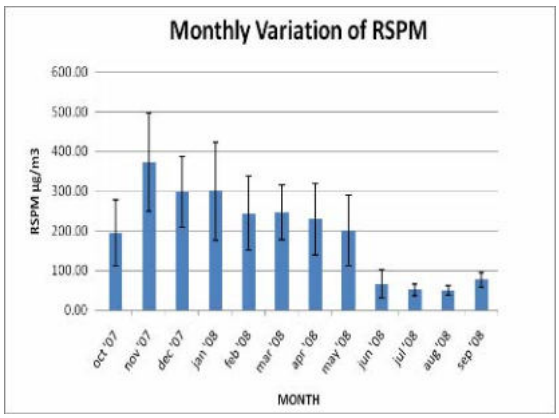


Fig. 5.52: Monthly variation in concentration of PM_{10}

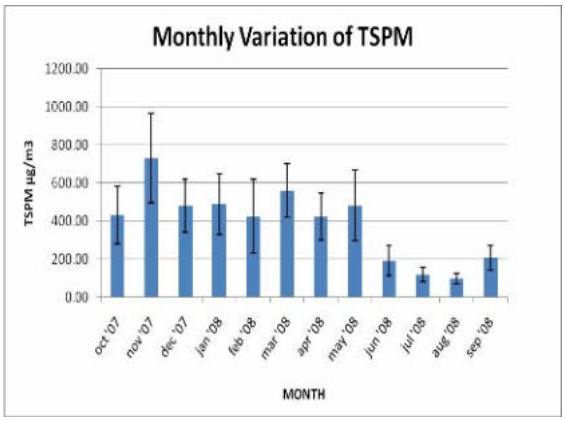


Fig. 5.53: Monthly variation in concentration of TSPM

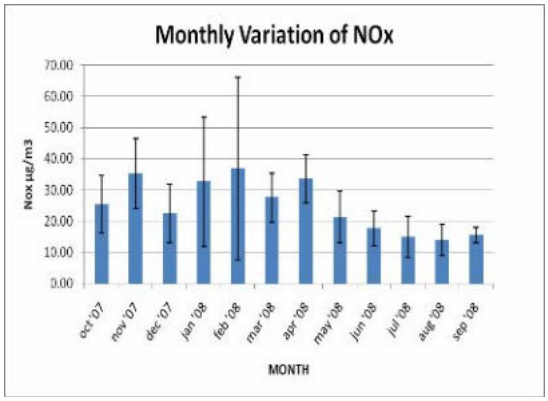


Fig. 5.54: Monthly variation in concentration of NOx

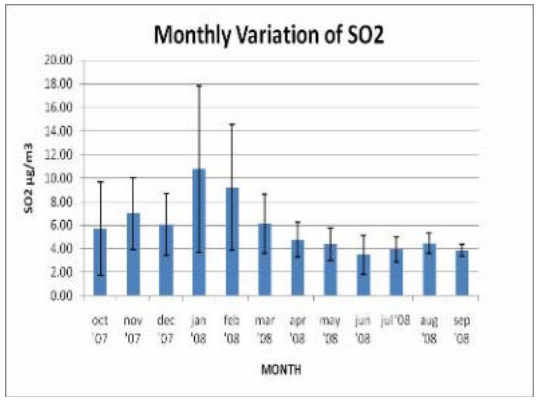


Fig. 5.55: Monthly variation in concentration of SO_2

5.4.4 Ambient Air Quality at Lucknow

Ambient air quality at Lucknow is regularly been carried out by Central Pollution Control Board, Zonal Office – Lucknow at Vikas Khand, Gomtinagar a residential area of city for criteria pollutants i.e. respairable particulate matter (RPM), Oxide of Nitrogen (NOx) and Sulphur-dioxide (SO_2). The monitoring activities are continuous for all working days round the clock. The air quality status as observed has been presented in Fig. 5.56.

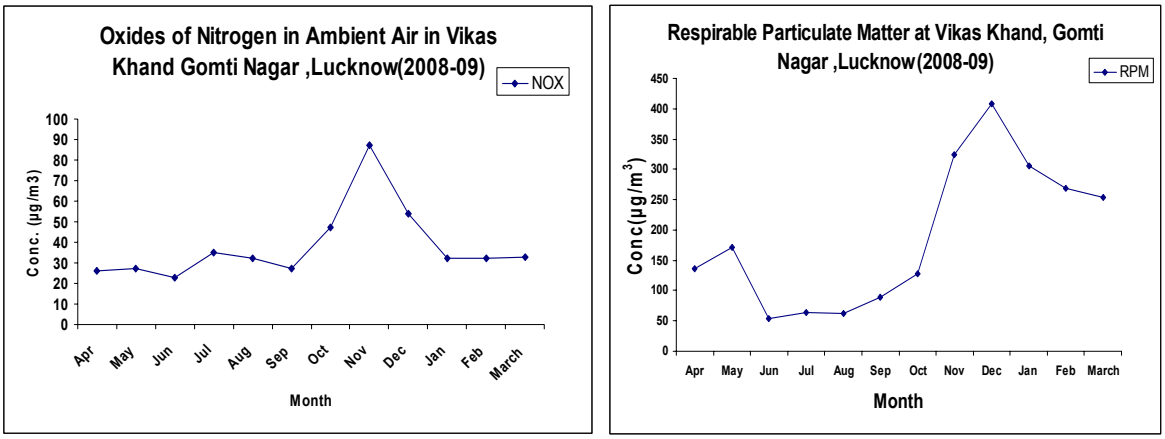


Fig. 5.56: Concentration of NOx and Respirable Suspended Particulate Matter (RSPM) at Gomti Nagar, Lucknow

5.4.5 Ambient Air Quality at Kasba (Southend Conclave Building), Kolkata

Regular monitoring of ambient air quality is being undertaken in Kasba, Kolkata to provide data for daily national telecast. The study assesses the air quality parameters like RSPM, SO_2 and NO_2.The generated data are presented in Table 5.11. The permissible limit with respect to RSPM exceeds in the month of January and February. The values of NO_2 and Sulphur Dioxide have been found well below

the permissible limit. The increase in the RSPM level during the winter may be because of atmospheric inversion.

Table 5.11: Ambient Air Quality Status at Kasba, Kolkata

Parameter → Month↓	RSPM (µg/m^3)			SO_2 (µg/m^3)			NO_2 (µg/m^3)		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Apr-08	*9*	*242*	*90*	**1**	**7**	**3**	13	72	34
May-08	22	141	64	2	7	4	12	49	29
Jun-08	17	119	49	1	6	3	9	46	25
Jul-08	10	83	37	1	6	3	8	45	24
Aug-08	1	61	35	1	7	4	8	41	24
Sep-08	10	99	48	1	8	4	10	53	27
Oct-08	23	434	162	2	10	5	16	55	38
Nov-08	87	487	238	3	10	5	30	65	46
Dec-08	86	505	254	2	13	6	20	83	52
Jan-09	95	536	307	2	12	6	21	90	56
Feb-09	125	622	344	3	13	7	31	91	57
Mar-09	101	656	274	3	13	6	32	89	52

5.5 AMBIENT AIR QUALITY MONITORING AT PORT CANNING, WEST BENGAL BORDERING BANGLADESH UNDER MALE DECLARATION

The Ambient Air quality monitoring station at Port Canning, West Bengal is under operation since September, 2004. One meteorological station is situated in the same campus. Central Pollution Control Board is regularly monitoring RSPM, NO_2 and SO_2 for at least ten days in a month. Analysis of the rainwater is also regularly being undertaken.

The average concentration of RSPM observed in the month of January, December and February was 156, 153 & 126 µg/m^3 respectively (Table 5.12), which exceed the permissible limit of 100 µg/m^3.

Table 5.12: Month-wise Average values of RSPM, Nitrogen Dioxide (NO_2) and Sulphur Dioxide (SO_2)

RSPM (µg/m^3)		NO_2 (µg/m^3)		SO_2 (µg/m^3)	
Month	**Avg.**	**Month**	**Avg.**	**Month**	**Avg.**
Apr	49	Apr	13	Apr	1
May	30	May	15	May	2
June	29	June	15	June	1
July	27	July	17	July	2

RSPM (µg/m^3)		NO_2 (µg/m^3)		SO_2 (µg/m^3)	
Month	**Avg.**	**Month**	**Avg.**	**Month**	**Avg.**
Aug	19	Aug	19	Aug	2
Sep	15	Sep	12	Sep	2
Oct	50	Oct	21	Oct	3
Nov	97	Nov	21	Nov	3
Dec	153	Dec	19	Dec	3
Jan	156	Jan	22	Jan	4
Feb	126	Feb	21	Feb	3
Mar	74	Mar	22	Mar	3

Air Quality Standard RSPM – 100 µg/m^3; NO_2 – 80 µg/m^3; SO_2 – 80 µg/m^3

The violation of RSPM have been found nil in the month of May, June, July, August & September, while maximum violation was observed in the month of January, which may be due to brick kilns operation during peak winter months. The concentration of SO_2 and NO_2 was always found below the Ambient Air Quality Standards.

Table 5.13: Frequency of RSPM Exceeding the Permissible Limit (April, 2008 to March, 2009)

Months	No. of Observations	Number of Violation of Standard	% Violation of Air Quality Standard
Apr	11	1	9
May	12	NIL	Nil
June	11	NIL	Nil
July	12	NIL	Nil
Aug	11	NIL	Nil
Sep	12	NIL	Nil
Oct	10	1	10
Nov	12	5	42
Dec	14	12	86
Jan	13	11	85
Feb	12	7	58
Mar	13	2	15

Chemical characteristics of rain water reveal the acidic nature of the rain in the area but the conductivity of the water is normal. Presence of chlorides in the rainwater may be due to evaporation of the coastal water and the presence of nitrate in the atmosphere may be due to the application of fertilizers in the agriculture fields located in vicinity of monitoring station. Sulphur Dioxide is known as a definitive indicator of coal and home heating oil burning emissions. Further, oxidation of Sulphur Dioxide in the atmospheric air results in the particulate sulfate, which appears in the rain water.

Table 5.14: Chemical Characteristics of Rainwater at Port Canning during year 2008

Sample Code	pH	Cond.	Na^+	K^+	TH	Ca^{2+}	Mg^{2+}	Cl^-	NO_3-	NH3-N	SO_4
June	5.5	5	BDL	BDL	BDL	2.00	BDL	3.00	0.14	BDL	BDL
July	6.5	10	BDL	BDL	BDL	BDL	BDL	3.37	0.67	BDL	6.0
July	6.0	14	1.60	0.5	BDL	BDL	BDL	7.71	0.24	BDL	2.5
August	5.8	14	1.30	BDL	BDL	BDL	BDL	7.70	0.90	BDL	4.4
August	5.6	9	BDL	BDL	BDL	BDL	BDL	5.00	0.72	BDL	6.7

All values are reported in mg/l except pH and conductivity. The conductivity is reported in μs/cm. TH = (total hardness).

5.6 CONTINUOUS AIR QUALITY MONITORING

5.6.1 Continuous Air Quality Monitoring (CAAQM) in Delhi

Central Pollution Control Board is conducting ambient air quality monitoring with automatic ambient air quality monitoring analyzers at three fixed Continuous Ambient Air Quality Monitoring Stations (CAAQMS) stations namely Delhi College of Engineering (DCE), Bahadur Shah Jafar Marg (ITO) and Sirifort in addition to 01 mobile Ambient Air Quality Station in Delhi with the objective to assess air pollution concentration bearing varying number of anthropogenic sources of pollution and to assess the status of air pollution to adjudge the effectiveness of air pollution control strategies and long term management of air pollution. The live data from these CAAQM stations are updated at 15 minutes interval on CPCB website (www.cpcb.nic.in) for public awareness.

During the year 2008, the annual average concentration of Sulphur Dioxide (SO_2) was 14 μg/m^3 at DCE, 14 μg/m^3 at B.S.Z. Marg and 10 μg/m^3 at Sirifort, which is much lower than the permissible limit of 60 μg/m^3. The annual average concentration of Nitrogen Dioxide (NO_2) at B.S.Z. Marg (61 μg/m^3) was slightly higher than permissible limit of 60 μg/m^3. Whereas it was lower than the permissible limit at DCE (34 μg/m^3) and Sirifort (57 μg/m^3).

The annual average concentration of Carbon Monoxide (CO) was: 1005 μg/m^3 at DCE, 2249 μg/m^3 at B.S.Z. Marg and 1198 μg/m^3 at Sirifort. The annual average concentration of Ozone (O_3) was 45 μg/m^3 at DCE, 40 μg/m^3 B.S.Z. Marg and 31 μg/m^3 at Sirifort. During the year 2008, the annual average concentration of $PM_{2.5}$ at B.S.Z. Marg was 137 μg/m^3 whereas annual average concentration of PM_{10} at DCE was 215 μg/m^3, which was higher than the permissible limit of 60 μg/m^3 (Table 5.15 and 5.12).

Table 5.15: Monthly Average of SO_2, NO_2, CO, O_3 and PM at Continuous Ambient Air Quality Monitoring Station during year 2008

Delhi Engineering College, 2008												
Sulphur Dioxide (SO_2)												
Jan	*Feb*	*Mar*	*Apr*	*May*	Jun	*Jul*	Aug	*Sep*	*Oct*	*Nov*	*Dec*	*Avg*
7	-	25	21	10	5	6	5	13	20	20	17	14
Nitrogen Dioxide (NO_2)												
26	37	29	26	23	14	-	44	54	63	39	18	34
Carbon Monoxide (CO)												
809	905	814	789	991	904	879	746	761	1115	1593	1759	1005
Ozone (O_3)												
-	-	72	68	63	52	59	19	17	33	35	27	45
Particulate Matter (PM_{10})												
-	325	269	190	189	96	101	89	118	309	356	319	215
Traffic Intersection Bahadur Shah Zafar Marg												
Sulphur Dioxide (SO_2)												
Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Avg*
29	17	17	16	10	9	8	8	7	10	16	19	14
Nitrogen Dioxide (NO_2)												
90	100	80	60	42	34	26	22	60	70	88	59	61
Carbon Monoxide (CO)												
2242	2404	2229	1528	2144	2226	1931	1556	1836	2784	3312	2799	2249
Ozone (O_3)												
22	29	43	43	34	48	47	58	61	40	33	26	40
Particulate Matter (PM_{10})												
152	178	134	80	63	49	-	-	-	159	230	191	137
Sirifort												
Sulphur Dioxide (SO_2)												
Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Avg*
16	13	18	15	9	4	5	4	9	10	9	10	10
Nitrogen Dioxide (NO_2)												
122	78	103	64	58	31	21	26	31	72	28	47	57
Carbon Monoxide (CO)												
1505	1213	1248	1067	865	787	821	996	932	1336	2134	1471	1198
Ozone (O_3)												
14	17	20	22	35	48	37	46	37	44	34	18	31
All values are in $\mu g/m^3$												

5.6.2 Continuous ambient air quality monitoring at Bangalore and Chennai

As part of strengthening of continuous ambient air quality monitoring and its network in the country, it has been decided to install three Continuous ambient air quality monitoring (CAAQM) stations at Chennai and Bangalore cities. The data generated from various operational CAAQMS are presented in the form of wind and pollution dispersion roses.

The monthly pollution dispersion rose at Alandur CAAQMS for February, 2009 (Fig. 5.57) depicts that the concentration of Carbon Monoxide ranged from 2 mg/m^3 to 3 mg/m^3 whereas monthly average was found 2.03 mg/m^3. The concentration was predominant from South West and South directions. The wind rose at Alandur

CAAQMS for February, 2009 depicts that wind speed ranged between 1.15 to 1.26 m/s while 24 hrs average wind speed was 1.09 m/s.

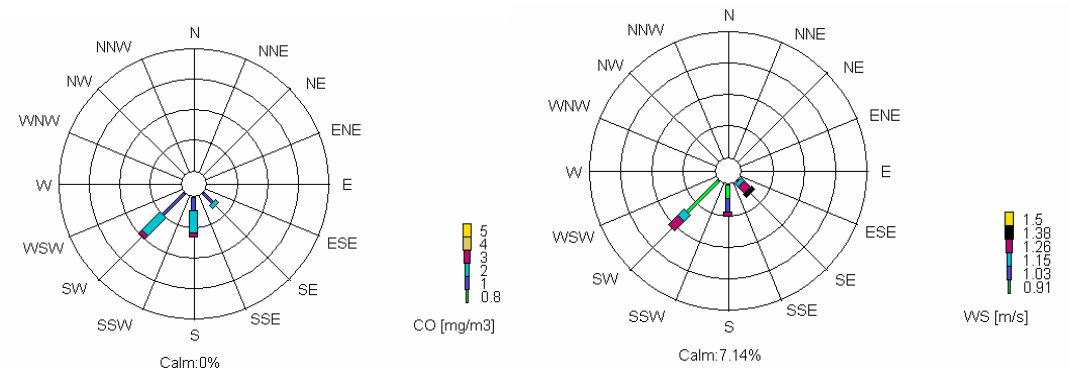


Fig. 5.57: Wind and Pollution Dispersion Rose at Alandur, Chennai (February, 2009)

The monthly Pollution Dispersion Rose at IITM, Chennai for February, 2009 (Fig. 5.58) depicts that the respirable suspended particulate matter (RSPM) varied between 60 to 80 µg/m^3 with monthly average of 71 µg/m^3. The concentration of RSPM was predominantly from South West direction. The monthly wind rose was ranging from 0.55 to 0.57 m/s and 24 hrs average wind speed for February, 2009 was 0.56 m/s.

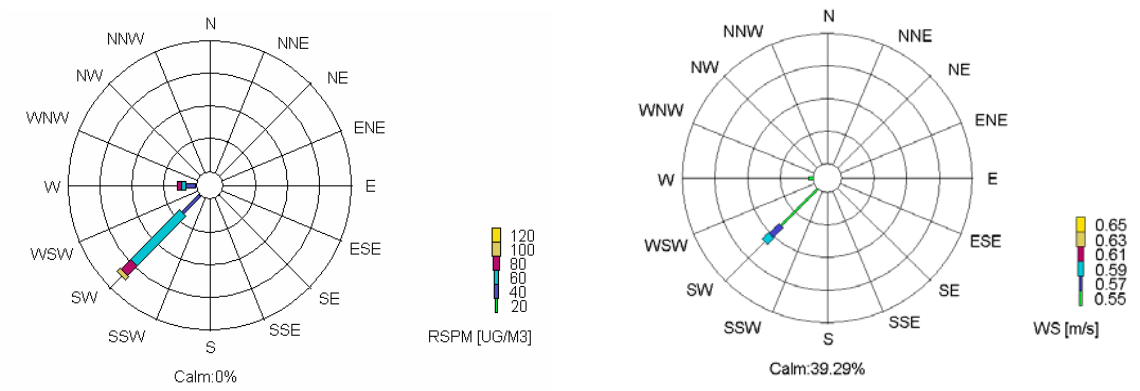


Fig. 5.58: Wind and Pollution Dispersion Rose at IITM, Chennai (February, 2009)

The monthly pollution rose at BWSSB, Bangalore for the month of November, 2008 (Fig. 5.59) depicts that the range of RSPM was varied from 40 to 60 µg/m^3 and the monthly average was 50 µg/m^3. The concentration of RSPM was predominantly from South East and East directions. The monthly wind rose reflects that the wind speed ranged between 2.36 to 3.59 m/s and the 24 hrs average wind speed was 2.95 m/s during November, 2008.

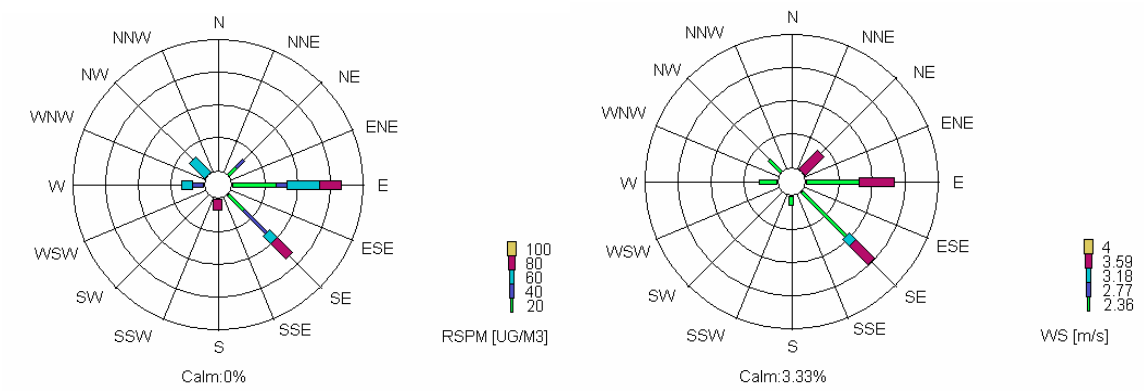


Fig. 5.59: Wind and Pollution Dispersion rose at BWSSB, Bangalore (November, 2008)

The monthly pollution dispersion rose at Bangalore for March, 2009 (Fig. 5.60) reflects that the RSPM was in the range of 100 to 125 µg/m^3 with monthly average of 117 µg/m^3. The concentration of Respirable Suspended Particulate matter (RSPM) was predominantly dispersing from South & South East directions.

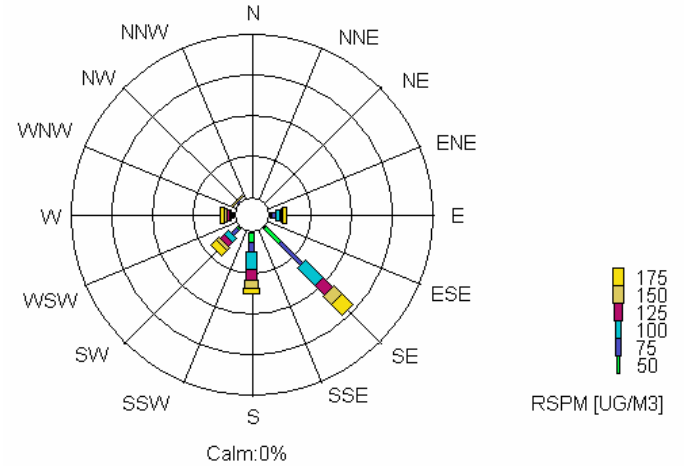


Fig. 5.60: Pollution Dispersion rose at Peenya, Bangalore (March, 2009)

5.6.3 Continuous Ambient Air Quality Monitoring at Lucknow

A network of three Continuous Ambient Air Quality Monitoring (CAAQM) Stations has been installed by Central Pollution Control Board in Lucknow .These stations are located at Talkatora, Lalbagh and Aliganj areas. Aliganj station is representative of residential area, Lalbagh station is located in commercial/high traffic zone, while Talkatora station reflects the air quality of Industrial area. All the three stations are connected to Central Station at Central Pollution Control Board Zonal Office for online transfer of data. The monitoring stations are also linked with the Central Computer at CPCB, Delhi. Eight to ten ambient air quality parameters are being monitored at these locations. Besides these parameters, meteorological parameters like temperature, wind speed, wind direction, atmospheric pressure, relative humidity and solar radiation are also being monitored.

5.7 PRIVATE PARTICIPATION IN MANAGEMENT OF CONTINUOUS AMBIENT AIR QUALITY MONITORING STATIONS / NETWORK

It was decided by Planning Commission, Govt. of India that CPCB/SPCB should start Monitoring of air quality in major cities and critically polluted areas by installing continuous ambient air quality monitoring stations (CAAQMS). This may be accomplished through Public-Private Participation due to shortage of technical manpower at Central / State Pollution Control Board. The common difficulties observed in the direct management of the network as below:

- The public procurement system is cumbersome and time-consuming resulting in longer downtime. Buying spare parts from a foreign manufacturer can be extremely difficult.
- Technical and skill manpower availability is a major problem particularly under the present government ban on new recruitment.
- Good working conditions of the system are not guaranteed (repairs are not always done in time).

After evaluating the merits & demerits of possible models including private participation in the management of Continuous Ambient Air Quality Monitoring Station (CAAQMS), Central Pollution Control Board decided that the following two new models may be adopted as pilot project in the identified cities:

- Model- I: Operation contract (OC)
- Model-II: Build Own & Operate (BOO) contract (investigation and operate)

Accordingly, project proposal was made to execute Model I in four cities i.e. Bangalore, Chennai, Lucknow & Delhi and Model II in another two cities i.e. Mumbai and Ahmadabad. Each identified cities to have a pilot network of three CAAQM Stations. National thermal Power Corporation (NTPC) was engaged as procurement consultant to CPCB for execution of the project under both the selected models.

The major activities covered under the two models are to evaluate the option of contract in the identified cities for further extension/adoption in the management of National / State Ambient Air Quality Monitoring Network and to assess the viability of the said option – limiting factors. The scope of activities under Operation Contract model includes:

- Supply, installation and Commissioning of Twelve sets of AAQMS Equipment
- Operation and Maintenance of the AAQMS Equipment for a period of five years from the date of commissioning.
- Daily reporting of data pertaining to Ambient Air Quality to Central Pollution Control Board.

The scope of activities in BOO contract includes:

- Long-term contract (at least five years) between CPCB and service provider for providing Air Quality Data for the identified parameters with AQ/QC requirements
- CPCB / SPCB to supervise all the operations of CAAQMS and check Quality assurance / Quality control compliance.
- The private contractor buys the equipment, Operate and maintains the equipment according to Quality assurance / Quality control requirements, validates and disseminates data according to Terms of Reference. (ToR).
- All the cost for personnel, consumables, spares etc. to be borne by the service provider.
- Data production with specified data capturing rate and data reliability is assured through penalty clauses.

During the year 2008-2009 following activities undertaken under Operation contract:

- Completed Selection & acquisition of suitable monitoring sites & sites for installation of data display board. Handed over all the 12 sites to M/s Environment S.A.
- Required electric connection, telephone line with STD connection and other pre-requisites were provided to M/s Environment S.A.
- Detailed drawing and specification of structure being installed for mounting data display board has been reviewed, commented and provided approval on modified drawings;
- During the year 11 out of 12 stations have been installed (Table 5.17) with proper foundation work and commissioned. Fine tuning / repairs / replacement are being completed; weather monitoring system is integrated with data acquisition system. The foundation work for remaining one station in Chennai is completed and its installation & commissioning work is under progress.
- The erection of data display boards is completed for all the CAAQMS except for Chennai station.
- M/s Environment S.A. has deployed round the clock security personnel at the CAAQMS sites.
- A Room in the building of Central Pollution Control Board Head office at Delhi has been dedicated for setting up of Central Management Unit for Online transfer of data.
- Connectivity Check between Regional station & Local station and Installation of Data Acquisition System at Regional & Central station is completed.
- M/s Environment S.A., France has submitted required proposal / documents and undertaking regarding alternate O & M partner i.e. M/s Environment S.A., India.

Two Continuous Ambient Air Quality Monitoring Stations at Delhi and Continuous Ambient Air Quality Monitoring Stations (CAAQMS) at Bangalore & Chennai were inaugurated on World Environment Day i.e. 5th June, 2008.

Inauguration of CAAQMS at Delhi on 5th June, 2008 World Environment Day

The activities completed during the year under Build, Own & Operation (BOO) contract are as:

- Notice of inviting tender (NIT) for BOO was published in all leading newspapers.

- Total six requests for qualification (RFQ) applications received till its closing date. Out of six, three bidders have withdrawn their applications. The relevant division of one of the prospective developer out of three developers under consideration has been taken over and merged to overseas company leaving only two prospective developers under consideration. Present number of prospective applicants (two no.) for developers may not be considered as adequate. It was also found that developers are unable to submit certain documents sought in RFQ documents as evidence of meeting the Qualification Requirements. Therefore, RFQ document needs to be reviewed for getting better response. Considering all as above it was decided to go for fresh tendering with revised RFQ.

- A meeting of the CPCB officials was held with NTPC officials and the revised draft RFQ document submitted by NTPC / Ernst & Young was reviewed & finalized after incorporating required minor modifications.

- The financial model for BOO is under finalization by NTPC.

Table 5.16: Status of CAAQMS under Operation Contract during the year 2008-2009

City	Location	Monitoring Parameters	Status
Delhi	DMS, West Patel Nagar	$PM_{10/2.5}$, CO, SO_2, -NO_2- NO_x - NH_3, O_3, BTX	
	Netaji Subhash Institute of Technology, Dwarka	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, O_3 Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
	IHBAS, Dilshad Garden	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, BTX, HC/NMHC Analyzer Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
Lucknow	Talkatora District Industries Center	$PM_{10/2.5}$, CO, SO_2, -NO_2- NO_x - NH_3, O_3, BTX, Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	• Completed construction of shelter Foundation & erection work. • Provided required power supply & telephone connections. • Installation & Commissioning of CAAQMS is completed. • Connected with the city Central data management center and with the Central Management Unit at CPCB, Delhi. • Data display board erected.
	Dayanidhan Park	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, BTX, HC/NMHC Analyzer Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
	Kendriya Vidyalaya, Aliganj	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, O_3 Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
Bangalore	M/s Ace Manufacturing Systems, Peenya Industrial Area	$PM_{10/2.5}$, CO, SO_2, NOx-NO_2-NH_3, O_3, BTX Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
	BWSSB Kadabesanahalli	$PM_{10/2.5}$, CO, SO_2, -NO_2- NOx-NH_3, BTX, HC/NMHC Analyzer	
	Madivala Lake, near BTM layout	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, O_3, Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
Chennai	Allandur Bus Depot	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, BTX, HC/NMHC Analyzer Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
	IIT Chennai	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x, O_3 Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	
	Aavin, Ambattur Industrial Area	$PM_{10/2.5}$, CO, SO_2, NO-NO_2- NO_x - NH_3, O_3, BTX, Temp, Humidity, Wind Speed, Solar radiation, barometric pressure	• Completed construction of shelter Foundation & erection work. • Installation & Commissioning of CAAQMS is under progress.

CHAPTER VI

PRESENT STATE OF ENVIRONMENT, ENVIRONMENTAL PROBLEMS AND COUNTER MEASURES

6.1 ENVIRONMENTAL STATUS OF FRESH WATER ENVIRONMENT

6.1.1 Bio-monitoring of River Gomti in Uttar Pradesh

River Gomti is an important tributary of River Ganga. It originates from Gomat Tal near Madhotanda village of Pilibhit district in Uttar Pradesh. The total length of River Gomti is approximately 940 km, passes through district of Lakhimpur Kheri, Sitapur, Lucknow, Sultanpur and Jaunpur. The river confluences with River Ganga near village Rajwari in district Ghazipur downstream Taunpur. There River Kathna, Sarayan and River Gone are the main tributaries of River Gomti.

Based on various sources of domestic and industrial discharges in River Gomti, bio-monitoring was carried out at 24 locations. Water quality status at these locations is depicted at Table 6.1.

Table 6.1: Water Quality Status of Gomti River at various locations

S. No.	Location of River Stretch	Water Temp. (^{0}C)	pH	Dissolved Oxygen (mg/l)	Saprobic Score	Diversity Score	Biological Water Quality Criteria	Biological Water Quality
1.	Madhotanda, 30 km from Pilibhit , L.H. Sugar factory	29.3	-	6.5	4.4	0.739	C	Moderate Pollution
2.	Near Biharipur bridge, Puranpur road, canal by road	32.0	7.80	2.9	4.6	0.38	C	Moderate Pollution
3.	5 km from Gomti Gurudwara, Puranpur road bridge,40 km from Pilibhit	29.0	7.80	0.6	5.0	0.64	C	Moderate Pollution
4.	Near Ghungchai Bridge	32.0	8.00	4.7	5.5	0.79	C	Moderate Pollution
5.	Ghatampur, near bridge, 25 km away from Gola district	34.0	7.80	5.4	6.0	0.28	C	Moderate Pollution
6.	Near Bridge at Nemesarai	32.0	7.80	5.3	6.0	0.42	C	Moderate Pollution
7.	River Gon at Kamlapur	18.0	7.87	8.0	5.24	0.62	C	Moderate Pollution
8.	River Sarayan, B/c to Gomti river at Kudo village	20.0	7.93	8.0	5.4	0.4	C	Moderate Pollution
9.	River Gomti A/c River Sarayan at Bhatpur	20.0	8.40	8.1	5.12	0.5	C	Moderate Pollution
10.	River Kathna towards Hardoi Road, near Kutub Nagar	18.0	8.23	9.0	6.0	0.45	C	Moderate Pollution
11.	Upstream River Gomti at Ghailghat, Lucknow	20.0	8.06	9.7	5.5	0.4	C	Moderate Pollution

S. No.	Location of River Stretch	Water Temp. (^{0}C)	pH	Dissolved Oxygen (mg/l)	Saprobic Score	Diversity Score	Biological Water Quality Criteria	Biological Water Quality
12.	Upstream River Gomti at Water intake, Gaughat, Lucknow	18.0	7.99	9.0	5.71	0.41	C	Moderate Pollution
13.	River Gomti at Pipraghat, Lucknow	18.0	7.59	4.0	1.75	0.19	E	Severe Pollution
14.	River Gomti at Kuda village	20.0	8.21	8.7	3.8	0.5	C	Moderate Pollution
15.	River Gomti (1) B	-	-	-	5.8	0.4	C	Moderate Pollution
16.	River Reth at Ghuskarghat, Barabanki	20.0	7.36	7.5	4.33	1.0	C	Moderate Pollution
17.	River Gomti a/c of River Reth near Bastauli village,Lucknow	21.0	7.50	4.5	4.0	0.08	D	Heavy Pollution
18.	River Gomti a/c of River Loni,near Salempur village, Lucknow	23.0	7.64	5.7	2.0	0.15	E	Severe pollution
19.	River Gomti a/c River Sai,Trimuhani, Rajepur village, Sarkoni,Distt. Jaunpur	25.0	7.54	8.5	6.0	0.39	C	Moderate Pollution
20.	River Sai upstream, Trimuhani, Rajepur village, Sarkoni, Distt. Jaunpur	25.0	7.78	7.2	5.5	0.68	C	Moderate Pollution
21.	River Gomti, downstream Sultanpur	26.0	7.88	9.8	5.0	0.75	C	Moderate Pollution
22.	River Gomti a/c Kadu Nala at Bhaddaurghat, Jagdishpur,Distt. Sultanpur	26.0	8.03	9.5	6.0	0.72	C	Moderate Pollution
23.	River Loni, Near Salempur Village, Lucknow	22.0	7.73	9.6	5.0	0.37	D	Heavy Pollution
24.	River Gomti at Rajwari, Distt. Banaras, before confluence Ganga	31.0	8.00	8.6	5.42	0.67	C	Moderate Pollution

NA = Data not available.

It was observed during the survey that River Gomti originates in the form of a pond at Madhotanda, thereafter it develops a number of wetland downstream at Biharipur village. River Gomti acquired its flow at Puranpur village near Gomti Gurudwara. However, further downstream at Ghungchiai, river attains negligible flow due to development of wetland on a vast area. Sampling was continued at Ghatampur, 25 km downstream of Gola village and Nemasarai. Bio-monitoring results indicated Moderate pollution (Class 'C') in 83% of the River stretch. Heavy pollution (Class 'D') was observed at two locations namely, River Gomti a/c of River Reth near Bastauli village, Lucknow and in River Loni, near Salempur village, Lucknow. Severe pollution (Class 'E') in water quality was also observed in River Gomti at Pipraghat, Lucknow and at River Gomti a/c of River Loni near Salempur village, Lucknow. The stretch in Clean water quality Class 'A' and slightly polluted Class 'B' water quality have not been observed, as per Biological Water Quality Criteria.

6.1.2 Assessment of River (Ganga & Yamuna) Water Quality at Sangam during Magh Mela

Considering the potential of pollution due to mass bathing during the Magh Mela, Central Pollution Control Board has undertaken detailed study for assessment of impact of mass bathing on the water quality of river Yamuna and Ganga at Allahabad. During the study regular monitoring was carried out on major bathing days i.e. January 9th -16th, 2009, January 26th 2009, and February 23rd, 2009 during Magh Mela Period.

Pilgrims take bath on large scale at Sangam, Allahabad being the confluence of River Ganga and River Yamuna. The water quality as observed during Mela Period did not conform with the designated best use of bathing. The concentration of BOD, total and fecal coliform was found higher than the desired value. BOD level was observed in the range of 3 mg/l to 11 mg/l, while dissolved oxygen level ranged between 8 to 10 mg/l (Table 6.2). The increase in BOD value on the day of Mauni Amawasya (26th January, 2009) can be attributed to congregation of maximum pilgrims (approx. 100 lakh) who have taken bath in the river.

Pilgrims taking bath and undertaking Rituals during Magh Mela

Pilgrims Congregation at Sangam during Magh Mela

Table 6.2: Water Quality of River at Sangam in Allahabad during Magh Mela Period

Date of analysis	Field Analysis		General		Organic Matter		Major Ions
	pH	Electrical Conductivity (µs/cm)	Color (Hazen)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	Cl^- (mg/L)
09/01/2009	8.7	552	20	9	8	29	28
10/01/2009	8.6	541	17	9	7	26	31
11/01/2009	8.7	549	18	9	4	19	28
12/01/2009	8.8	548	23	9	3	15	30
13/01/2009	8.7	531	23	9	3	15	35
14/01/2009	8.8	554	22	9	7	28	25

Date of analysis	Field Analysis		General		Organic Matter		Major Ions
	pH	Electrical Conductivity (µs/cm)	Color (Hazen)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	Cl^- (mg/L)
15/01/2009	9.0	506	15	9	6	23	24
16/01/2009	9.0	510	15	9	6	21	28
26/01/2009	8.7	521	22	10	11	31	22
23/02/2009	8.1	525	12	8	3	11	34

6.1.3 Impact Assessment of Idol Immersion on Water Quality of Bhopal Lake during Ganesh Chaturthi and Durga Pooja.

A large number of idols are generally being immersed in the water of Bhopal Lake during Ganesh Chaturthi and Durga Pooja festivals. It is observed that this activity has significant impact on the water quality (Table 6.3). A study was undertaken to assess the impact of idol immersion on the water quality of Bhopal Lake.

Table 6.3: Water Quality of Bhopal Lake during Ganesh Chaturthi and Durga Pooja

Location	Observation	pH	Conductivity	Total Solids	Total Suspended Solids	Total Dissolved Solids	Total Hardness	COD	BOD	Chloride	NO_3	PO_4
Bairagarh	I	7.08	334	350	12	338	132	24.4	03	42	0.03	1.5
	II	7.30	805	672	26	646	213	156	42	29	0.09	0.16
	III	7.61	1220	978	24	954	240	102	35	39	BDL	0.09
Khanugoan	I	7.60	178	236	60	176	102	21.2	07	32	0.04	BDL
	II	7.50	170	248	136	112	76	99	09	10	0.03	0.16
	III	7.32	202	220	12	252	110	27	< 1	11	0.02	0.04
Kamla Park	I	7.20	174	240	36	204	96	19.6	01	29	0.02	BDL
	II	7.88	172	122	12	110	48	47	04	11	0.02	0.018
	III	7.30	200	176	14	162	96	18	02	10	0.02	0.02
Vanvihar	I	7.29	302	384	20	364	120	26.4	06	39	0.20	0.76
	II	7.52	573	380	22	358	159	289	27	41	0.49	1.65
	III	7.67	752	456	14	442	130	35	42	49	0.08	1.45
Prempura Ghat	I	7.27	485	426	68	358	128	34	10	59	0.30	1.75
	II	7.33	592	384	24	360	140	358	22	42	0.20	1.42
	III	7.50	862	510	30	480	142	94	47	60	0.46	0.95
Bhoj Bridge	I	7.08	596	504	62	442	110	67.6	09	72	0.07	1.25
	II	7.02	690	436	32	404	155	53	32	45	0.53	0.02
Bhadbada Bridge	I	7.38	547	504	58	446	140	72.4	14	65	0.80	0.02
	II	7.60	612	486	68	418	131	242	51	40	0.52	1.61
	III	7.43	790	430	136	294	112	58	50	25	0.40	0.82

NOTE: I – Monitoring undertaken on 10.09.2008 before Ganesh Chaturthi festival
II – Monitoring undertaken on 29.09.2008 after Ganesh Chaturthi festival but before Durga Pooja
III – Monitoring undertaken on 22.10.2008 after Durga pooja
TH- Total hardness
All values in mg/l except pH & conductivity. Conductivity in µs/cm

6.1.4 Water Quality of River Suswa, Dehradun (U. P.)

The river Suswa joins the tributary Song River, which finally merges into the river Ganges at Hardwar. There is no sewage treatment plant in Dehradun city for treating the sewage generated from various sources. Thus, all the city sewage is being discharged directly into the river Suswa just after its origin at Maturawala, without any treatment. The river Suswa flows like a drain as it passes through the Rajaji National Park forest area.

The water quality of the river is presented in Table 6.4. To restore the water quality of river, it is recommended that the sewage generated in the area should be treated before discharging into the river. Possibility of treating the entire sewage of the area at a common STP required to be explored.

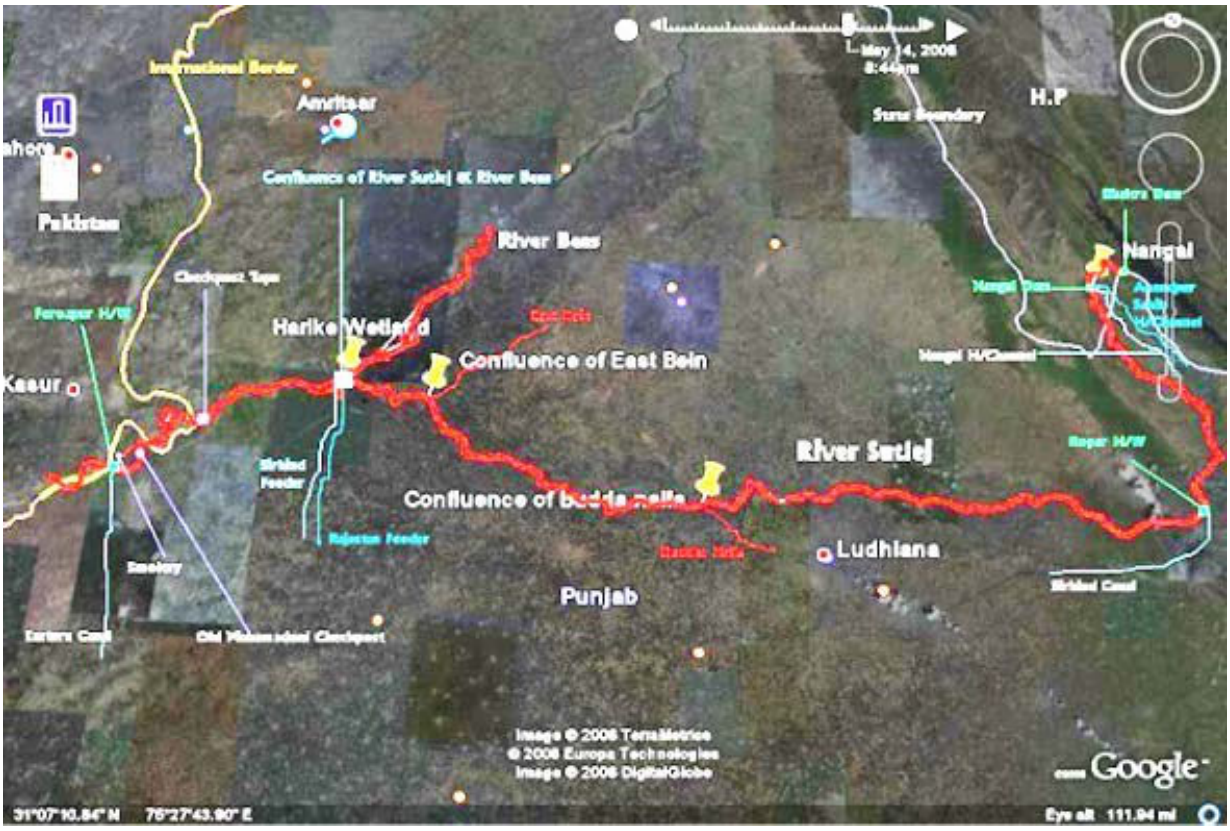
Table 6.4: Physico-chemical Water Quality in different stretches of the River Suswa

Location	Suswa river at origin	Ripsana drain b/c Suswa river	Suswa river a/c Ripsana drain	Bindal drain b/c Suswa river	Suswa river a/c Bindal & Ripsana drain	Suswa river in Rajaji Park
pH	6.2	6.9	6.5	6.7	6.7	6.7
Conductivity	793	904	855	1031	1035	506
SS	5.1	23.3	20.2	61.2	69	1593
TDS	338	371	321	458	397	292
FDS	119	169	75	206	128	110
Total Hardness	289	280	289	353	344	260
Chloride	11	26	19	25	34	4.99
Fluoride as F	0.1	0.3	0.3	0.2	0.2	NT
Sulphate as SO_4	210	111	121	100	98	103
Phosphate as P	0.2	0.9	0.6	0.8	0.9	0.9
Ammonical Nitrogen	0.0	2.4	2.2	2.3	2.5	7.8
DO	7	6	4	5	5	BDL
COD	11	54	31	63	73	860
BOD	ND	11	7	12	16	159
Total Coliform MPN/100 ml	$2.2x10^3$	$1.7x10^5$	$1.7x10^4$	$3x\ 10^5$	$1.7x10^5$	$8x\ 10^5$
Faecal Coliform MPN/100 ml	$3.4x\ 10^2$	$5\ x\ 10^4$	$8\ x\ 10^3$	$1.7x\ 10^5$	$1.3x\ 10^5$	$2.7x\ 10^5$

Remark: All values except pH and conductivity are expressed in mg/l
BDL = Below Detection Limit; ND = Not Detectable.

6.1.5 Water Quality Status of River Sutlej in Punjab

Sutlej River is the longest (1450 km) of the five rivers that flow through Punjab in northern India. River Beas is the major tributary of this river. After confluence with River Beas, the major part of its flow is diverted through two canals namely Rajastan feeder and Srihind feeder. During the water quality monitoring, nearly all the flow was diverted to the canals at Harike and there was hardly any flow in the river downstream Harike.



Natural flow of River Satluj and Beas

The water quality of river confirms to the Class A except coliform, while it enters the Punjab at Nangal. The water quality deteriorates after confluence of Buddha Nalla and East Bein which carries the industrial and domestic effluent from Ludhiana, Macchiwara, Phillore, Phagwara and Jallander cities. The water quality in the river improves after the confluence of River Beas at Harike and it confirms to designated class A except coliforms. The coliforms counts were found less near the international boundary as compared to the counts in River Sutlej u/s of Harike confluence point with Beas. Slight increase in the values of TDS, Magnesium, Chloride, Sodium, Potassium, Chloride, sulphate and nitrate was observed at BSF check post, Samoke (where the river re-enters in the country from Pakistan Territory). The water quality of river confirms to class B at Firozpur Head Works and BSF check post at Muhamadwal.

6.1.6 Lake Water Quality at Bangalore

About few decades back, Bangalore was having 262 lakes, but presently only 81 of these exist. The water quality of these lakes is badly affected due to sewage flow and urbanization. Efforts have been made to clean and revive some of these lakes particularly Ulsoor lake, Sanky tank, Madiwala lake and Hebbal lake.

During the year 2008-09, two rounds of water quality monitoring study was undertaken for Ulsoor lake, Sanky tank, Hebbal lake and Madiwala Lake. Water samples were collected near to the inlet and outlet points of the above lakes and analysed for pH, Conductivity, Dissolved Oxygen, BOD, COD, Alkalinity, Solids, Chloride, Sulphates, Fluoride, Sodium, Potassium, Boron, Hardness, Calcium, Magnesium, Nitrates, Ammonical nitrogen, Chlorophyll, P/R Ratio and Heavy metals.

It has been observed during the study that Ulsoor lake has been transformed in the Eutrophic conditions though the sewage enters only during rainy season. Phosphate and nitrogen levels have been found above the prescribed water quality limits of 30 µg/l and 1.5 mg/l respectively. In Sanky Tank only storm water enters and no sewage contamination noticed. Sanky Tank is comparatively less polluted with less phosphate and nitrogen content. Separate Ganesh Idol immersion pond is also available here. Treated waste water from Sewage Treatment Plant enters into Madiwala lake. However, the Sanky Tank ecological condition is eutrophic with high level of phosphate and nitrogen. Hebbal lake is leased to a hotel management group for recreation activities and only legal minimum water level is maintained here.

6.2 GROUND WATER QUALITY STATUS

6.2.1 Ground Water Quality Status in Madhya Pradesh

Thirty two ground water bodies have been monitored by Central Board in the Madhya Pradesh state. These water bodies are located at Jabalpur, Nagda, Ratlam, Gwalior, Indore and Bhopal. The water from these monitored bodies is generally used for drinking and other domestic purposes. Only few water bodies are being used for industrial or agricultural purposes. The ground water reflects the water quality status at selected cities of Madhya Pradesh is presented in Table 6.5.

Table 6.5: Ground Water Quality Status at selected Cities of Madhya Pradesh

S. No	Location	Approx. Water Level in m	pH	Conductivity µS/cm	TDS mg/l	Chloride mg/l	PO_4 mg/l	NO_3 mg/l	Alkalinity mg/l
Jabalpur									
1.	Kamla Chemical, Richai Industrial area	200	7.12	1610	1008	232	1.43	0.10	338
2.	Bhashkar Lubricant, Richai Industrial area	150	7.49	599	364	33	4.12	0.06	289
3.	Seana Industries,Adhartal I.Area	120	6.76	712	474	80	0.68	0.06	163

S. No	Location	Approx. Water Level in m	pH	Conductivity µS/cm	TDS mg/l	Chloride mg/l	PO_4 mg/l	NO_3 mg/l	Alkalinity mg/l
4.	Samdria Green City, MSW dump site	50	7.37	703	438	39	1.68	0.08	259
5.	Lalita Colony, H. No. 86 Nehru ward	100	7.78	250	144	13	5.62	0.03	137
6.	Ranital Old MSW dump site	125	7.74	2290	1740	339	1.43	0.71	370
7.	Kathonda,to be the New MSW site	110	7.29	614	354	11	0.81	0.01	368
Nagda									
1.	Ingoria Road near ESI Hospital, Nagda	260	7.53	1300	900	170	1.19	0.08	285
2.	Mahitpur road MSW site, Nagda	300	7.41	1290	882	174	0.56	0.096	245
3.	Near Nagar Palika, Nagda	200	7.48	2790	2164	571	0.56	0.096	306
4.	Mehtwas near, Wter tank, Nagda	150	7.33	2230	1572	340	0.94	0.114	532
Indore									
1.	Near Khalsa Dhaba	225	7.59	2160	1604	313	0.31	0.380	189
2.	Near MSW dumping site, Devguria	22	8.22	2490	2210	344	7.37	0.810	386
3.	Polo Compound Industrial area	300	7.89	1300	808	122	0.69	0.068	490
4.	Sawer road Indutrial area	250	7.70	1760	1224	243	4.0	0.109	435
5.	Tarawali village near Promary School	300	7.59	935	610	73	4.12	0.073	405
Ratlam									
1.	Field of Badvi ba, Titri, near Trenching ground Ratlam	300	7.22	2740	2170	413	NT	4.0	509
2.	Kazipura road (near Wasim Kirana), Ratlam	200	6.94	1420	1008	126	NT	3.0	866
3.	M/s. ACMA Fero Allove Industry, Ratlam	240	6.71	11700	11376	2993	NT	0.29	635
4.	Shiv Kashtbhaghya Haniman Mandir, Indutrial area, Ratlam	110	7.03	1800	1410	253	NT	0.66	803
Gwalior									
1.	Chandrabadni Nakka, Shivpuri Road	300	7.5	930	553	119	0.018	0.005	346
2.	Laxman Taliya , Old MSW site	120	7.4	633	445	33	0.030	0.07	298
3.	Maharajpura Ind. Area	305	7.1	1400	954	241	0.004	0.06	385
4.	Birla Nagar,Ind. Area	125	7.4	1150	747	50	0.003	0.116	549
5.	Jawahar Colony, Campo	300	7.9	1040	815	117	0.003	0.270	298
Bhopal									
1.	MSW site Bhanpura Vidisha road	115	6.98	1120	689	121	BDL	1.86	432

S. No	Location	Approx. Water Level in m	pH	Conductivity µS/cm	TDS mg/l	Chloride mg/l	PO_4 mg/l	NO_3 mg/l	Alkalinity mg/l
2.	MSW site Bhanpura Vidisha road	250	6.76	1320	898	162	BDL	2.52	426
3.	Adarsh nagar industrial area Goutam Nagar	150	7.29	1350	880	212	BDL	2.66	356
4.	Barkheda Pathani	150	7.35	1060	680	202	BDL	0.26	190
5.	Nayapura Mavati masjid Mandideep Industrial area	150	7.17	840	513	84	BDL	1.43	299
6.	Muncipal Corporation, Indira nagar, Mandideep I A	330	7.59	1800	1389	291	BDL	3.12	379
7.	Pump house Kaliasote, Mandideep Industrial area	300	7.33	973	594	84	BDL	0.40	424

6.2.2 Ground Water Quality near Treatment Storage Disposal Facilities (TSDFs) Sites in Gujarat & Maharashtra

There are eight TSDFs located in different industrial estates of Gujarat. Central Pollution Control Board has carried out ground water quality monitoring in and around two TSDF sites located in Gujarat in order to assess the status ground water quality. In long run, the study may help in finding out the trend.

The groundwater quality studies at TSDF GEPIL, Surat reveals highest COD and TDS values as 164 mg/l and 37962 mg/l respectively. The groundwater quality at TSDF BEIL, Ankleshwar reflects maximum concentration of COD, TDS and hardness as 22 mg/l, 1910 mg/l and 523 mg/l respectively. The concentration of other parameters viz. TKN, NO_3-N, and NH_3-N were also found elevated in the ground water. The COD value measured in the leachate wells of BEIL TSDF, Ankleshwar was as high as 20794 mg/lit, however this leachate being collected and treated at Common Effluent Treatment Plant.

6.2.3 Assessment of Ground Water Contamination using Mass Transport Modelling in Ranipet, Tamil Nadu

Unscientific and illegal disposal of hazardous wastes in the environment has resulted in contamination of soil and aquatic resources and reclamation of such areas needs resources and time. Present study deals with case study at chemical industry at Ranipet, Vellore District (Tamil Nadu). The industry is producing Sodium Bi-chromate Crystals and Chromium Sulphate tanning powder since year 1975 and dumped its chromium waste (mainly Hexavalent chromium) of about 2.2 lakh tonnes within the factory premises.

The leachate generated from the dump site contaminated the soil and the groundwater of the surrounding areas with chromium. Due to the hazardous nature of contamination, Central Pollution Control Board and Tamil Nadu Pollution Control Board alongwith NGRI and IIT, Chennai conducted detailed study to assess the groundwater contamination including hydro-geological features. The study revealed

that downstream of the dump site (upto 5 km radius) contaminated with significant quantity of hexavalent chromium. Extensive withdrawal and use of groundwater for agricultural purposes was mainly responsible for this situation. The groundwater use for agricultural activity has been stopped in the surrounding areas. Based on the data collected, groundwater modelling (Fig.6.1) undertaken using 'Mode Flow' software, which indicated movement of chromium and concluded that remedial measures are required to be taken at the site. As a follow-up to the development of model and lab scale experiments at Indian Institute of Technology, Chennai, a field scale pilot plant bioremediation of contaminated site and groundwater is being taken up through IIT, Chennai.

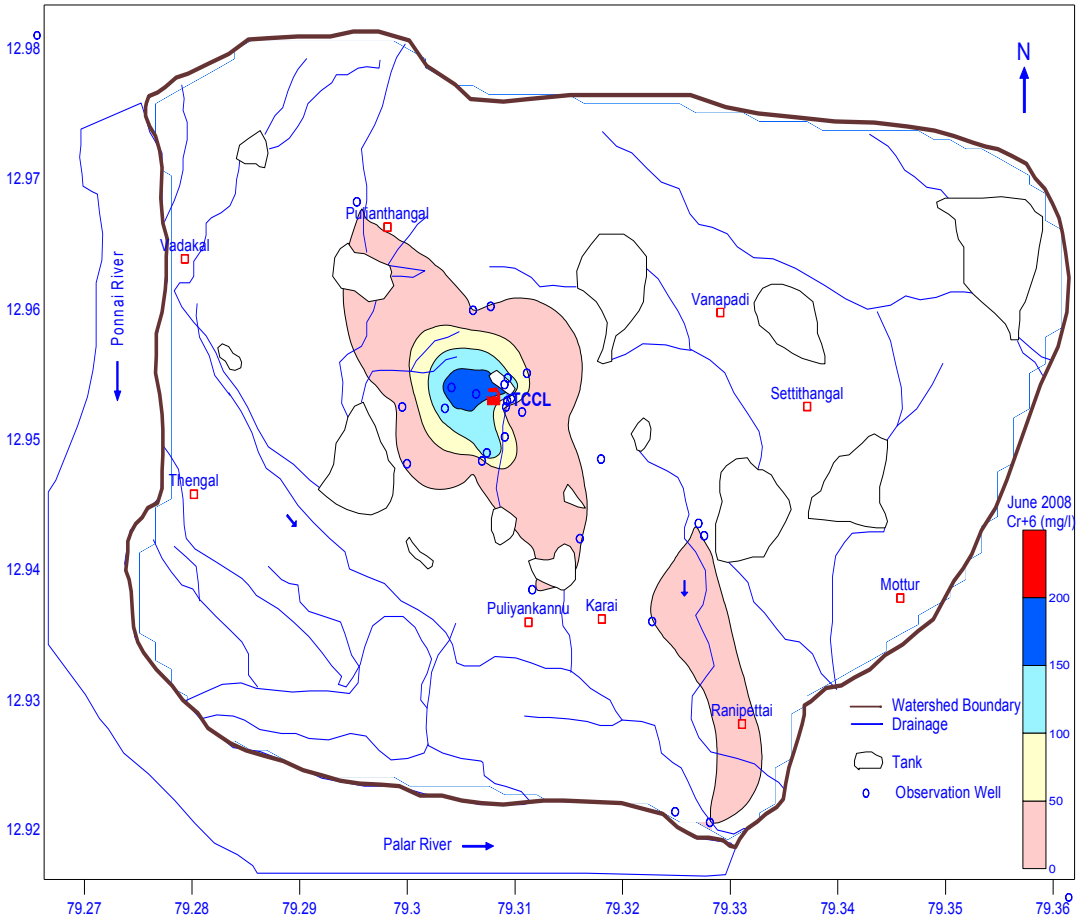


Fig. 6.1: Mass Transport Modeling for Groundwater Contamination in Ranipet, Tamil Nadu

6.2.4 Fluoride Contamination of Groundwater in West Bengal

The most basic needs of human are to have access to safe drinking water. Though, monitoring of ground water quality undertaken at National level, but actual status of ground water quality particularly in rural areas are not available. As a result, people are using ground water for drinking and cooking purpose without knowing the quality of water leading to exposure of public to various diseases. The earlier studies of CPCB mainly emphasized the level of arsenic contamination in ground water in West Bengal and Bihar, its impact on people's health and performance of various technologies for the treatment of arsenic in ground water. A large number of areas in

West Bengal and Bihar are prone to fluoride contamination in ground water. Therefore, the study has been undertaken at some blocks of Purulia and Birbhum districts in West Bengal to evaluate the trend of fluoride in groundwater. Total 55 tube wells were monitored in affected blocks of Purulia and Birbhum districts in West Bengal. The monitoring has been undertaken throughout the year to evaluate the level of contamination, temporal and spatial distribution of fluorides and interrelation among various water quality parameters.

The analytical result indicates (Table 6.6) that the fluoride concentrations were varying from 0.46 – 5.2 mg/l with average concentration of 1.64 mg/l. It has been inferred for the study that most of the areas are already contaminated with fluoride. Therefore, intensive survey needs to be carried out to identify the groundwater sources, which are highly contaminated so that necessary remedial action may be taken.

Table 6.6: Average Concentration in ground water (55 Tubewells)

	pH	Conductivity	TDS	F	SO_4	TH	Ca	Mg	Alk	Cl	NO_3	PO_4	Fe	Mn	Zn
Concentration	7.4	704	495	1.64	46	241	74	14	159	78	5.47	.04	3.1	0.3	0.72

All values are in mg/l except pH and conductivity which is in µs/cm

6.2.5 Ground Water Quality at Agra

There has been reports that there has been contamination of groundwater due to non installation of proper lining at the oxidation pond based STPs at Agra at Buri-ka-nagla and Pila-khar. The water quality status at studied locations in terms of general water quality parameters and heavy metals are presented in Tables 6.7 and 6.8. The chloride contamination (a conservative parameter) was observed at three locations (two locations near to Buri ka Nagla and one location near Peela Khar. However, No heavy metal contamination of ground water observed.

Table 6.7: Ground Water Quality around Oxidation Pond based Sewage Treatment Plant at Agra City (December, 2008)

Location	Description of sampling site with approx distance from STP	pH	Conductivity (µmhos/cm)	TDS (mg/l)	Chloride (mg/l)
Raddi Godown	Submersible 20 m distance from Boori Ka Nagla STP	8.05	2340	1404	219
Construction Site	Submersible 25 m distance from Boori Ka Nagla STP	7.96	2540	1530	222
Residential House	Hand Pump 50 m distance from Boori Ka Nagla STP	7.98	2240	1300	209
Mandir	Hand Pump 40 m distance from Boori Ka Nagla STP	7.97	1510	906	126
Residential House	Hand Pump 30 m distance from Boori Ka Nagla STP	7.88	2340	1426	230

Location	Description of sampling site with approx distance from STP	pH	Conductivity (µmhos/cm)	TDS (mg/l)	Chloride (mg/l)
Mangla Vihar (I)	Hand Pump 200 m distance from Peela Khar STP	7.93	5070	3346	1021
Mangla Vihar (II)	Hand Pump 225 m distance from Peela Khar STP	7.82	8470	5336	2172
Peela Khar (I)	Hand Pump 80 m distance from Peela Khar, near bypass of STP	7.85	2050	1230	316
Peela Khar (II)	Hand Pump 100 m distance from Peela Khar, near bypass of STP	7.88	9840	6296	3198

Table 6.8: Heavy metal Concentration around Oxidation Pond based Sewage Treatment Plant at Agra City
(December, 2008)

Description of sampling site with approx distance from STP	Heavy Metals concentration (mg/l)						
	Cd	Cr	Cu	Fe	Ni	Pb	Zn
Submersible, background site	NT	NT	NT	NT	NT	NT	0.96
Hand Pump 150 m distance from Peela Khar	NT	NT	0.10	0.92	NT	NT	0.01
Hand Pump 160 m distance from Peela Khar	NT	NT	0.10	1.82	NT	NT	1.25
Hand Pump, 25 m distance from Peela Khal	NT	NT	0.06	0.87	NT	NT	0.04
Hand Pump, 50 m distance from Peela Khal	NT	NT	0.18	1.20	NT	NT	1.81
Hand Pump 50 m West Nagla Rambal Landfill site	NT	NT	0.04	10.50	NT	NT	0.31
Hand Pump 50 m West Nagla Rambal Landfill site	NT	NT	0.06	2.66	NT	NT	0.23
Hand Pump 25 m East Nagla Rambal Landfill site	NT	NT	0.52	0.96	NT	NT	0.98
Submersible 50 m East Nagla Rambal Landfill site	NT	NT	0.05	0.17	NT	NT	0.16
Hand Pump 50 m distance from Boori ka nagla	NT	NT	0.06	0.24	NT	NT	2.66
Hand Pump 40 m distance from Boori ka nagla	NT	NT	0.09	0.56	NT	NT	0.14
Hand Pump 50 m distance from Boori ka nagla	NT	NT	0.12	1.72	NT	NT	0.95
Hand Pump 60 m distance from Boori ka nagla	NT	NT	0.04	1.54	NT	NT	0.49

6.2.6 Status of Ground Water/Supply Water Quality in Major Cities of North East States

The ground water is used for domestic purposes at most North Eat states. The ground water sources are prone to contamination due to improper management of municipal solid waste (MSW). MSW is dumped in an open area without any consideration of environmental contamination. This usually results in contamination of ground water sources due to percolation of lechates. The quality water supplied through pipelines for domestic consumption is also prone to contamination due to leakages. The study was undertaken with the objective to assess the quality of both the ground and piped supply water at Jorhat (Assam), Imphal (Manipur) and Aizawl (Mizoram) towns in North-East states.

Analysis of the collected samples indicates that ground water is moderate to extremely hard. pH of the most of the ground water samples were within permissible limits. However, conductivity and turbidity were observed high in most of the samples. The water quality status at Jorhat (PHED water supply) and Aizawl (ground water) is presented in Tables 6.9 and 6.10.

Table 6.9: Status of Water Quality supplied by PHED at Jorhat (Assam)

Sampling Locations	pH	Turbidity (NTU)	Conductivity (mS/cm)	Hardness (mg/l)
Boliagohain Pukhuri	6.48	53.8	0.22	77
Bongal Phukhuri Raw Water	7.24	9.3	0.37	102
Bongal Phukhuri Treated Water	7.1	8.5	0.33	88

Table 6.10: Ground Water Quality Status at Aizawl, Mizoram

Source	pH	Turbidity (NTU)	Conductivity (mS)	Hardness (mg/l)	TSS (mg/l)	TDS (mg/l)	Chloride (mg/l)	Calcium (mg/l)	Sulphate (mg/l)
Chaltlang	7.0	11.7	0.31	120	5	376	24.8	52.4	0.1
Ramhlun	7.0	97.1	0.19	85	15	176	12.2	87.4	0.3
Chhinga Veng	7.0	18.8	0.56	262	8	482	38.9	238.8	1.8
St. 4 Republic Veng	7.0	1.5	0.47	204	4	355	17.2	143.7	0.05
Tuikual	7.0	7.4	0.53	151	6	516	86.8	85.4	3.3

6.3 STATUS OF WASTE WATER OUTFALLS

6.3.1 Survey and monitoring of major drains in NCT Delhi

Twenty one major wastewater drains of NCT- Delhi are being monitored regularly by Central Pollution Control Board on monthly basis. Out of twenty one drains, seventeen drains joins river Yamuna, three joins Agra canal and one drain joins Gurgaon canal. On the basis of annual average the total discharge and pollution load (BOD load) of these drains during the year 2008 was about 50 m^3/sec. and 270 Tonnes per day (TPD) respectively. Out of total BOD load, the load of 44 TPD joins canals, while BOD load of 226 tonnes per day joins Yamuna River. Najafgarh drain is the biggest drain contributing maximum both in terms of discharge and BOD load followed by Shahdara drain (Fig. 6.2 and 6.3). These two drains contribute about 58% and 75% of Total BOD load and Total discharge of all the monitored drains. The pollution load of these drains was about 1.8% less during the year 2008 in comparison to year 2007, whereas the discharge increases by about 5% (Fig. 6.4). This trend in BOD load and discharge might be due to prolonged rainfall at NCT-Delhi during year 2008.

A detailed survey has also been carried out along both the banks of River Yamuna Delhi stretch and various canals that falls in NCT- Delhi. The objective of survey was to identify any additional wastewater outfalls, which has been formed due to development activities, joining River Yamuna & canals and not yet identified. The discharge and pollution load of newly identified drains has also been measured. It was observed during the survey that no additional drain besides Shahdara drain joins Yamuna River on its left bank. While on the right bank six new drains join the river, Out of these six drains, only two drains i.e. Jaitpur Thana drain and Abul Fazal drains are identified as major source of pollution. Two drains out of existing 21 drains i.e. Drain No.12 A and drain at LPG bottling plant, instead of joining Yamuna River join Sen Nursing Home and Tuglakabad drain respectively. Ten additional drains (only five are contributing significant pollution) were found joining canals. Kalkaji drain instead of joining Agra canal joins Sarita Vihar bridge drain. Thus, there are 25 major wastewater drains, out of which 17 joins Yamuna River and 8 drains join Agra / Gurgaon canals.

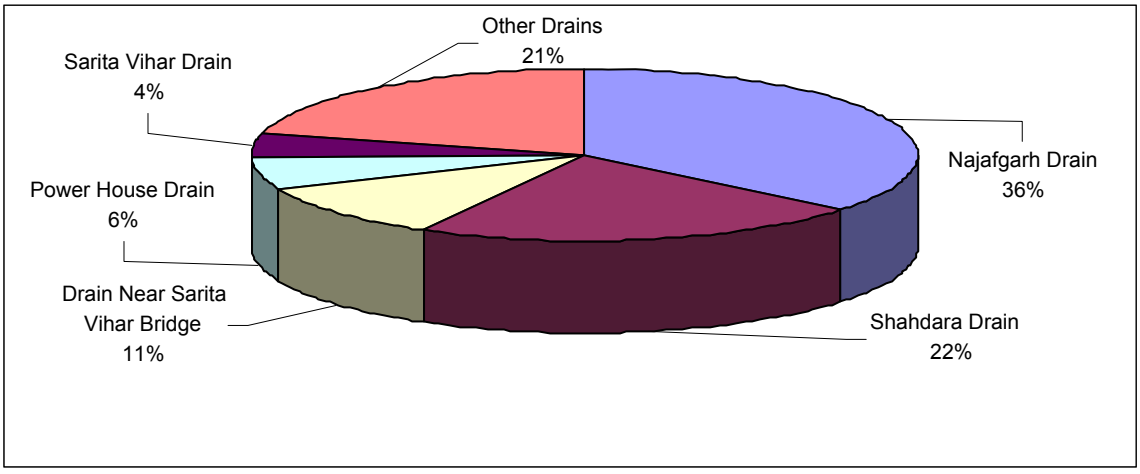


Fig. 6.2: BOD Load Contribution of various wastewater Drains at Delhi (year 2008)

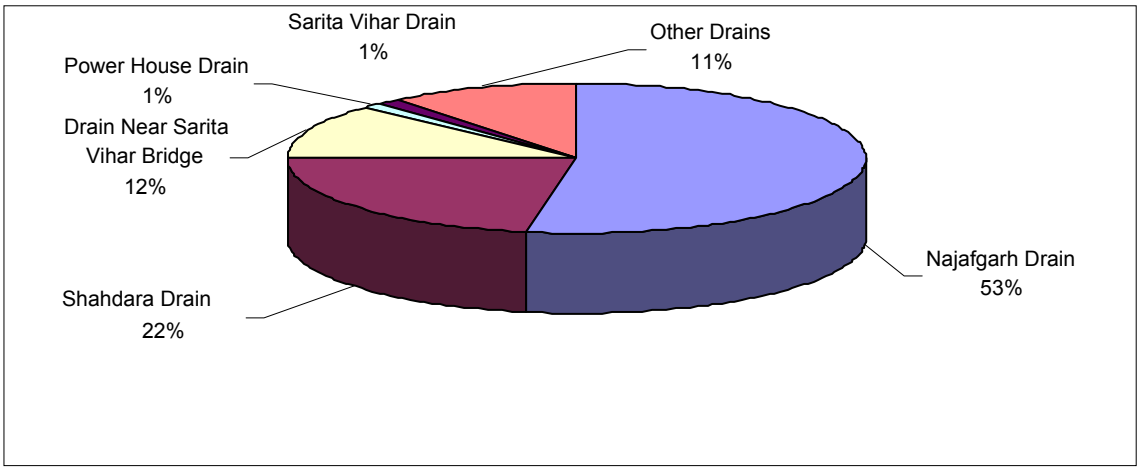


Fig. 6.3: Discharge Contribution of various at Delhi (year 2008)

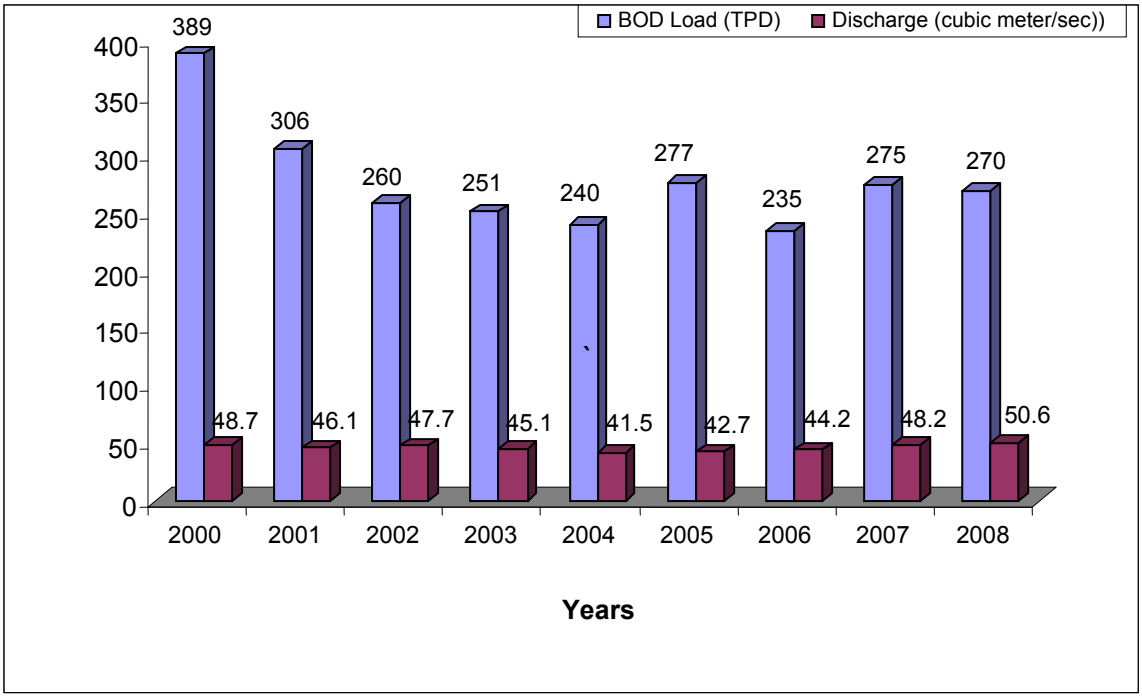
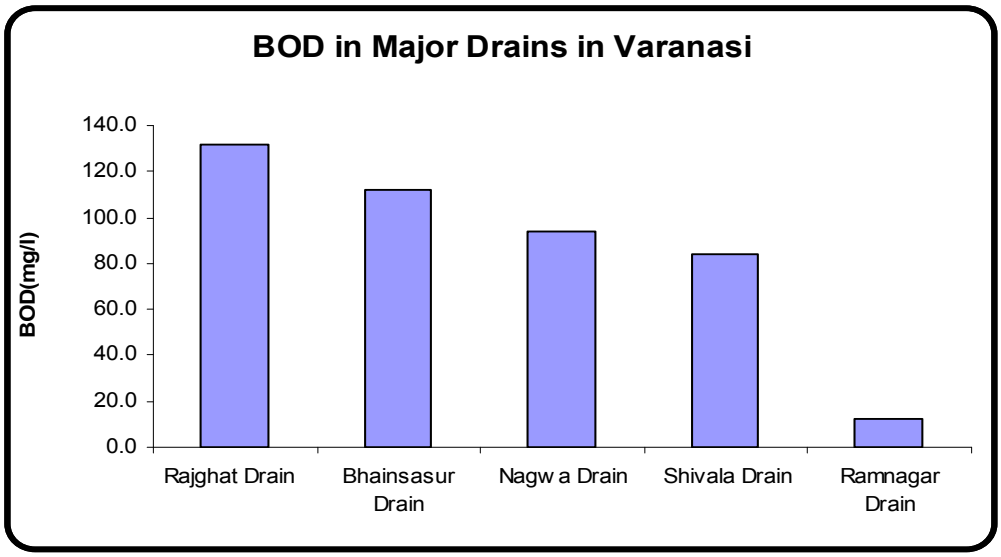
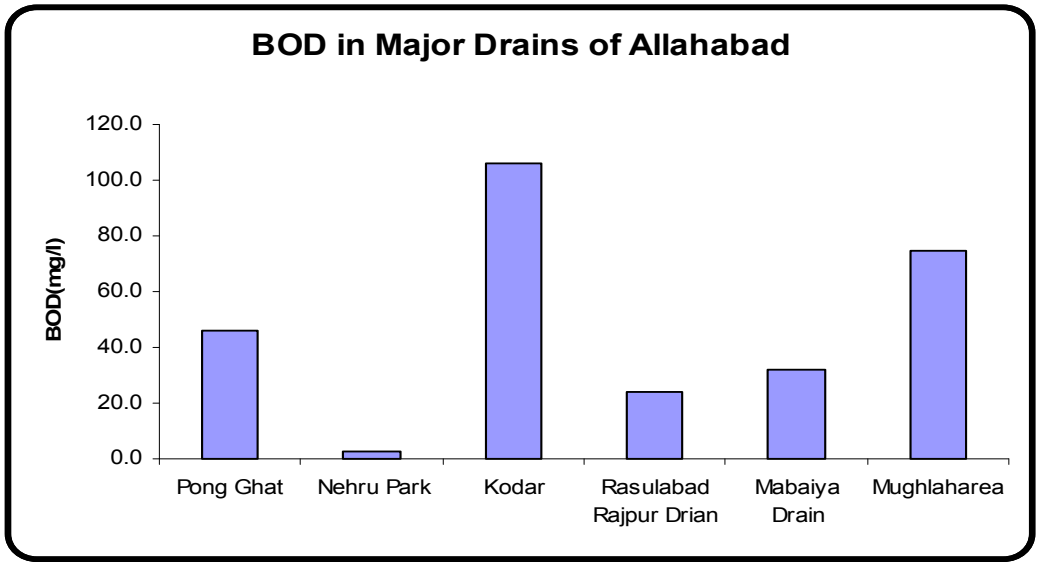


Fig. 6.4: Trend of BOD Load & Discharge Contributed By Major Drains at Delhi

6.3.2 Status of Wastewater outfalls at Varanasi, Allahabad and Mirzapur

Characterization of major waste water outfalls was undertaken once during the reporting year. During the study, six drains at Allahabad, five at Varanasi and two at Mirzapur were monitored for eleven Parameters. The status of BOD in wastewater in major drains at Varanasi, Allahabad and Mirzapur is presented in Fig. 6.5.





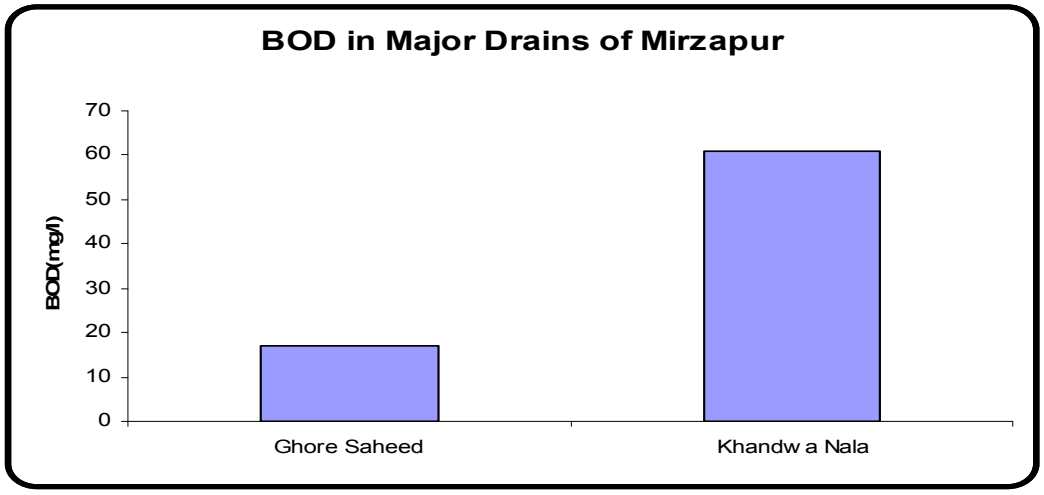


Fig. 6.5: Bio-chemical Oxygen Demand in various Drains at Varanasi, Allahabad and Mirzapur

6.4 STATUS OF ATMOSPHERIC ENVIRONMENT

6.4.1 Air / Noise Monitoring at Various Cities during Deepawali / Navaratri

DELHI

Ambient air quality is being measured during Deepawali days for the past many years. During Deepawali days, the air quality deteriorates alarmingly due to the bursting of crackers. In order of assess the air pollution caused due to bursting of crackers, ambient air quality was measured in Delhi at seven locations (industrial, residential and traffic intersection).

Sulphur dioxide concentrations on Deepawali day during year 2008 decreased at all locations as compared to same day during year, 2007. The concentration of SO_2 ranged between 7-24 µg/m^3 as compared to Deepawali day, 2007 SO_2 8-113 µg/m^3 during year 2007. Levels of SO_2 have been found within the prescribed air quality standard of 80 µg/m^3 at all the locations. Nitrogen dioxide concentrations on Deepawali day, 2008 has decreased at two locations (residential), increased at three locations (two industrial and 1 residential) and remained unchanged at two locations (residential and traffic intersection) as compared to previous year. The NO_2 levels exceeded marginally the prescribed standard of 80 µg/m^3 at two locations namely, Shahdara and Bahadur Shah Zafar Marg (ITO). At ITO, being high traffic zone, NO_2 exceeds the air quality standard generally even on normal days. NO_2 values during Deepawali day 2008 ranged between 33-83 µg/m^3 as compared to 45-91 µg/m^3 during year 2007.

SPM levels have shown decreasing trend at all the locations except at Shahdara on Deepawali day, 2008 in comparison to previous year. SPM levels during Deepawali day, 2008 ranged between 692 and 1331 µg/m^3. The highest SPM of 1331 µg/m^3 was reported at Janakpuri (Residential Area). RSPM levels have also shown decreasing trend at all the locations except at Shahdara on Deepawali day, 2008 as compared to preceding year 2007. RSPM levels on Deepawali day, 2008 ranged between 578-931 µg/m^3 as compared to 610 and 1294 µg/m^3 on Deepawali day during, 2007. The highest RSPM of 931 µg/m^3 was reported from Janakpuri Residential Area.

Ambient Noise level

Noise level was measured at nine (7 residential and 2 commercial) locations on Deepawali day during year 2008. The ambient noise level at all the locations has found increased as compared to normal day. During Deepawali of the year 2008 ambient noise level has been found increased at three locations, whereas it has decreased at six locations as compared to Deepawali, 2007.The average ambient noise levels on normal day and on Deepawali were ranged from 53 to 69 dB(A) Leq. and 67 to 85 dB(A) Leq respectively.

KOLKATA

Ambient Air Quality

Ambient air quality Monitoring was carried out at five locations at Kolkata i.e. Kasba, Behala, Shyam bazaar, Jodhpur Park and Canning (rural area). Monitoring was undertaken during pre Deepawali day, Deepawali and post Deepawali day. Sampling of SPM and RSPM was carried out on eight hourly averaging basis and gaseous sampling was carried out on four hourly averaging basis.

It has been observed that there was significant raise in dust concentration on Deepawali day than the pre and post Deepawali day at most of the locations. A comparative evaluation reveals that SO_2 is significantly higher during Deepawali day compared to that of pre Deepawali and post Deepawali day. There was sudden increase of SO_2 at Shyambazar from 3 $\mu g/m^3$ on pre Deepawali day to 24 $\mu g/m^3$ on Deepawali day, even in rural area like Canning significant increase in SO_2 level was noticed. In case of NO_2, increase in concentration was observed on post Deepawali day. RSPM concentration is less than the concentration observed during last year at some of the locations due to climatic conditions, but concentration was found significantly higher on Deepawali day in comparison to normal days.

Ambient noise level

Ambient noise monitoring was carried out in four locations at Kolkata i.e. Saltlake (residential area), Shyambazaar (commercial area), Tollygunge (commercial area) and College Square (sensitive area). 24 Hrs Continuous monitoring was undertaken at each location.

The study reflects that the noise level was high on pre Deepawali and Deepawali days as compared to post Deepawali day at Tollygunge, Salt lake and Shyam Bazaar. Noise level on pre Deepawali day and Deepawali day in sensitive area (College square) was less than other normal days. Comparative evaluation of data indicates that noise levels were found increased in previous two years particularly in residential area. Enhancement of noise level from the normal level by 22 dB, 18 dB, 15 dB and 20 dB at Saltlake, Shyambazar, Tollygunge and College Square respectively on pre Deepawali day and enhancement of 26 dB, 18 dB, 21 dB and 21 dB respectively than the normal noise level on Deepawali day. The noise level has not changed much at Shyambazar and at College square on Deepawali day in comparison to pre Deepawali and post Deepawali day. Noise level at night time was higher on Deepawali day at all locations except Syambazaar.

LUCKNOW

Central Pollution Control Board has conducted Ambient Noise and Air quality monitoring at two locations at Lucknow during Deepawali of year 2008.

Ambient Air Quality

Sulphur dioxide concentration at Gomtinagar and Nishatganj was found below the detection limit, while the SO_2 concentration ranged between 7 and 8.8 $\mu g/m^3$ during

Deepawali of year 2007. Increased concentration of nitrogen dioxide levels observed at both the locations. NO_2 levels have been found between 96 and 107 µg/m^3 as compared to 56.5 and 64.8 µg/m^3 on Deepawali Day during year 2007. RSPM levels have shown increasing trend during year 2008 at both the locations as compared to previous year. RSPM values ranged between 464-584 µg/m^3 during Deepawali 2008 as compared to 261-264 µg/m^3 during 2007. Higher concentration of RSPM was observed at all the continuous air quality monitoring stations. The Deepawali Day's RSPM value ranged between 301-362 µg/m^3. Increase in RSPM levels on Deepawali day during year 2008 may be attributed to meteorological conditions, movement of vehicles, road conditions and probably more bursting of light emitting crackers.

Ambient Noise Level

The Ambient noise level on Deepawali day has increased as compared to the normal days at both the locations. Noise level on Deepawali day i.e. October 28, 2008 (ranged between 57.2 - 83 dB(A) Leq) decreased at Gomtinagar as compared to Deepawali day, 2007 (range between 54 - 107 dB(A) Leq). The decrease in ambient Noise Level during Deepawali 2008 can be attributed to the awareness campaigns and lesser bursting of noise producing crackers. The Noise level at Nishatganj on Deepawali day 2008 ranged between 77 – 96.6 dB(A) Leq.

BANGALORE

Ambient Noise and Air Quality Status

Ambient Noise Air Quality was monitored at different locations in Bangalore city during Deepawali festival. The average noise level and RSPM concentration were exceeding the standard limits at many places including residential and silence zones. However the SO_2 and NOx concentration were well within the prescribed limit with few exceptions.

Based on the study it is recommended the crackers may be tested well in advance before entering to the market, so that the crackers violating the Noise limits can be banned. The adherence to the time limit for bursting crackers was not being followed for which public needs to be educated. The sale of garland crackers may be discouraged and collective participation of the community for bursting of crackers at play ground, stadium and open places should be encouraged rather than bursting of crackers near individual houses.

BHOPAL

The duration of bursting of firecrackers on Deepawali day was found slightly reduced as compared to previous years. Few colonies and townships located outside the city, have not witnessed the festival activity beyond 10 PM. As expected, the activity has been reduced considerably after Deepawali day. However, the after effects were observed during the monitoring.

Ambient Air Quality

During Deepawali festival in the year 2008 improvement in ambient air quality was observed at many areas of Bhopal city as compared to the year 2007. The highest SPM level (793 μg/m^3) was recorded at TT Nagar, a commercial centre of the city. The RSPM levels were observed in the range of 189-482 μg/m^3. Most of the residential areas are badly exposed to the fine dust and smoke during the Deepawali festival. SO_2 concentration was noticed below detection level to13 μg/m^3, whereas NO_X concentration was observed below detection level to 56 μg/m^3. In spite of repeated requests made by the local authorities, the loud noise continued due to bursting of crackers even after 10 PM. In fact, at some of the commercial areas many business people have started celebrating the festival after 10 PM of shops.

Ambient Noise Level

The ambient noise levels at Bhopal ranged from 59 to 91 dB (A). Maximum noise levels were recorded between 8 and 9 PM on Deepawali day. The increased commercial activities during the festival season and increased vehicular traffic also contributed to the noise levels.

AGRA

Ambient Air quality

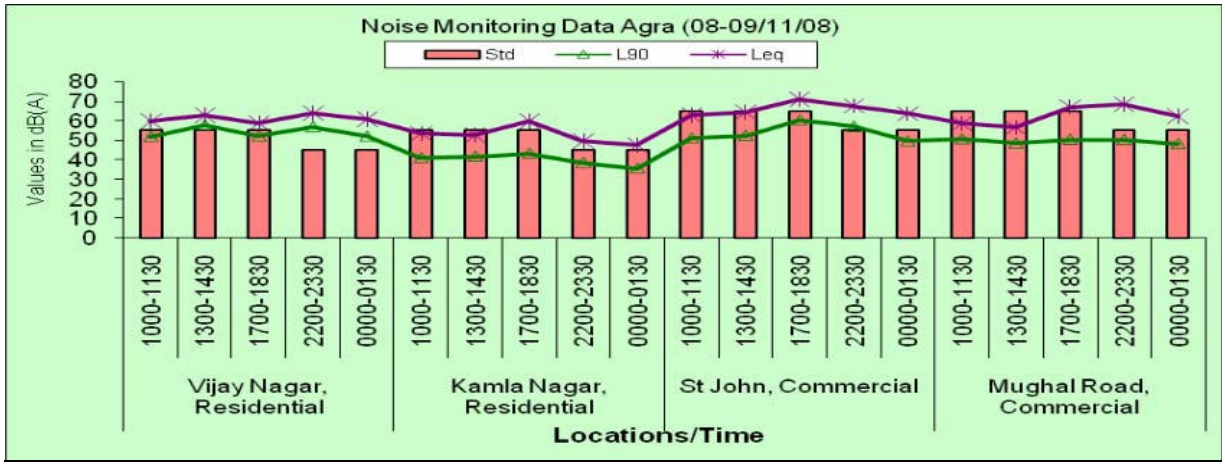
Monitoring of ambient air quality and noise level at Agra during Deepawali festival has been carried out at two locations viz. Tajmahal (sensitive area) and Dholpur House (residential area) It may be observed from the study that there was increase in the concentration of SPM, RSPM, SO_2 and NO_2 and decrease in mixing height from 220 m to 188 m on the Deepawali festival day compared to pre and post festival days. However, the pollution was found to have increased on next day of festival around Tajmahal, which may be attributable to late settlement / transportation / intrusion of pollutants, being covered with green buffer area around it.

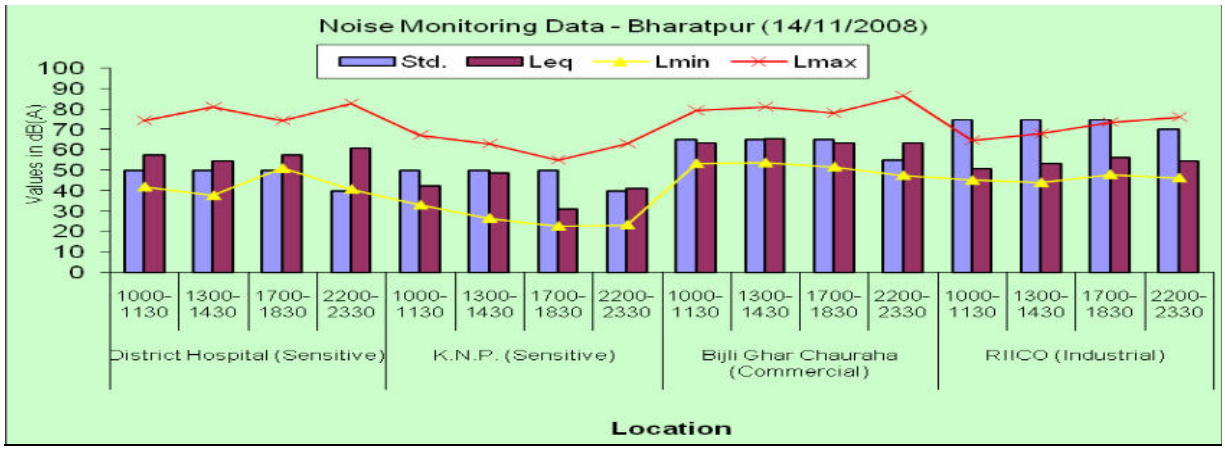
Ambient Noise Level

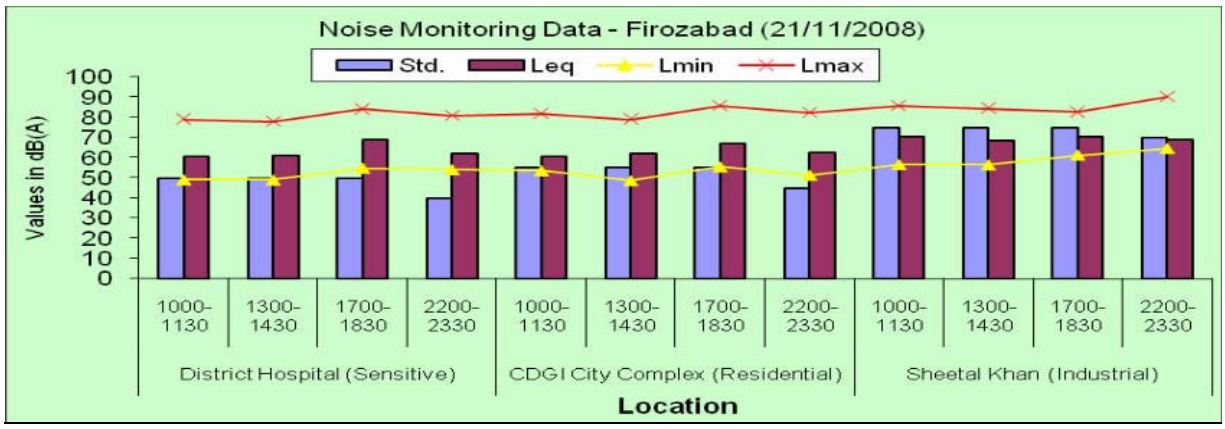
The ambient noise level particularly at evening to night hours has been undertaken at Agra at five locations viz. Tajmahal (Silence), Dist. Hospital (Silence), Dholpur House (Residential), Tajgunj (Residential) and Sadar market (Commercial). It has been observed that the stipulated Noise standards have been violated at all the locations at Agra, except early night hours around Tajmahal and late night hours at Sadar market area.

6.4.2 Noise level at Taj Trapezium Zone (TTZ)

The noise level was monitored at Agra, Firozabad, Bharatpur and Mathura cities within Taj Trapezium Zone during the winter season. It has been that Leq was found to have violated at all the monitoring locations within Bharatpur, except RIICO industrial area. The Noise levels violated the stipulated noise standards at all the monitoring locations at Mathura.







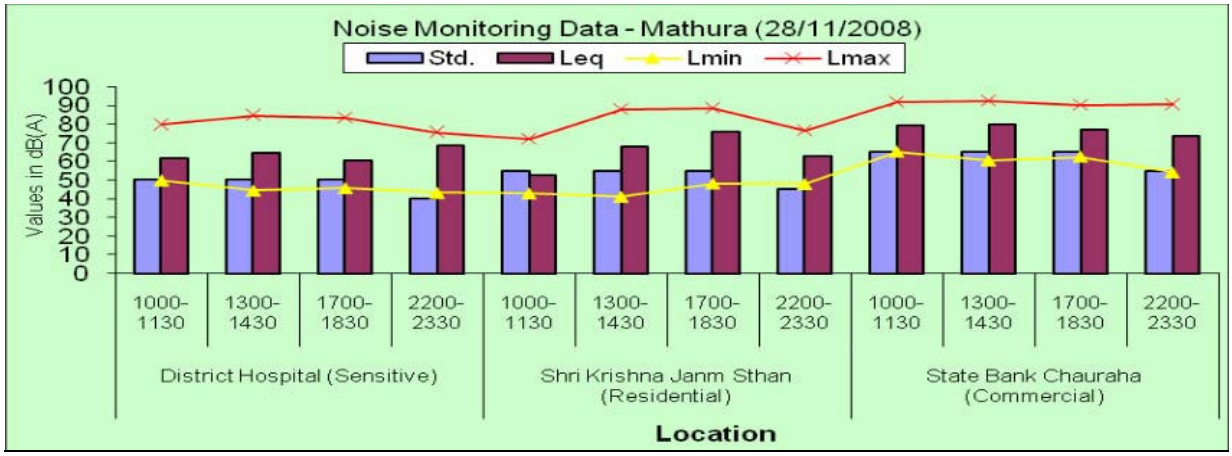


Fig. 6.6: Noise level in Taj Trapezium Zone (TTZ)

6.4.3 Noise level at Tajmahal, Agra

The ambient noise level monitoring study was undertaken during December, 2008 within the Tajmahal and the monitoring data is presented at Fig. 6.7. The ambient noise monitoring data was compared with sensitive area day and night time standards respectively as prescribed in the Environment (Protection) Act. The ambient noise level was higher than the prescribed norms may be because of increased number of visitors at Tajmahal during day time, while at night it may be due to movement of security personal at night besides generation of background noise at surrounding residential areas.

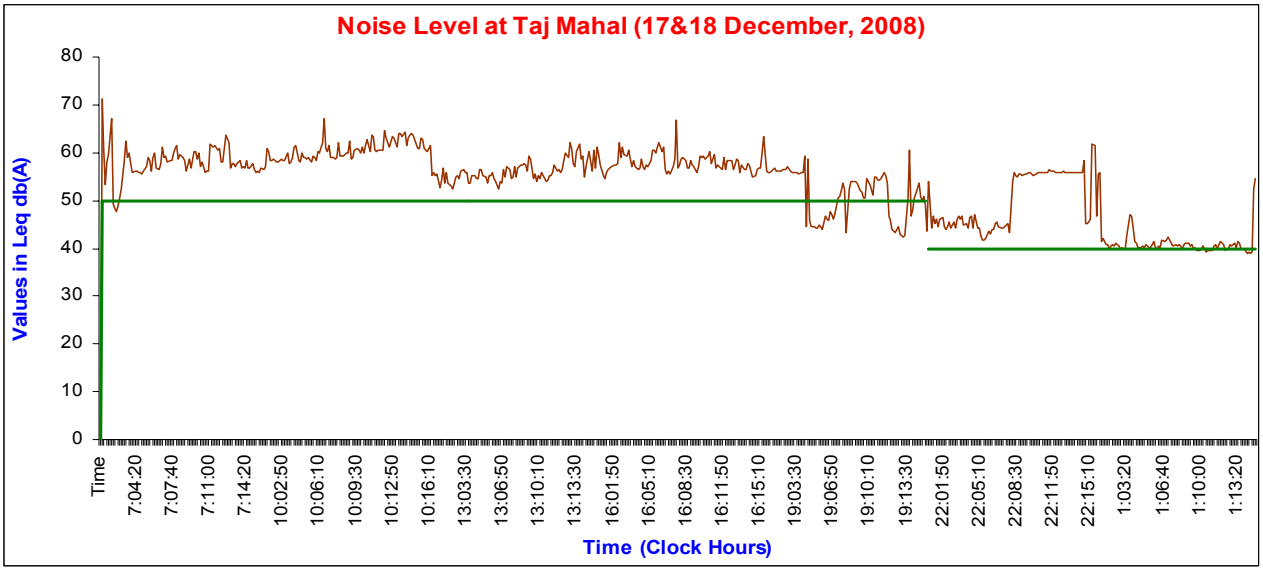


Fig. 6.7: Noise Level at Tajmahal, Agra

6.4.4 Atmospheric Mixing Depth Observations at Delhi

Sound Detection and Ranging System (SODAR) is in continuous operation at Central Pollution Control Board, Parivesh Bhawan to measure mixing height. The SODAR data collected in different months during the year 2008-09 are presented in Table 6.11.

Table 6.11: Period of high convective activity, Mean Mixing Heights, Maximum Mixing Height and Minimum Mixing Height (in Metres) in different months of the year 2008-09 (hourly average values)

Months	Mostly occurring period of high convective activity during the month	Mean Mixing Height in the period of high convective activity	Mean Mixing Height in the period of low convective activity	Monthly Mean Mixing Height	Maximum Mixing Height*	Minimum Mixing Height*
April, 2008	08 a.m. and 09 a.m. to 06 p.m.	993	254	545	1515	90
May, 2008	08 a.m. to 06 p.m. and 07 p.m.	979	206	538	1452	90
June, 2008	07 a.m. or 08 a.m. to 06 p.m. and 07 p.m.	971	144	534	1325	90

Months	Mostly occurring period of high convective activity during the month	Mean Mixing Height in the period of high convective activity	Mean Mixing Height in the period of low convective activity	Monthly Mean Mixing Height	Maximum Mixing Height*	Minimum Mixing Height*
July, 2008	07 a.m. or 08 a.m. to 06 p.m. and 07 p.m.	974	180	516	1367	95
August, 2008	07 a.m. or 08 a.m. to 06 p.m.	938	149	490	1409	85
September, 2008	07 a.m. and 08 a.m. to 06 p.m.	1056	191	554	1494	85
October, 2008	08 a.m. and 10 a.m. to 05 p.m. and 06 p.m.	1008	224	503	1409	85
November, 2008	10 a.m. to 04 p.m. and 05 p.m.	1032	189	423	1538	80
December, 2008	10 a.m. or 11 a.m. to 04 p.m. and 05 p.m.	1031	229	426	1621	80
January, 2009	10 a.m. or 11 a.m. to 5 p.m. and 6 p.m.	1081	254	476	1621	85
February, 2009	10 a.m. to 6 p. m.	1209	280	580	1600	100
March, 2009	9 a.m. and 10 a.m. to 6 p. m.	1100	251	560	1473	90

Monthly mean mixing height varied between 423 meters (November, 2008) and 580 meters (February, 2009)**.** Mean mixing height in the period of high convective activity during day time varied between 971 meters (June, 2008) and 1209 meters (February, 2009)**.** Mean mixing height in the period of low convective activity during night time and morning varied between 144 meters (June, 2008) and 280 meters (February, 2009). Diurnal variation of mixing height and variation of pollutants concentration at Bahadur Shah Zafar Marg with mixing height in the month of December 2008 is depicted in Fig. 6.8 to 6.12. In winter month the period of high convective activity reduces to minimum. It can be observed that air pollutant concentration except Ozone were found increasing, when the mixing height was decreasing.

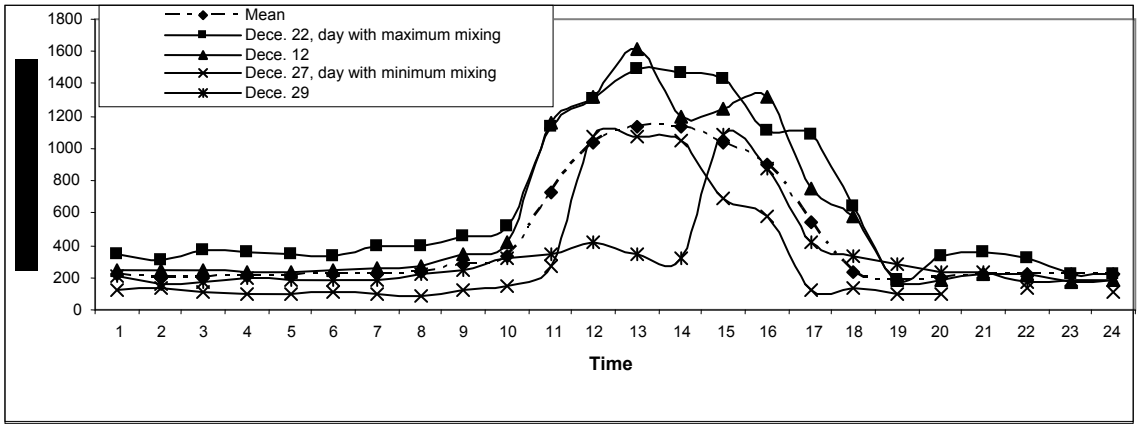


Fig. 6.8: Diurnal Variation in Mixing Height (December 2008

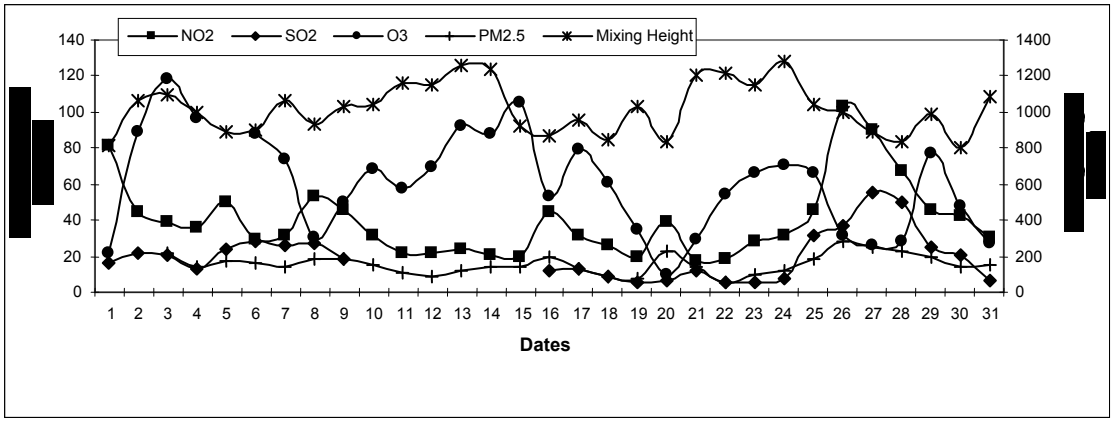


Fig. 6.9: Variation In NO_2, SO_2, O_3 & $PM_{2.5}$ concentrations at Bahadur Shah Zafar Marg with Mixing Height during period of High Convective Activity (December 2008)

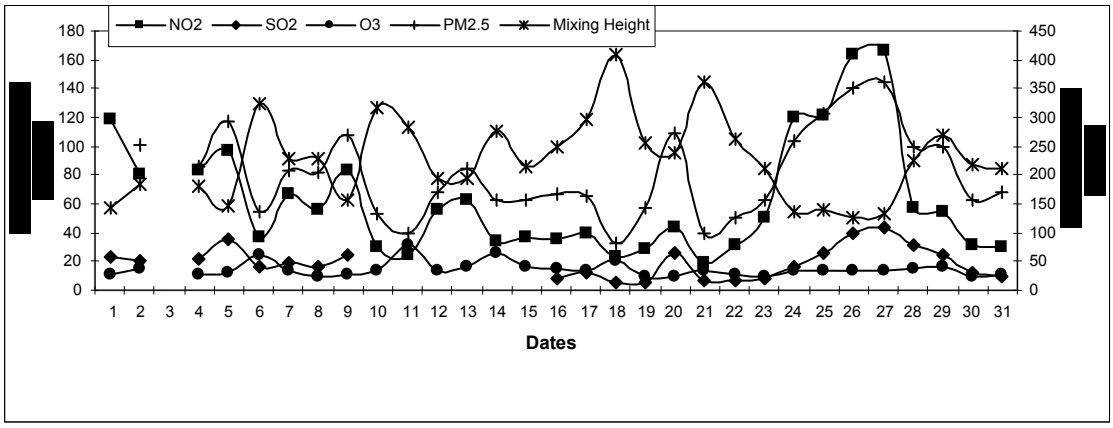


Fig. 6.10: Variation in NO_2, SO_2, O_3 & $PM_{2.5}$ concentrations at Bahadur Shah Zafar Marg Intersection with Mixing Height During period of Low Convective Activity (December 2008)

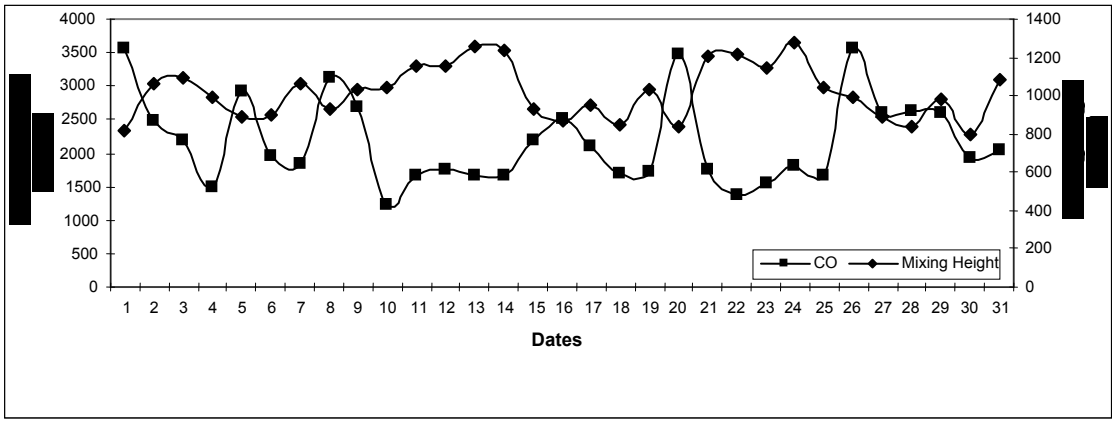


Fig. 6.11: Variation in CO concentration at Bahadur Shah Zafar Marg Intersection with Mixing Height during period of High Convective Activity (December 2008)

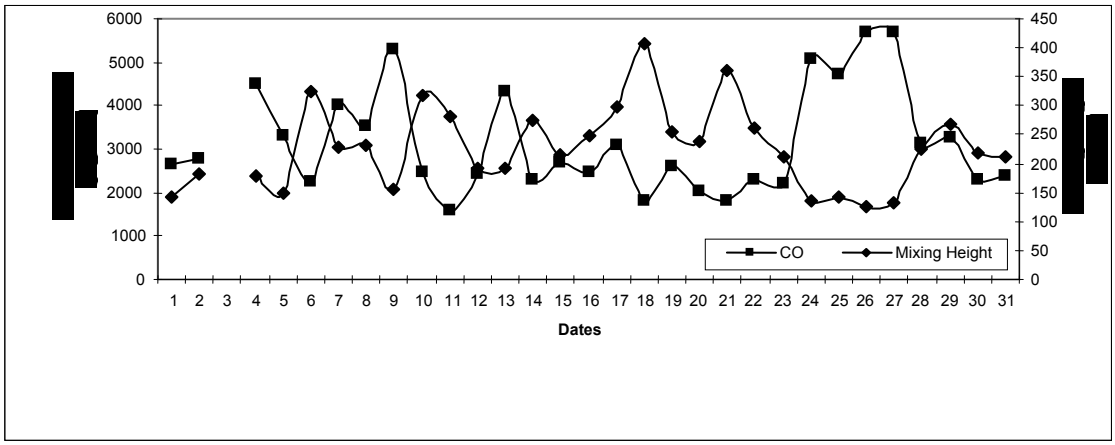


Fig. 6.12: Variation in CO concentration at Bahadur Shah Zafar Marg Intersection with Mixing Height during period of Low Convective Activity (December 2008)

6.4.5 Characterization of Particulate Matter (PM_{10} and $PM_{2.5}$) at Delhi

The high particulate concentration in ambient air is a serious issue in urban areas of the country. Speciation sampling for characterization of PM_{10} and $PM_{2.5}$ was initiated in Delhi at two NAMP stations (Shahzada Bagh, Siri Fort) and Bahadur Shah Zafar Marg during year 2008. Four Channel Speciation samplers are being used for the study. Channel I & II are used for PM_{10} and Channel III & IV for $PM_{2.5}$. Both Quartz and Teflon filters are being used for simultaneous collection of samples on suitable filter matrix to facilitate Ion and elemental analysis on Teflon filter and OC/EC in quartz filters. Weekly samples were collected for complete characterization of particulate matter.

Speciation Sampler

Speciation Cartridges

(Teflon coated on top and Anodized at bottom)

Average percentile composition of anions and cations in PM_{10} and $PM_{2.5}$ are presented in Table 6.12 and Table 6.13. Elemental Carbon and Organic Carbon concentrations at three monitoring stations are presented in Table 6.14.

Table 6.12: Percentage Anions and Cations in PM_{10} Particulate (RSPM)

Ions analyzed>	F^-	Cl^-	NO_2^-	Br^-	NO_3^-	PO_4^-	SO_4^{2+}	Na^+	NH_4^+	K^+	Ca^{2+}	Mg^{2+}	Total
ITO	0.33	3.51	0.06	0.01	3.97	0.01	8.24	6.48	0.72	1.32	3.54	0.50	28.70
Shahzada Bagh	0.36	1.80	0.17	0.01	4.20	0.00	6.98	10.0	1.42	3.70	7.91	0.76	37.32
Siri Fort	0.80	8.64	0.04	0.00	3.70	0.01	8.51	8.40	1.34	2.95	4.53	0.39	39.31

Table 6.13: Percentage Anions and Cations in $PM_{2.5}$ Particulates

Ions analyzed>	F^-	Cl^-	NO_2^-	Br^-	NO_3^-	PO_4^-	SO_4^{2+}	Na^+	NH_4^+	K^+	Ca^{2+}	Mg^{2+}	Total
ITO	0.01	2.92	0.09	0.92	5.26	0	18.01	2.1	6.21	1.32	2.01	0.1	38.95
Shahzada Bagh	0.09	2.1	0.11	0.41	6.21	0	16.45	4.26	5.28	4.56	3.42	0.31	43.2
Siri Fort	0.03	3.41	0.05	0.1	5.75	0.07	11.2	6.23	3.42	3.24	2.61	0.6	36.71

Table 6.14: Percentile composition of Elemental and Organic Carbon in Particulate PM_{10} & $PM_{2.5}$

Monitoring Stations	PM_{10} Particulate		$PM_{2.5}$ Particulate	
	Elemental Carbon	Organic Carbon	Elemental Carbon	Organic Carbon
ITO	13.26	8.52	18.24	9.32
Shahzada Bagh	8.85	9.78	12.97	10.66
Siri Fort	6.22	10.91	8.94	13.01

It has been deduced from the study that $PM_{2.5}$ constitutes 34 – 56% of the mass of PM_{10}. 25 – 40 % weight of PM_{10} is being contributed by soluble fraction of anions and cations. 38 – 43 % weight of $PM_{2.5}$ is soluble fraction of ions. Enrichment of SO_4^{2-}, NH_4^+, and NO_3^- has been found evident in $PM_{2.5}$ fraction. Lower percentile contribution of F^-, Cl^-, Na^+, Ca^{2+}, Mg^{2+} in $PM_{2.5}$ particulates indicate crustal origin of PM_{10} fraction. 17 – 22% of mass in PM_{10} is carbonaceous, indicating combustion sources. Elevated EC/OC ratio (> 1.0) at ITO clearly indicates direct impact of vehicular sources. The OC/EC ratios at other stations are also having impact of fuel combustion at receptor end. 22 – 29 % mass in the $PM_{2.5}$ particulate is carbonaceous, which indicate enrichment of carbonaceous aerosol in $PM_{2.5}$ particulates.

6.4.6 Impact of Jhum Cultivation on Ambient Air Quality in North East States

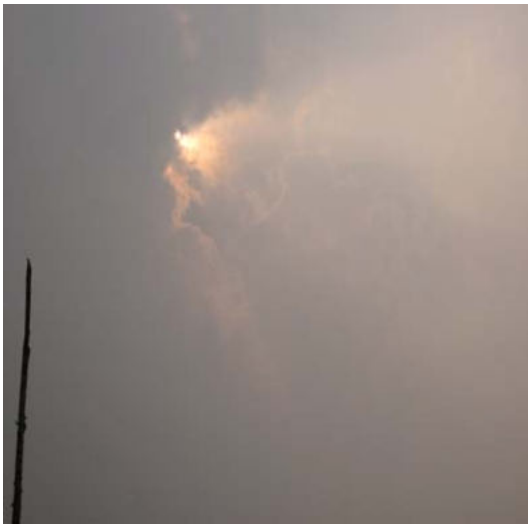
The North Eastern Region of the country is comprised of Himalayan and sub-Himalayan types of hills. Most of these hilly areas are occupied by the hill tribes. The traditional and main occupation of these hill tribes is Jhum Cultivation (Shifting Cultivation). The regular practice under this type of cultivation is to cut down all kinds of plants in the area and keep it for two to three months for drying. In order to clean the area for making it suitable for sowing and cultivation, the dried plants are burnt during the dry season. Every year thousands of hectares of land are cleaned and burnt up for cultivation. Most of the hilly areas in the region fall under this cultivation practice in rotation at an interval of three to seven years depending upon the size of land for each village and population of the village. The cultivation is also known as shifting cultivation as the cultivation is shifted from one area to another area in rotation. During the burning period, the smoke and fly ashes disturb even aviation services and also causing heavy air pollution in the region. When the monsoon rain follows the burning, the surface water/runoff from the area carries forward the pollutants from the cultivating area to the rivers. The practice also leads to soil erosion and disappearance of many precise plant species.

The background data of ambient air quality of these areas were generated along with the data of same areas during the burning period to know the level of air pollution contributed by the cultivation. From the monitoring of the ambient air quality it is observed that there is substantial increase of particulate matters in the ambient air during the burning period. The level of Suspended particulate matter before burning (Background) in most of the Jhum areas are less than 100 µg/m^3 while the level during the burning period ranges from 400-1600 µg/m^3. There is not much difference in SO_2 and NO_X levels before and during burning times.

Area to be Cultivated in Umlapher Village (Assam)

Burning of Jhum Field in Umlapher Village (Assam)

Burnt Area for Jhum Field Cultivation in Umlapher Village (Assam)



Sky covered with smoke from Jhum Burning

6.4.7 Air Pollution Estimation and Validation of Model for Greater Cochin

Under the project "Air pollution estimation and validation of model for greater cochin", Central Pollution Control Board has undertaken Source emission monitoring at major air polluting industries located in and around Cochin City. Subsequently, the grid survey of Cochin City had also been carried out. Further, micro meteorological data of Cochin City has been collected from INS Garuda, Naval Base Cochin. The compilation of data and the Development of Emission Inventory for Cochin City is under progress. The air quality model for Cochin City proposed to be developed using the ISC. AERMOD preview model.

6.5 MONITORING OF VOLATILE ORGANIC COMPOUNDS IN ENVIRONMENT

6.5.1 Volatile Organic Compounds (VOC) Monitoring at Delhi during Deepawali

Due to bursting of crackers during Deepawali festive season dangerous inorganic and organic carcinogenic/toxic pollutants are mixed in the environment which is already burdened by traffic and industrial pollution. The Central Pollution Control Board has conducted monitoring of Volatile Organic Compounds (VOCs) during Deepawali festive season October 27-29, 2008 to assess the levels of VOCs in ambient air. Three sampling locations were selected viz, East Arjun Nagar, Pitampura and Bahadur Shah Zafar Marg. Six hours continuous monitoring from 17.00 hours to 23.00 hours have been carried out on all the three festival days using Tenax and Chromosorb adsorbent tubes in series, tenax tube in the front and chromosorb tube at the back. The tubes were attached to the SKC low flow sampler with the flow of 100 ml/minute in each sampling. The sample adsorbent tubes were analysed by GC-MS-ATD instrument. The analytical results of VOC levels at various locations during Deepawali festive season is presented in Table 6.15 indicating that Toluene levels was dominating among all the VOCs.

Table 6.15: Analytical Results of VOCs Monitoring during Deepawali Festive Season (27-29 October, 2008) using Low Flow Sampler

Volatile Organic Compound	Pitampura			ITO			East Arjun Nagar		
	Pre Deepawali	Deepawali	Post Deepawali	Pre Deepawali	Deepawali	Post Deepawali	Pre Deepawali	Deepawali	Post Deepawali
Benzene	12.5	8.5	21.6	13.7	17.6	14.3	5.5	6.7	23.4
Toluene	151.1	57.7	394.1	77.4	57.1	13.4	60.1	2.7	347.2
Ethyl Benzene	4.3	4.8	11.1	5.9	5.3	11.8	3.2	3.4	14.9
m-Xylene	10.5	12.9	27.4	12.0	14.6	0.6	1.0	0.9	21.6
o-Xylene	8.5	11.0	22.4	10.6	12.0	5.2	ND	1.1	19.4
1,2,4-Trimethyl Benzene	7.6	7.1	11.2	11.9	2.6	ND	4.3	ND	3.5
1,2,3-Trimethyl Benzene	11.3	12.9	29.2	1.7	24.4	ND	ND	ND	24.8
Naphthalene	11.5	3.5	7.4	11.6	15.8	11.2	2.4	7.1	17.3

ND = Not detectable; All values are in microgram/m^3

6.5.2 Monitoring of Volatile Organic Compound (VOCs) at Jedimetla Industrial Area, Hyderabad (A.P.)

Volatile Organic Compound (VOCs) monitoring conducted at selected industries at Jedimetla industrial area, Hyderabad and at the roof top of Andhra Pradesh State Pollution Control Board, Sanath Nagar during the October, 2008. Trichloromethane and Toluene was found dominant among all the Volatile Organic Compounds monitored.

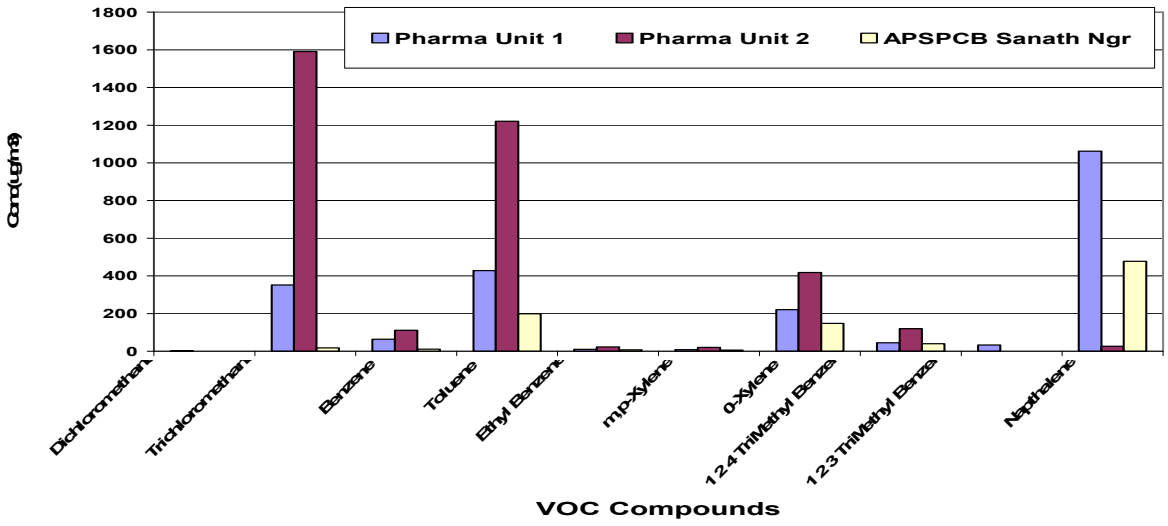


Fig. 6.13: VOC Levels at Jedimetla Industrial Area, Hyderabad

6.5.3 Monitoring of Volatile Organic Compounds (VOCs) at Hot Mix Plant at Indira Gandhi International Air Port, New Delhi

Stack monitoring of Volatile Organic Compounds (VOCs) was undertaken at Hot Mix Plant at Indira Gandhi International Airport on 17th March, 2009. As the Hot mix plant was not running to full capacity/load, monitoring was undertaken in duplicate. Aromatic compounds like Benzene, Toluene and Naphthalene were identified and measured. The values of selected VOCs such as Benzene, Toluene and Naphthalene has been presented in Fig. 6.14.

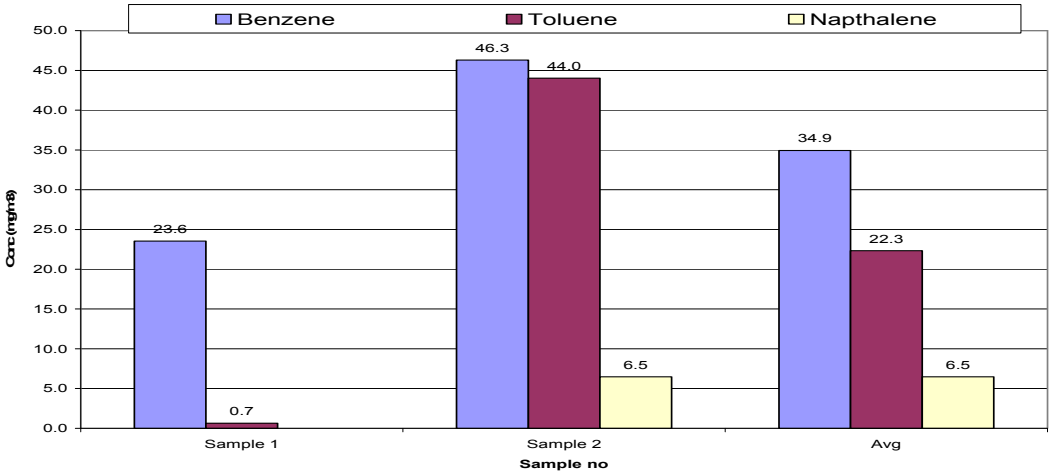


Fig. 6.14: VOC Levels in Source Emission from Hot Mix Plant near Indira Gandhi International Airport

A typical VOC Mix Standard Chromatogram is presented in Fig. 6. 15, which facilitate identification & quantification of VOCs in the samples after calibration.

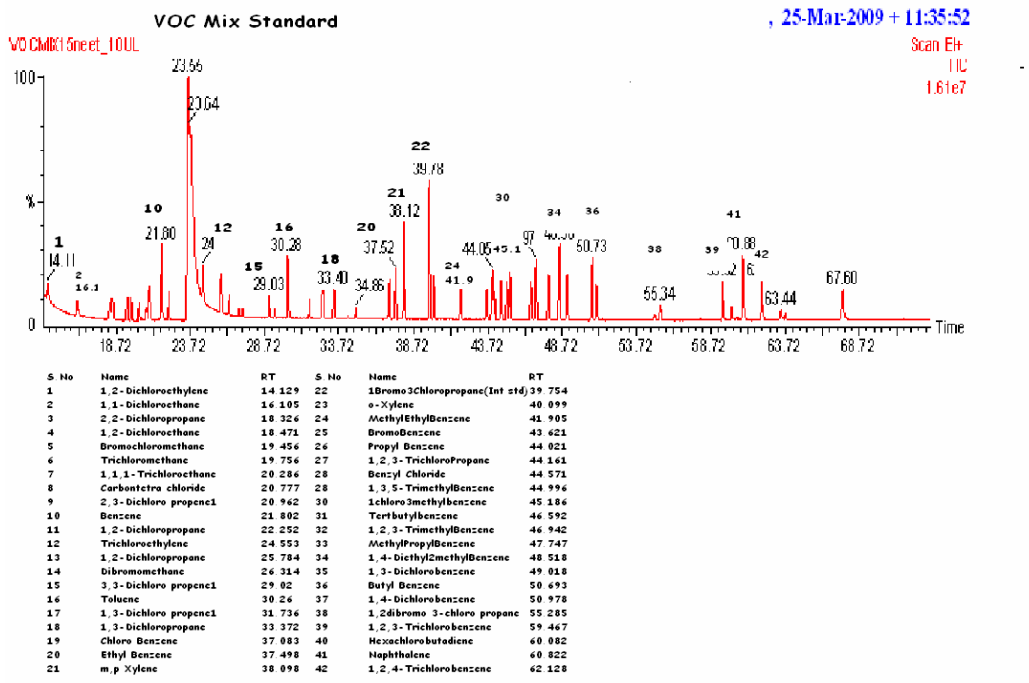


Fig. 6.15: VOC Mix Standard Chromatogram from ATD-GC-MS

6.5.4 Volatile Organic Compounds (VOCs) Monitoring at Tarapur, Maharashtra

Tarapur is one of the critical pollution problem areas identified in Maharashtra by Central Pollution Control Board because of the pollution caused by the industries located there. The Central Pollution Control Board Zonal Office – Vadodara has undertaken VOC monitoring with the technical assistance of M/s SGS India (P) Ltd., Chennai, for assessment of Hazardous Air Pollutants (HAPs) in the ambient air at Tarapur Industrial Area. The samples of hazardous waste and effluents have also been collected to track the direction of losses. The study has been undertaken to prioritize some potential HAPs for development of standards for enforcement.

VOC Monitoring Instrument

The VOCs levels found in ambient air was Benzene, Chlorobenzenes, Chlorinated Alkanes, Xylene and Toluene etc. The Presence of Benzene, Chlorobenzenes, Chlorinated Alkanes, Toluene and Xylene were observed at almost all the monitored locations, while the concentration of Chlorobenzens and Toluene observed highest amongst the VOCs detected at most locations, whereas Naphthalene and Chloroform were found maximum at a few locations. The probable places of loss of VOCs are centrifuging, filtration, glands, charging material into the reactors, solvent storage area, distillation and ETP area. The presence of solvents in the wastewater was due to improper separation of intermediates/products/solvents at different unit process operations, which result into high organic load in wastewater posing difficulty in treatment. The study revealed potential of further exploration on the issue for strategic planning for control and enforcement of VOCs.

6.5.5 Volatile Organic Compounds (VOCs) Monitoring at Vapi (Gujarat)

Vapi is one of the critically pollution problem areas in Gujarat. Central Pollution Control Board has undertaken monitoring of ambient air, hazardous waste, effluent and water quality of River Damanganga.

VOC monitoring in ambient air was undertaken carried out at six locations located in each directions and at the centre across the industrial estate to assess the

dispersion of air pollutants based on wind pattern, residential establishments etc. Total 35 VOCs have been detected out of 60 VOCs, which were identified for sampling and analysis. The prominent VOCs with range of minimum & maximum (values are expressed as $\mu g/m^3$) have been Benzene (0.49-108 $\mu g/m^3$), Bromobenzene (2.09-22.75 $\mu g/m^3$), Carbon Tetrachloride (1.97-84.43 $\mu g/m^3$), Chlorobenzene (32.02-503.1 $\mu g/m^3$), Chloroform (3.53-34.90 $\mu g/m^3$), 1,2-Dibromoethane (15.38-70.19 $\mu g/m^3$), 1,2- Dichlorobenzene (37.37-179.86 $\mu g/m^3$), Ethylbenzene (1.76-69.18 $\mu g/m^3$), Napthalene (1.27-30.32 $\mu g/m^3$), 1,3-Dichlorobenzene (5.23-48.70 $\mu g/m^3$), 1,4-Dichlorobenzene (14.6-64 $\mu g/m^3$), 1,2-Dichloroethane (4.93-298 $\mu g/m^3$), Toluene (66.97-1283.67 $\mu g/m^3$), Trichloethylene (1.89-13.41 $\mu g/m^3$). These VOCs are known for human health effect. Out of 35 VOCs detected, most of the chlorinated compounds are toxic and known or suspected as human or animal carcinogens.

At most of the monitored industries, the presence of numbers of VOCs in the wastewater & hazardous waste were found more than the presence of numbers of VOC in the air (fugitive) samples. The presence of many solvents (VOCs) in the wastewater may be due to improper separation of intermediates/products/solvents at different unit processes/ operations which are finding their way into the wastewater resulting into higher organic loads and difficulty in treatment of wastewater at ETPs. Solvents are carried along with wastewater from individual Industries to CETP, Surface water bodies. Total 18 VOCs have been found in the inlet of CETP and six at the Outlet of CETP. The VOCs detected at the final outlet are Chlorobenzene, 1,2-Dibromoethane, 1,2 Dichlorobenzene, 1,2-Dichloroethane, Dichloromethane & Toluene.

Total 7 VOCs (n-Butylbenzene, Chlorobenzene, 1,2-Dibromoethane, 1,2 Dichlorobenzene, 1,2-Dichloroethane, Dichloromethane & Toluene) have been detected at River Damanganga downstream to CETP Outfall. The maximum concentration of 1,2-Dichlorethane has been found at this location. Awareness about the VOCs, their emissions, effects etc. less among workers, staff and management levels in various industrial units.

6.5.6 Volatile Organic Compounds (VOCs) in few Industrial Areas of Andhra Pradesh and Tamilnadu

The study was initiated to assess the Volatile Organic Compounds (VOCs) at two industrial estates of Andhra Pradesh and one industrial estate of Tamilnadu. For VOC monitoring studies method USEPA 17 has been adopted. The brief details about VOC measurement at various industrial estate is presented below:

Jeedimtla, Medak (Andhra Pradesh): Jeedimetla industrial estate is in Medak district of Andhra Pradesh having about 60 Bulk drug and formulation units which uses large quantity of solvents. VOCs are measured at five Ambient air locations at the estate and Toluene, 1,2 Di Chlorobenzene, O-Xylene, 1,2 Di chloroethane, Chloroform, M&P Xylene and Benzene have been found.

Pattencheru-Pachimylam, Medak (Andhra Pradesh): This industrial estate houses about 110 major Bulk drug and other engineering industries. Most of the industries are using solvents which are of volatile in nature and release VOCs in the

environment. Ambient air VOCs have been measured at five locations. VOCs such as Toluene, Chloroform, CCL4, M&P Xylene, Ethylbenzene, 1,2,4 Trimethyl Benzene, O-Xylene, 1,2 Dichloropropane, Chloro Benzene, 1,2 Dichloroehane and Styrene have been prominent in various environmental samples.

Manali, Chennai: The petrochemical industries are in operation at Manali industrial estate.. These industries produce many organic solvents, which are volatile in nature. Ambient air is monitored at three identified locations. The VOCs observed include Toluene, 1,2,4 Trimethyl Benzene, Chloroform, Styrene, M-Xylene, Ethyl Benzene 1,3,5 Tri Methyl Benzene, 4 Chloro Toluene and Benzene. VOCs have been measured in effluent and solid samples to assess the possibility of their release into the atmosphere.

VOCs which are prominent at in all the three industrial estates in are presented in Table 6.16. Manali Industrial Estate at Tamilnadu was having highest VOCs levels among the monitored industrial estates, which is of concern.

Table 6.16: Volatile Organic Compounds (VOCs) having significant concentration at Pattencheru, Jeedimetla and Manali Industrial Estates

S. No	VOCs	VOCs concentration µg/m^3		
		Pattencheru (A.P.) Industrial Area	Jeedimetla (A.P.) Industrial Area	Manali (T.N.) Industrial Area
1.	Chloroform	417	48	10854
2.	Toluene	577	450	96253
3.	Ethyl Benzene	251	74	1352
4.	M&P Xylene	275	38	2977
5.	O-Xylene	181	152	142
6.	Benzene	167	10	807

6.6 ASSESSMENT OF POLLUTION / CASE STUDIES

6.6.1 Assessment of Environmental Status at Jamnagar, Gujarat

Jamnagar is one of the important towns in Gujarat with industrial growth potential lying in vicinity to coast line. Establishment of two major oil refineries near the town contributed towards exponential growth and socio-economic development of the town. Infrastructure development could not keep pace with the development therefore the development has become cause of concern from environmental view point. Central Pollution Control Board has undertaken a study on Status of Environment at Jamnagar.

Ambient air quality monitoring, groundwater & surface water quality monitoring, noise level monitoring and survey of the area have been carried out apart from dry data collection. It has been observed that town with such a good potential for growth does not have engineered municipal waste disposal site as per the guidelines, sewage treatment plant for the sewage generated from the town. The sewage is being disposed off presently into the Rangmati River without any treatment. The historic Ranmal talab (Pond) needs attention for its conservation and rejuvenation. The detailed report is under preparation.

Historic Ranmal Talab at Jamnagar depicting Floating waste

6.6.2 Studies of Environmental Stress in Himalayan sub region due to Religious Tourism at Char (Badrinath, Kedarnath, Gangotri and Yamunotri) at Uttarakhand

Char Dham (meaning four sacred spots) in Uttarakhand State is being referred to four most revered Hindu temples viz. Yamunotri (nearing four sacred spots), Gangotri, Kedarnath and Badrinath. According to the Puranas and various Hindu scriptures the Char Dham Yatra is of very high religious significance and most sacred of all pilgrimage. Pilgrims from all around the world brave the severe conditions of landscape and weather to visit the shrines and have the holy darshan of the revered deity. Yatra to Char Dham Holy Shrines for which one has to trek a height of about 3000 to 5000 meter are full of thrill and joy .The feeling of divine which is always beneath ones' heart, burst out and one realizes "Moksha" as one attends the Cave and perform the prayer before the Shivlinga surrounded by beautiful valleys, mountains, one will always feel his presence on the paradise of the earth. The memory of which hardly vanishes with the time. A journey to Char Dham rediscovers the nature and its love, which is always inside but one has never felt, draws massive crowd of pilgrims every year.

There are important environmental issues, which are affecting sustainable religious tourism. The environmental issues such as sanitation problem, domestic waste, pressure on transportation and ecology are being developed due to congregation of large number of pilgrims. There is no information available, regarding environmental stress caused by the large mass of pilgrims congregated, who are extensively using river water and leave severe impact on ecology and environment at upper stretch of Himalayas near Gangotri, Yamunotri, Kedarnath & Badrinath. No in-depth studies have been made till date on Impact assessment due to pilgrimage at Char Dham.

In the present project efforts have been made to study the impact of religious tourism on stretch of Garhwal Himalaya, host population, Geographical conditions and ecological environment of Char Dham. Every year pilgrims visiting Char Dam are increasing. The impact of Char Dham Yatra on local environment have been made to determine carrying capacity of the region, the population load and development are being studied to assess the impact of environmental degradation.

The Environment Management Plan has been developed based on the studies. The major recommendations in Environment Management Plan pertain to following issues:

- Management of Demographic problem
- Management of pilgrims accommodation
- Management of water supply
- Sanitation and wastewater management
- Management of ambient air quality, noise
- Traffic management
- Management of Municipal solid waste through collection, segregation, storage and disposal
- Management of Hazardous waste
- Management of Eco-tourism

Based on the studies, site specific recommendations have also been proposed to mitigate major environmental issues and their management.

6.7 ENVIRONMENTAL STATUS AND MANAGEMENT IN INDUSTRIES / INDUSTRIAL AREA

6.7.1 Inventorization and assessment of pollution load in Bhilwara Industrial Area, Rajasthan

Bhilwara is located on national highway in southern Rajasthan has become famous textile processing, especially suiting. There are three major industrial areas at Bhilwara viz. Biliya, Chittor Road and Ajmer Road. Few units are also located in non-industrial areas. There are around 20 major textile processing units (with captive power plants) and more than 1,000 weaving & dyeing units. The total processing/manufacturing of blended suiting in the region is around 40 to 45 million meters/month.

The water source for various industrial processes is River Kothari, Kankrouli and Berauch. The industrial unit require approx. 32 liters of water for finishing of 1 kg of cloth. The treated/untreated waste water from these units finds its way into drains that finally join River Kothari and Banas. The industrial units in Bhilwara have provided effluent treatment facilities. The consent conditions stipulates to achieve zero discharge by recycling 70% of the treated effluent and to utilize the rest of the effluent for gardening. Some of the units have provided reverse osmosis plant and others are in process of installing it. The values of BOD and COD in the drains and nullahs are in the range of 103-281 mg/l and 333-1, 022 mg/l, respectively indicate that the industrial effluent is not treated adequately. Total dissolved solids and conductivity in the ground water near the effluent carrying drains are in the range of 825-4790 mg/l and 1170-7980 µs/cm respectively.

The hazardous waste generated from various industrial units is around 220 MT/month and the waste is disposed through co-incineration.

Based on the inventory undertaken by Central Pollution Control Board it is recommended that all the textile units may be directed to install Reverse Osmosis

plants for treatment of effluent and to recycle effluent in the process. It is recommended that RIICO may identify land for utilization of treated effluent for irrigation also and make arrangement for conveyance of treated effluents. Desludging of drain at Mandpiya village also required to be undertaken by RIICO.

6.7.2 Environmental Status of Raipur industrial area, Chhattisgarh

Raipur city is one to the emerging commercial centers in the country with rapid growth of industrial activities. The industrial areas are expanded in and around the city with units having extensive pollution potential. There are more than 820 industrial units in operation at four major industrial areas. Sponge iron and rolling mills contribute to pollution in a significant manner, while other SSI units discharge uncontrolled emissions/effluents.

On the basis of the survey undertaken by Central Pollution Control Board, it is recommended that the industrial units should not be allowed to operate without proper pollution control measures. Options of setting common ETPs for the treatment of wastewater from the industrial areas needs to be explored. Control of Fugitive emissions and proper management of solid wastes in sponge iron units should be given high priority. A common treatment, storage and disposal facility for hazardous waste to be developed in the State.

6.7.3 Assessment of Status of Environment at Ankleshwar, Gujarat

Ankleshwar is one of the largest chemical industrial estates established during year 1976-77 by Gujarat Industrial Development Corporation (GIDC) and is located in Bharuch district of Gujarat State. Ankleshwar is one of the critically polluted problem areas due to the presence of two major chemical industrial estates viz. Panoli and Jhagadia. The industrial estates are accommodating over 1000 operating industrial units, manufacturing a spectrum of products such as Pharmaceuticals, Dyes & Dye Intermediates, Pesticides, Engineering, Plastic, Paints, Textile, Food Processing and Packaging, etc.

Central Pollution Control Board as pollution assessment exercise has monitored the situation of water pollution in the area and carried out monitoring at CETPs (at Ankleshwar & Panoli) and Final Effluent Treatment Plant (FETP), Ankleshwar. FETP (Capacity 40 MLD) is provided for polishing treatment of the effluent generated from industries from three industrial areas (Ankleshwar, Panoli, Jhagadia), effluents from CETPs (Ankleshwar & Panoli). The final discharge is being made through Marine Outfall. Central Pollution Control Board has also issued direction under Section-18 (1) (b) of The Water (Prevention and Control of Pollution) Act, 1974 to Gujarat Pollution Control Board in the matter of pollution of CETPs and also communicated concern to Dept of Environment, Govt. of Gujarat over the situation of FETP in respect of insufficient hydraulic as well as treatment capacities. Gujarat Pollution Control Board has taken steps towards controlling pollution problems in the Bharuch Region including directions to CETPs, individual industries violating norms, meetings with Industrial Associations & GIDC, restrictions on granting consent to operate for new as well as expansion of existing industries etc. As a result FETP has been expanded with additional capacity 20 MLD to accommodate more effluent generated from new as well as from expansion of existing units. The situation at Amlakhadi,

natural drain carrying domestic as well as industrial effluent from Ankleshwar has slightly improved. Sewage Treatment Plant (STP) of capacity 22.5 MLD is provided for the domestic wastewater generated from residential area of GIDC. At present, 5-6 MLD sewage from part of residential area is being treated at STP.

The monitoring reflects that Amlakhadi is gradually becoming free from discharge of industrial effluent, industrial as well as domestic wastewater flow however, CETPs and FETP are still not meeting the discharge norms prescribed by Gujarat Pollution Control Board. FETP though provided for polishing treatment, receiving effluent with 2-4 times more than the inlet effluent quality norms. During the year 2008-2009, the levels of TSS, BOD, COD and ammonia in the FETP influent was in the range of 281-856 mg/l, 438-1023 mg/l, 2173-4127 mg/l and 32-1657 mg/l respectively where as the range of these parameters in the final effluent was 246-1220 mg/l, 338-885 mg/l, 911-4158 mg/l and 338-953 mg/l respectively. The average influent BOD & COD has been observed as 746 & 2752 mg/l respectively, while average effluent BOD & COD was 594 & 2410 mg/l.

6.7.4 Assessment of Status of Environment in Vapi, Gujarat

Vapi Industrial Estate, developed by Gujarat Industrial Development Corporation (GIDC), has came into the existence exactly four decades ago i.e. in 1967 – 68. Vapi GIDC Estate is centrally located on the National Highway No. 8 (Ahmedabad – Mumbai) with the Union Territories of Daman and Dadra & Nagar Haveli on either side. The Vapi industrial estate is one of the 'Critically Polluted Pollution Problem Area' in the Country. Basically a "declared" chemical estate, about 70% of the industries are chemical and chemical related such as Dyes & Dyes Intermediates, Pigments, Pesticides, Fine Chemicals and Pharmaceuticals etc. The remaining 30% industries comprises of Paper Mills, Packaging (both paper and plastic based), Engineering, Plastics, Textiles, Food Processing, Paints, Printing Inks and many other products.

Damanganga River, flowing through Vapi-Daman region has become polluted due to discharge of treated effluent (though not meeting discharge norm prescribed by GPCB) from Common Effluent Treatment Plant (CETP) and twin Distilleries at Daman. The CETP has been established during the year 1997 and industries are discharging partially treated effluents into GIDC drainage system leading to CETP for treatment. Regular complaints are being received from NGOs, Administration at UT of Daman, Diu & Dadra Nagar Haveli, Ministry of Home Affairs regarding water pollution and fish kills at Damanganga Estuary. Central Pollution Control Board has issued Direction (during December 2006) under Section-5 of EP Act, to CETP, Vapi.

As per the Directions, CETP has deposited Bank Guarantee of Rs. 50 Lakhs, which subsequently forfeited, in Central Pollution Control Board due to non-compliance of the direction in full. Now, Gujarat Pollution Control Board has been directed to review the situation and take further necessary action in this matter. The CETP has provided additional treatment units such as Up-flow Anaerobic Sludge Blanket Reactor (UASB), Tertiary Treatment Units consisting of Dyna Sand Filter, CAACO (Catalytic Autotrophic Activated Carbon Oxidation). The up-gradation of CETP is still undergoing. CETP has also provided On-line pH, Flow, TOC monitor at the Final Outlet. One of the directions was in respect of Ammonical Nitrogen (NH_3-N)

treatment, as it was not viable at CETP end, CETP and Gujarat Pollution Control Board has taken initiative for reducing NH_3-N at individual unit level. As a result, NH_3-N level has reduced in the influent to CETP. CETP has engaged National Institute of Oceanography (NIO), Mumbai for the Survey and identification of final discharge point for disposal of treated effluents in Arabian Sea.

During the year 2008-2009 the level of TSS, BOD, COD and ammonia in the treated waste water of CETP was in the range of 86-711 mg/l, 98-419 mg/l, 497-1399 and 88-248 mg/l respectively. The value of these four parameters in the untreated waste water of CETP was in the range of 273-931 mg/l, 403-910 mg/l, 1180-5358mg/l and 104-304 mg/l respectively. River Damanganga is continuous monitored on quarterly frequently at two locations viz. after CETP effluent discharge at Jari Causeway (Gujarat-Daman Border) and after Distillery effluent discharge near mouth of estuary, old bridge joining Nani & Moti Daman, under Interstate river quality monitoring programme.

6.7.5 Assessment of Status of Environment at Tarapur, Maharashtra

Tarapur has been identified one of the critically polluted pollution problem areas identified in Maharashtra by Central Pollution Control Board. The action plan for the problem area had been prepared and efforts are under way to implement the action plan. The time targeted action plan was prepared to solve pollution related problems of the area. The Maharashtra Pollution Control Board, Maharashtra Industrial Development Corporation & Tarapur Industries Association are the identified responsible agencies for the implementation of action plan. The review of critically polluted area Tarapur was carried out during year 2008. Illegal discharge of untreated effluent by industrial units, inadequacy of effluent carrying system in estate and non-compliance of the CETP have been the major issues in the industrial estate. Directions under Section 18 (1) (b) of The Water Act & The Air Act were issued to Maharashtra Pollution Control Board on the basis of the findings in June 2008. Subsequently, Maharashtra Pollution Control Board also has taken steps for improvements in the industrial estate. The new CETP has also taken-up steps to augment the hydraulic treatment capacity. The issues are yet to be addressed in more focused manner by implementing agencies viz. Maharashtra Pollution Control Board, Industries and Maharashtra Industrial Development Corporation.

6.7.6 Assessment of Status of Environment in Chembur, Maharashtra

Chembur is identified as another critically polluted pollution problem areas in Maharashtra because of the pollution generated by the industries located in the region. The action plan for the area was prepared and various efforts have been made for implementation to solve the pollution problem. Central Pollution Control Board has carried out detailed survey / monitoring of the area, to assess the status of implementation of earlier action points. Central Pollution Control Board has carried out a review study in Chembur. The detailed survey / monitoring including ambient air quality monitoring, source emission monitoring, effluent discharge sampling and Hazardous Waste Management has been undertaken at identified industries. The action points were also reviewed by Central Pollution Control Board along with Maharashtra Pollution Control Board and all the old action points were found complied. Transfer of material from oil refineries through pipelines has reduced the

traffic load due to refineries. However, it is recommended that MPCB may initiate the activities like networking of ambient air quality monitoring stations operated by individual industries, implementation of revised standards and source monitoring for compliance verification as per new standards at Fertilizer unit & Oil refineries, monitoring of hazardous Air Pollutants in the ambient air and traffic decongestion programme for further improvement in the situation.

6.7.7 Status of Environment at Manali, Tamilnadu

Manali, is one of the pollution problem area identified at Tamilnadu and action plan is under implementation. In order to review the progress, Central Pollution Control Board has undertaken detailed study of the area action plan prepared with reference to non-compliance points and reviewed the same with participation of all stake holders. During the study, assessment have been made through stacks monitoring, continuous online stack monitors, continuous and manual ambient air quality stations, ambient VOC & PAH measurement, analysis of effluent / canal / sludge and inspection of municipalities and other industries in the area.

The study reflects that in the SPM varied from 83 to 323 µg/m^3, SO_2 from 6 to 86 µg/m^3, NO_x from 10 to 28 µg/m^3 & NH_3 from 5 to 17 µg/m^3 in the ambient air (Fig.6.16). PAH was in the range of below detection limit (BDL) to 18 ng/m^3 (Fig. 6.17). Petrochemical and Oil refinery industries have not yet complied the changing over to low NOx burners. Management of solid waste and hazardous wastes is not satisfactory in few industries. No air pollution control measures were observed in the stacks attached to boilers and DG sets. Flare gas control measures to recover off gas during operation of flare gas stacks have not been provided. Biomass based boiler plants instead of FO/LSHS based boilers, adequate delay tanks before discharge into sea, introduction of LSHS in place of FO, strengthening of monitoring facilities, implementation of new standards for petrochemical and Oil refinery are also yet to be complied. Reverse Osmosis rejects and ETP sludge are dumped in low lying areas. It has been observed that monitoring facilities / provisions are not provided as per Emission Regulation part III. Air Pollution Control devices and ETPs are yet to be provided with separate energy meters. As per CREP conditions regular ground water monitoring, study of sea water intrusion (Ennore region), inventory of HAPs & carcinogenic compounds in Petrochemical and oil refineries are also yet to be started / completed. The details of the hazardous waste generated in Manali area is presented in Table 6.17

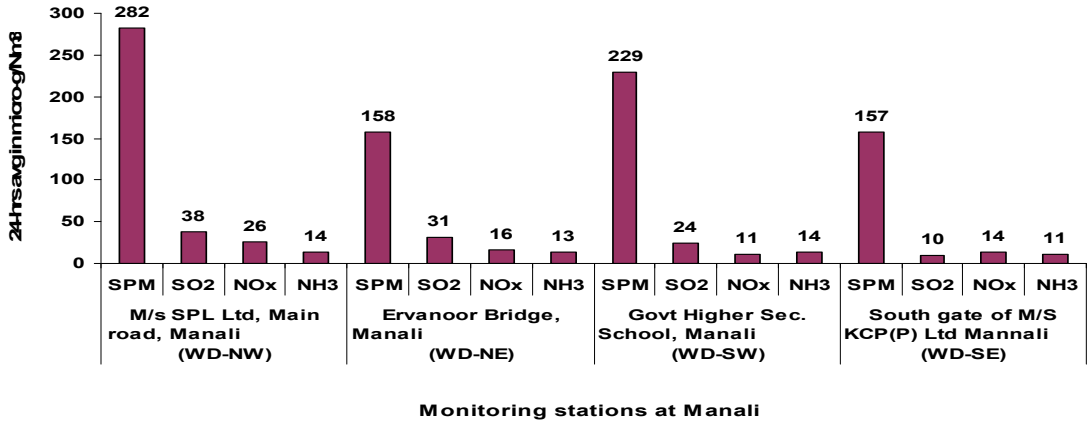


Fig 6.16: Ambient Air Quality Status at Manali, Tamilnadu

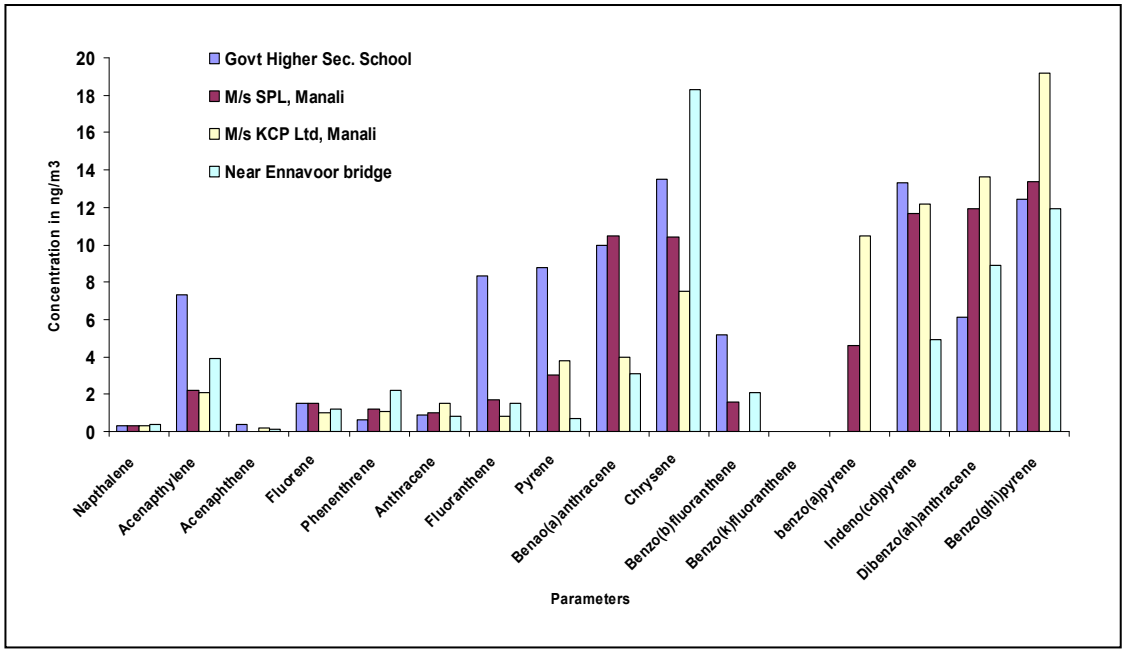


Fig 6.17: Poly Aromatic Hydrocarbon (PAH) Level in Ambient Air at Manali, Tamilnadu

Table 6.17: Hazardous Waste Generation in Manali area

S. No.	Industry	Hazardous Waste Generation (Tons / annum)
1.	M/s Manali Petrochemical Limited (Plant I & II)	3.2
2.	M/s Futura Polymers Limited	4.6
3.	M/s Indian additives Limited	1274
4.	M/s Balmer & Lawrie Co Limited	14.6
5.	M/s SRF Limited	56.96
6.	M/s Madras Fertilizers Limited	71.25
7.	M/s Kothari Petrochemicals Ltd	1.26
8.	M/s Coromandel Fertilisers Ltd	10
9.	M/s Petro Araldite Pvt. Limited	10
10.	M/s Tamil Nadu Petrochemical Limited (LAB)	1534
11.	M/s Tamil Nadu Petrochemical Limited (ECH)	140
12.	M/s Tamil Nadu Petrochemical Limited (HCD)	430
13.	M/s Cetex Petrochemicals , Manali	0.65
14.	M/s Nicholas Piramal Limited	23
15.	M/s CPCL (Refinery I,II ,III,CPP & other plants)	5400
	Total quantity	**8974**

6.7.8 Assessment of Status of Environment at Greater Cochin, Kerala

Greater Cochin area, located on the banks of river Periyar, is one of the major industrial hubs in Kerala. It was identified as a pollution problem area and action plan was prepared for implementation during year 1993. Most of the industries in the Greater Cochin area are located in the Eloor–Edayar belt, which are the two main streams of the River Periyar. The industries flow draw water from the river and discharge their treated effluent directly into it. In order to review/assess the progress, the study covering nine major industries was undertaken during September, 2008.

Major changes in the operation of these industries were noticed and most of the recommended in the earlier action plan were complied. However, there are some new issues i.e. solid and hazardous waste management, installation of air pollution control measures at stacks, water quality monitoring of ground water and Periyar River, regular ground water monitoring and pollution of Periyar River due to industrial discharge etc are yet to be addressed.

During the study, some other specific observations such as storage of oil residue in a stone quarry, spillage of Sulphur from the Sulphur recovery plant, non availability of in-house monitoring facility, non compliance of emission standards, etc. have been made. It is recommended that about 150 KLD of wastewater containing traces of radioactive material should be reused, DDT or final product storage should be properly made to avoid any chance for wash off during rains, ETP sludge stored in the unlined lagoons should be transported to sanitary land fill site or TSDF and electroplating area fumes should be collected and neutralized. The new comprehensive action plan needs to be prepared especially for preserving the Periyar River and improving the overall environment.

During the study water quality monitoring undertaken at river Periyar, in the upstream and downstream of the industrial area and the status is presented in Table 6.18.

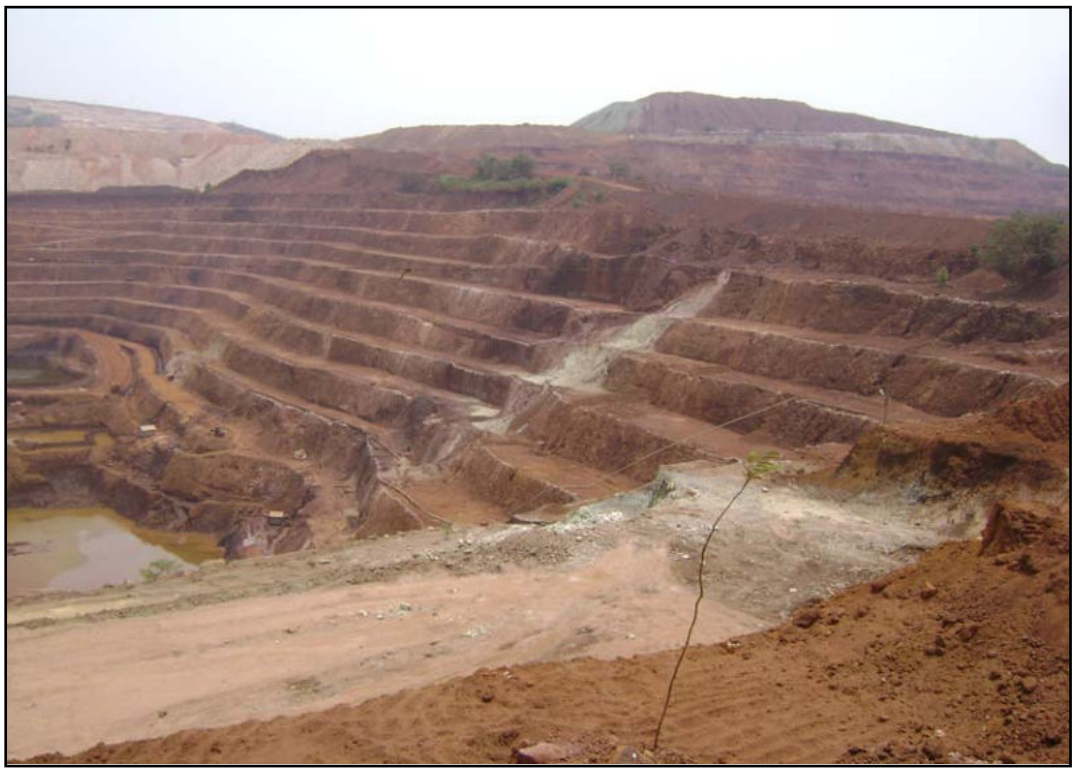
Table 6.18: Water Quality of Periyar River during September 2008

S. No.	Sample Details /Parameter	Upstream	Downstream
1.	pH	6.50	6.10
2.	Electrical Conductivity (µS/cm)	62	116
3.	Total Dissolved Solids (mg/l)	40	79
4.	Dissolved Oxygen (mg/l)	7.60	5.60
5.	Biochemical Oxygen Demand (mg/l)	BDL	BDL
6.	Chemical Oxygen Demand (mg/l)	15	12
7.	Alkalinity as $CaCO_3$ (mg/l)	15	17
8.	Total Hardness as $CaCO_3$ (mg/l)	30	36
9.	Calcium Hardness as $CaCO_3$ (mg/l)	12	20
10.	Magnesium Hardness as $CaCO_3$ (mg/l)	18	16

S. No.	Sample Details /Parameter	Upstream	Downstream
11.	Chloride (mg/l)	6	18
12.	Sulphates (mg/l)	2.50	1.40
13.	Fluoride (mg/l)	BDL	BDL
14.	Ammonical Nitrogen (mg/l)	0.30	2.20

6.7.9 Status of Chromite Ore Mining in Sukinda Valley, Orissa

Sukinda valley is formed between the Mahagiri and Doitari hill ranges of Orissa. Chromite ore is available at these hill ranges in deep vertical bed of 6 to 40 mt wide extended over 40 km in the North East to South-West direction in the Jajpur and Dhenkanal districts. There are fourteen chromite mines operating in the region, of which 13 mines are in production stage. The mines in Sukinda valley are open cast mines with exception one underground mine at Katpal.



Typical Chromite Ore Mine Pit with Benches and Seepage Water collection

The analysis of chromite ore mine seepage water in Sukinda indicates presence of dissolved chromium compounds both in trivalent and hexavalent form. It has been reported that in Sukinda valley generally Chromium^{+6} problem is associated with friable mineral. Presence of toxic hexavalent chromium in untreated mining discharge has been observed in the range of 0.2 to 2.2 mg/l during the monitoring conducted jointly by Central Pollution Control Board and Orissa State Pollution Control Board (OSPCB) during 2005 - 2008. Most of the mines have installed ETPs based on Ferrous sulfate ($FeSO_4$) dosing followed by contact chambers prior to final

discharge. This method of treatment has reportedly achieved satisfactory results. However, proper operation, maintenance and adequate dosing of $FeSO_4$ in ETP are of major concern in achieving the desired results. The Damsala Nala passes along the mining belt between the Sukinda valleys. The water discharged from all the mines in the areas reaches Damsala River. There is little flow in Damsala river at upstream of mining area; but receives significant discharge in the downstream stretch.

Opencast chromite mining generates enormous quantities of overburden (OB) as the stripping ratio in the area varies from 1:3 to 1:20. Improper management of over burden may lead to air / water pollution problems. The runoff from the overburdened dumps have dual potential of polluting the receiving water bodies as well as leaching of Chromium^{+6} into the ground water.

Chrome ore is being lifted from Seam at the bottom of the pit

Movement of trucks in the mining area causes major air pollution problem. It is understood that haul roads within the mine lease areas can not be covered with permanent black top or concrete due to changing contours of the mine pits. Water sprinkling on roads is effectively practiced at most of the mines.

The chromate ore deposits in Sukinda valley exists in forest area because of which, destruction of forest land is inevitable. The environmental clearances to these mines have been issued by Ministry of Environment & Forests to safeguard the environment.

The monitoring has been conducted jointly by Central Pollution Control Board and Orissa State Pollution Control Board indicate that the quality of river has been affected with Hexavalent chromium with downstream concentration reaching upto 0.2 mg/l from Below detection limit in the upstream.

Run-off from depleted friable ore in overburden dump may also contribute to ground water contamination.

Based on the study, following recommendations have been made to restore the environmental conditions at Sukinda Valley:

- All the overburden dumps, whether fresh or old should be scientifically covered. The fresh dump should be stabilized with Geo textile, coir matting and plantation.

- Facilities should be created to intercept the runoff from the dump site.

- Only the treated effluent and should be used for water sprinkling in mining and other areas.

- The haul roads in and around the mines should be properly maintained and water sprayed at regular intervals to prevent the airborne dust.

- Green belt should be provided all along the haul roads, mining area, workshop and stockyard.

- Regular monitoring of air and water in area as well as mines should be undertaken by individual mining agencies to assess the status of pollution in the area.

- The contaminated water should not be discharged above the permissible limit into receiving water bodies.

- The scope of filling the old mine voids with overburden may be studied, especially when the mining has to go underground after achieving the limitation of depth.

6.7.10 Environmental Status of Coastal Aquaculture in West Bengal

Aquaculture interacts with the environment, utilizes resources and may cause environmental changes. The interactions have both beneficial and adverse effect. Central Pollution Control Board has taken up a project to observe and understand the present local practices of Coastal Aquaculture specially Shrimp Farming within/outside CRZ region in the State of West Bengal.

Fish Harvesting Operation

The potential aquaculture area in West Bengal is about 2.10 lakh ha of which approx. 0.55 lakh ha has been developed scientifically. The Coastal aquaculture in West Bengal mostly employs traditional and improved traditional organic farming and most of the Bhery farms are located in 24 Parganas, South & North districts, whereas the intensive & modified culture practices are prevalent in East Midnapore district.

Total 18 aquaculture Farms located in the above three district of West Bengal was monitored during the year. The Aquaculture farms were of various dimensions. During monitoring it has been observed that that there is lack of spacing norms between farms. Farms have common intake and outflow channels and intake water of one pond mixes with the untreated effluent of the another pond. Stocking rate/m^2 has been ignored for more yield and profit from the one time crop. Rampant use of feed (including natural and commercial pellets of organic material) aggravate the formation of pond bottom sludge and fouling of the pond water. This practice also leads to hypernutrification followed by eutrophication in the farm water and in the receiving water bodies. The largest portion of solid waste generated from metabolic waste product of the shrimp and non-edible food materials, may be released along with farm waste water which may result in the formation of anoxic sediments. Out gassing of carbon dioxide, ammonia, methane and hydrogen sulfide may enhance the possibility of reduction or abundance in micro/macro fauna, biomass and species composition.

6.7.11 Assessment of Status of Environment at Singrauli Area

Singrauli had been identified as pollution problem area. To review the status of Action Plan for the area and physical verification of Action Points, the survey has been undertaken by Central Pollution Control Board. During the survey it was observed that except for power plants of NTPC Rihand and HINDALCO Captive Plant at Renusagar, and partially in case of NTPC Vindhyachal, all the other power plants are yet to ensure provision of ash water recirculation system. M/s HINDALCO Industries and M/s Kanoria Chemicals at Renukoot have taken steps for waste minimization. M/s HINDALCO Industries have also established complete dry scrubbing for emissions, besides recycling of pot line for Cryolite recovery and upgradation of ETP. M/s Kanoria Chemicals at Renukoot have been sequentially upgrading the Caustic Soda production based on Membrane Technique. Pollution due to stone crushers is still a serious issue in Singrauli region as the compliance of environmental standards is not satisfactory.

6.7.12 Monitoring of Tea gardens at North Bengal and Darjeeling for Assessment of Residual Pesticides in Soil and River water

The Doars and Darjeeling district are famous for the tea gardens. As in other agricultural productions, the tea estates are using pesticides such as BHC, Heptachlor, Endrin, Methoxychlor, pp-DDT, Endo11, Endo1, Dieldrin, Lindane and HCH for protection of yield from insect pests. The common insects affecting tea gardens are mainly red spider, looper mites; reds slug termites, helopeltis and green fly. The indiscriminate use of pesticide chemicals may create adverse effects on human life and posing health challenge. Release of the pesticide to the environment takes place through volatilization, spray drift, run off, leaching, absorption and crop removal.

The amount of the pesticide that is adsorbed to the soil varies with the type of pesticide, soil moisture, soil pH and soil texture. Pesticides are strongly adsorbed to soils that are high in clay or organic matter. Most of the soil-bonded pesticides that are less likely to give off vapors or leach through the soil, are moving in to receiving body along with surface run-off over a sloping surface. Thus, pesticides are mixed with the water or adsorbed to eroding soil.

Tea Gardens at North Bengal and Darjeeling

Tea Leaves collection from Tea Garden

Considering the seriousness of the problem, Central Pollution Control Board had undertaken an in-depth survey in the selected tea gardens of Doars and in the Darjeeling District. The sampling was undertaken at the garden using Bio–pesticides as well as the garden using pesticide intensively in the Doars area. In Darjeeling area the collection of soil, sediment and river water samples was restricted to the gardens using bio-pesticides only. Due to the location of these gardens in terrai and hilly region, surface run off is influenced by natural undulation. The gardens under study are infested by pests both in the Terrai region as well as in the hill region.

Table 6.19: Soil characteristics in the Tea Gardens of Doars and Darjeeling District

Area	Tea Garden	pH	Organic Carbon %	Sand %	Silt %	Clay %	Textual class
Darjeeling District	Rangli	4.20	5.24	36.20	45.28	18.52	Loam
	Pandam	4.5	4.54	32.18	49.93	17.89	Loam
	Ging	5.0	6.02	35.38	42.33	22.29	Loam
	Teesta	4.8	6.00	39.20	42.18	23.62	Loam
Doars	Gangaram	4.3	5.72	48.72	43.78	7.50	Silt
	Bagrakote	4.5	5.00	50.00	40.50	9.50	Silt
	Kilkot	5.7	5.65	41.8	39.45	18.75	Loam
	Taipu	5.5	4.85	47.62	42.38	10.00	Sandy loam

Soil characteristics at the Tea gardens monitored has been depicted in Table 6.19. The high content of organic carbon in The Garden of Teesta, Rangli and Ging in the Darjeeling district is a local phenomenon.

The study of tea gardens reveals the presence of pesticides in the Garden soil, sediment collected from the Jhoras and river water. BHC, Heptachlor, Endrin, Endo11 & Methoxychlor are the most common pesticides found at all the garden soil as well as in the receiving water bodies. Presence of these pesticides in the garden soil of Darjeeling district inspite of not using chemical pesticides, might be the after effects of the pesticides application in the lean season to the soil for the removal of the weeds and the soil pests. The concentration of BHC in the Jhora and river water has been found between 0.0765 to 0.3291 μg/l , Heptachlor as 0.2498 to 0.5124 μg/l Endrin 0.0207 to 0.1556 μg/l , Heptachlor–Epoxide 0.1571μg/l, Endo II between 0.0423 to 0.1229 μg/l, pp-DDT 0.0908 to 0.7206 μg/l, Methoxychlor between 0.548 to 1.3238 μg/l. The presence of these pesticides in the river water may be due to surface run off from the tea gardens as well as from the adjoining agriculture soil. Most of the soil of the tea garden reveals the presence of Methoxychlor, BHC and heptachlor. Methoxychlor varied from 0.0653 to 0.0814 mg/kg, BHC from 0.0535 to 1.4757 mg/kg and Heptachlor varied from 0.0135 to 0.0664 mg/kg.

Surface run off from tea garden

Based on the monitoring study in the tea gardens of Doars and Darjeeling district it is recommended that integrated pest management principals are to be practiced immediately. Implementation of available non-chemical control practices, including mechanical, cultural and biological controls, sanitation and plant resistance is to be adopted. Least selection of least harmful pesticides from human health view point must be undertaken.

6.7.13 Status of Pollution Control during Coal Mining activities at Angul (Talcher) and Jharia (Dhanbad)

Coal is one of the primary sources of energy and the largest contributor to the industrial growth of the country. At present, 69% of the electricity is generated from coal based Thermal Power Stations. The major portion of coal is available in the states like Jharkhand, Orissa, Chhattisgarh, Madhya Pradesh, Andhra Pradesh and West Bengal. Jharkhand is endowed with 72.3 billion tonnes of coal reserves and is

the only state which is producer of prime coking coal. Orissa state is having around 23.8% of total coal reserves in India.

The key environmental problems and impacts because of coal mining activities include land degradation and loss of Bio-diversity, air, water & noise pollution etc. The study has been undertaken by Central Pollution Control Board to have first hand information on environment status at major coal mines at Angul and Jharia coal mine area. The study included the assessment of various environmental components, which are directly or indirectly exposed to the activities of mining along with various environmental management activities. Seven mines at Angul, Talcher area and ten mines at Jharia, Dhanbad were studied during the year.

Shovel operating on a bench

Shovel loading overburden onto a Dumper Truck

The overburden dumps generated from coal mines are not scientifically managed. The dumps are exposed to the atmosphere and suitable stabilization treatment such as coir matting, toe pitching, plantation etc. has not been carried out at many mines. The dumps are very close to the villages and flushing of same contaminate nearby water bodies. Friable dumps are major source of airborne dust and suspended solids in the river water. Most of the dumps are not covered with retaining wall and garland drains to prevent the runoff water from these dumps to flow into the main river. Local people of the villages, colonies located near the mines are continuously subjected to the air and noise pollution caused by the movement of the vehicles engaged for transporting coal. Poor road conditions are significantly contributing to spillage of friable coal dust on roads. Deforestation is also responsible for air borne dust in the surrounding areas. Water spraying was observed at many mines, however spraying on the haul road alone does not serve the purpose. Spraying with treated water should be extended to fresh dumps to enable plantation and stabilization. The operation and maintenance of ETPs has not been found satisfactory, ETPs are either inadequate or not operating at designed capacity. Middling and rejects from few coal washeries were stored in stockyard near the river, which was not brick lined and of inadequate capacity. During monsoon season the overflow from these stockyards may flow directly into the river, thus polluting the river. Surface mining using surface miner is most suitable mining option from environmental pollution viewpoint.

Following are the recommendations to restore the environmental conditions of coal mines:

- All the overburden dumps whether fresh or old should be scientifically covered. The fresh dump should be stabilized with coir matting and plantation, whereas, the old dumps should be covered with grasses and plantation.
- The overburden bench should be suitably designed and rehabilitated with grass and plants to prevent its runoff and slope failure. Special care should be provided to minimize run off/ seepage.
- All the dumps should be covered by retaining walls at toe side, garland drains to intercept the runoff all along the dump side leading to a holding pit to retain the run off.
- The Effluent Treatment Plant should have adequate capacity.
- Hazardous waste should be properly managed.
- Only treated effluent from the ETPs should be used for dust suppression in and outside the mining area.
- Roads in and around the mine should be properly maintained and adequate arrangement for water spraying should be provided to suppress the air borne dust.
- Green belt should be provided all along the haul roads.
- All the run-off drains from the mining areas should collect into a holding / settling pond to remove the settable solids before discharging into the receiving body.
- A green belt should be developed covering the mining area, workshop and stockyard.
- Regular monitoring of air and water in and around the mining area should be undertaken to assess the status of pollution.
- All the stock yard in and around the river for washed coal, middling and rejects should have retaining wall & provided with drains and catchments pit of adequate capacity keeping in mind the excess surface water during rainy season.

6.7.14 Environmental Status of Oil & Gas Exploration and Drilling areas in North - Eastern region

Oil and Gas exploration and drilling activities may contribute significantly towards environmental pollution in the mining area. Crude Oil and Natural gas are available in the States of Assam, Arunachal Pradesh, Nagaland and Tripura. Oil and Natural Gas Corporation Limited (ONGCL) and Oil India Limited (OIL) are the major agencies for oil & gas exploration and drilling activities in these States since a long. However, during the recent years, various Private Sector companies have also started Oil and Gas Mining operations in the States of Assam, Arunachal Pradesh, Nagaland and Tripura.

To assess the environmental Pollution from Oil and Gas mining areas, the important Oil and Gas Exploration and Drilling Areas as well as major production installations in Arunachal Pradesh and Assam have been surveyed. The major findings of the study are haphazard dumping of Hazardous wastes (Oily sludge, Tank Bottom Sludge, etc.) by the Public/Private sector companies, disposal of formation water without sufficient pre-treatment, spillage of Oil / Oily Sludge from the Production Installations to the surrounding areas and improper design of round Flares of Natural Gases.

Earthen pits of crude / oily sludge inside Kathalguri mud preparation station

Sludge pit inside the Kathalguri Mud Preparation Station

Oil/Oily Sludge is flowing down the Natural Drain near the Kathalguri

Ground flare without proper enclosure at oil mining site at Arunachal Pradesh

It is recommended that oil and gas drilling/exploration companies should install Effluent Treatment Plant to treat the formation water to meet with the prescribed norms. Inventorisation and reclamation of oily sludge dumping pits is required. Oil companies should construct brick wall as per norms around the ground flares. DG set or power generators should have roper acoustic enclosures. Emissions from DG Set or power generators should be released in the vertical direction at a proper height as recommended in The Environment (Protection) Act, 1986.

6.7.15 Status of Environmental Management by Automobile Workshop in North-East States

Automobile Workshops release significant quantity of wastewater from vehicle washing activities. The wastewater contains Oil and Grease, Greasy mud etc. Lube oils are often replaced during servicing of vehicles. Mode of disposal of the spent lube oil is important as it is categorized as Hazardous Waste. In addition to these the automobile workshops also uses DG Sets and Paint booths.

To understand the status of pollution Control Measures adopted by the automobile workshops, the study was undertaken by Central Pollution Control Board in North East States. It was observed that the waste water generated during vehicle washing is not treated properly. In the States of Meghalaya and Mizoram, automobile workshops are applying for consents from the respective State Boards, while in other States like Assam, Nagaland etc, the workshops are running without any consent from discharge of effluent. The Used oil generated by the Workshops are not quantified and disposed off to the registered recyclers and thus not handled as per the Hazardous Waste (Management and Handling) Rules, as amended. Diesel Generating Sets are not having proper acoustic enclosures and emissions are released at low height that too in the Horizontal Direction, in most of the cases emissions from the Paint booth are also found being released at a very low height.

Based on the studies, it is recommended that the automobile workshop should operate with valid consent and Hazardous waste authorization from respective State Pollution Control Board. Spent oil should be disposed off to registered recyclers only. Emissions from stacks of DG set and Paint booths must be released at a proper height in the vertical direction. It is also recommended that effluent should be released into the surface drain after filtering through Media filters.

6.7.16 Study of Micro-pollutants in Soft Drinks Industries

In various recent studies, metal concentration in the sludge generated from soft drink bottling plants has been reported. In some industries the heavy metal concentration has been found exceeding the prescribed limits. In some cases the ground water used in the process was also seen as one of the source of metal contamination. The study has been undertaken by Central Pollution Control Board at selected Beverage plants to assess the level of metals and pesticides accumulated in sludge. Seven heavy metals and five pesticides have been studied in eight plants located at Madhya Pradesh, Chhattisgarh and Rajasthan. The analytical results obtained during the study are presented in Table 6.20 and 6.21.

The study indicated that the source of metals is originating from bottle washing effluent. In the process of bottle washing process, previous codes of bottles get washed and coding ink keeps accumulating in caustic bath. It is also suspected that paints of various colors used for printing of bottles are also contributing heavy metals. Hence, separate treatment of soaking caustic waste may further reduce concentration of heavy metals in ETP sludge. The source of pesticide contamination may be either ground water used in the process or may be from the raw material used by the industries.

Considering the presence of micro-pollutants in the wastes of soft drinks industries, it is important to develop a database for ground water quality in and around the bottling plants, as initial stages of ground water pollution has been observed in vicinity of Beverage plants.

Table 6.20: Status of Heavy Metals in Beverages Plants located in Madhya Pradesh, Chhattisgarh and Rajasthan

Beverage Plant	Sampling Location	Heavy Metal Concentration (in mg/l in liquid samples mg/kg in solid samples)						
		Cd	Cr	Cu	Fe	Ni	Pb	Zn
M/s Hindustan Coca Cola Beverages Pvt. Limited, Pillukheddi, District- Rajgarh Madhya Pradesh	Raw Ground water	NT	NT	0.03	0.19	NT	NT	0.07
	Treated Ground water	NT	NT	0.03	0.08	NT	NT	NT
	ETP Inlet	NT	NT	0.05	1.06	NT	NT	NT
	ETP Outlet	NT	NT	0.04	0.53	NT	NT	NT
	ETP Sludge WTP	NT	0.062	0.003	14.800	0.099	0.056	0.035
	ETP Sludge	0.050	0.092	0.087	8.610	0.027	0.452	0.277
M/s Varun Beverages Limited, Bhiwadi, Rajasthan	Raw Ground water	NT	NT	0.04	0.20	NT	NT	NT
	Treated Ground water	NT	NT	0.04	0.16	NT	NT	NT
	ETP Inlet	NT	0.07	0.10	3.77	NT	0.67	0.31
	ETP Outlet	NT	NT	0.04	1.66	NT	0.29	0.01
	ETP Sludge	0.104	0.180	0.122	12.500	0.015	0.786	0.774
M/S SMV Beverages, Raipur, Chhattisgarh	Raw Ground water	NT	NT	NT	1.52	NT	NT	NT
	Treated Ground water	NT	NT	NT	1.16	NT	0.46	NT
	ETP Inlet	NT	0.09	0.05	3.02	NT	0.33	0.01
	ETP Outlet	NT	NT	NT	2.39	NT	0.30	NT
	ETP Sludge –I	0.021	0.081	0.205	37.600	0.029	1.420	0.699
	ETP Sludge –II	NT	0.009	0.015	1.510	NT	NT	0.049
M/s Narmada Drinks, Bilaspur, Chhattisgarh	Raw Ground water	NT	NT	NT	0.16	NT	NT	0.06
	Treated Ground water	NT	0.11	NT	0.19	NT	NT	0.12
	ETP Inlet	NT	NT	0.03	0.49	NT	NT	0.15
	ETP Outlet	NT	NT	0.03	1.18	NT	7.05	0.07
	ETP Sludge	0.003	0.053	0.026	13.600	0.022	0.145	0.293
M/s Udaipur Beverages Limited, Jabalpur Madhya Pradesh	Raw Ground water	NT	NT	0.03	0.21	NT	NT	NT
	Treated Ground water	NT	NT	NT	0.12	NT	10.30	NT
	ETP Inlet	NT	NT	0.04	0.83	NT	0.29	0.05
	ETP Outlet	NT	NT	0.03	1.42	NT	0.11	NT
	ETP Sludge –I	0.006	0.077	0.207	16.100	0.046	0.194	0.294
	ETP Sludge – II	NT	0.045	NT	17.000	0.049	NT	0.084
M/s SMV Beverages, Mandideep, District- Raisen Madhya Pradesh	Raw Ground water	NT	NT	0.43	NT	NT	0.62	NT
	Treated Ground water	0.18	0.09	0.54	NT	NT	NT	0.21
	ETP Inlet	NT	0.05	9.83	NT	NT	0.74	0.24
	ETP Outlet	NT	0.04	2.48	NT	NT	0.27	0.41
	ETP Sludge- I	0.033	0.069	0.075	19.500	0.011	0.977	0.260
	ETP Sludge –II	NT	0.007	0.010	1.110	NT	NT	0.002
M/s Varun Beverage Limited Jodhpur, Rajasthan	GW	NT	NT	NT	1.00	NT	NT	0.14
	Treated Ground water	NT	NT	NT	1.35	NT	NT	NT
	ETP Inlet	NT	NT	NT	0.30	NT	NT	0.08
	ETP Outlet	NT	NT	NT	0.23	NT	NT	0.01
	ETP Sludge –I	0.03	0.078	0.014	13.65	NT	0.644	0.254
M/s Hindustan Coca Cola Beverages Limited, Kaladera Industrial Area, Jaipur, Rajasthan	Raw Ground water	NT	NT	0.05	2.93	NT	14.80	0.17
	Treated Ground water	NT	NT	NT	0.32	NT	NT	0.13
	ETP Inlet	NT	NT	NT	0.18	NT	0.20	0.06
	ETP Outlet	NT	NT	0.03	0.26	NT	3.57	NT
	ETP Sludge –I	0.039	0.06	0.056	8.00	NT	64.30	0.248
	ETP Sludge –II	0.096	0.027	0.043	7.03	NT	3.95	0.239

***Abbreviations**: Arsenic (As), Cadmium (Cd), Chromium (Cr), Iron (Fe), Nickel (Ni), Lead (Pb), Zinc (Zn), Not traceable (NT)*

Table 6.21: Status of Organo-Chlorine Pesticides in Beverage Plants located at Madhya Pradesh, Chhattisgarh and Rajasthan

Beverage Plant	Sampling Location	Pesticides Residue Concentrations (in ng/l in liquid samples ng/kg in solid samples)		
		Total BHC	Total Endosulfan	Total DDT
M/s Hindustan Coca Cola Beverages Pvt. Limited, Pillukheddi, District-Rajgarh Madhya Pradesh	Raw Ground water	NT	NT	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	NT	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge	NT	NT	NT
M/s Varun Beverages Limited, Bhiwadi, Rajasthan	Raw Ground water	NT	NT	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	163.61	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge	16.89	61.47	15.08
M/S SMV Beverages, Raipur, Chhattisgarh	Raw Ground water	NT	NT	NT
	Treated Ground water	35.40	41.80	NT
	ETP Inlet	NT	NT	NT
	ETP Outlet	26.95	NT	NT
	ETP Sludge -I	NT	NT	NT
	ETP Sludge –II	NT	NT	NT
M/s Narmada Drinks, Bilaspur, Chhattisgarh	Raw Ground water	NT	NT	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	86.31	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge	NT	2.85	NT
M/s Udaipur Beverages Limited, Jabalpur Madhya Pradesh	Raw Ground water	NT	26.48	NT
	Treated Ground water	NT	59.89	71.45
	ETP Inlet	NT	NT	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge -I	18.65	NT	NT
	ETP Sludge –II	NT	NT	NT
M/s SMV Beverages, Mandideep, District-Raisen, Madhya Pradesh	Raw Ground water	NT	NT	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	NT	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge -I	NT	NT	NT
	ETP Sludge –II	NT	NT	NT
M/s Varun Beverage Limited , Jodhpur, Rajasthan	Raw Ground water	37.29	NT	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	NT	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge I	8.20	NT	23.19
	ETP Sludge II	NT	NT	NT
M/s Hindustan Coca Cola Beverages Limited, Kaladera Industrial Area, Jaipur, Rajasthan	Raw Ground water	NT	72.64	NT
	Treated Ground water	NT	NT	NT
	ETP Inlet	NT	NT	NT
	ETP Outlet	NT	NT	NT
	ETP Sludge I	NT	9.96	NT
	ETP Sludge II	NT	4.67	NT

6.7.17 Study of Environmental Problems of Aravalli Hills and Preparation of Action Plan for Restoration of Environmental Quality for Gurgaon and Alwar District

The Aravalli range, stretching from Palanpur in Gujarat to the State of Delhi, divides Rajasthan into three distinct climatic regions. The range is a unique amphitheatre of biological diversity. Due to its geographical location, the range harbours a mix of Saharan, Ethiopian, peninsular, oriental and even Malayan elements of flora and fauna. In the early part of this century, the Aravallis were covered with dense forest, waterfalls and one could encounter a larger number of wild animals. Over the last few decades intensive mining in the Aravalli Hills along with the operation of stone crushers and pulverizers, the deforestation and the unplanned construction activities have seriously affected the natural environment in the region by way of unattended excavated mine pits, disturbance in the underground aquifer besides a number of other disturbance to flora and fauna.

The Central Pollution Control Board has prepared a document “Study of Environmental Problems of Aravalli Hills & Preparation of Action Plan for Restoration of Environmental Quality” for Gurgaon and Alwar District. This Report seeks to provide some details of the pollution problems of Aravalli Hills area of Alwar and Gurgaon District and proposes an Action Plan for the restoration of the environmental quality to the extent possible.

CHAPTER VII

ENVIRONMENTAL RESEARCH

7.1 GROUNDWATER REMEDIATION IN KANPUR

The Pilot Project on Groundwater Remediation executed by Central Pollution Control Board Zonal Office - Lucknow was reviewed by the Asian Development Bank. The findings of the study were presented at the ADB Conference at Phillipines, Manila. The project proposal for full scale remediation of groundwater has been submitted to Ministry of Environment & Forests for financial support of The World Bank.

7.2 TESTING AND VALIDATION OF BOD BIOSENSOR BASED ON MICROBIAL MIXED CULTURE FOR RAPID BOD DETERMINATION IN WASTEWATER

Biochemical Oxygen Demand (BOD) is the most important and commonly used parameter in water quality monitoring and designing of effluent treatment plant. The BOD measurement takes considerable time i.e. 3 days at 27^{o} C or 5 days at 20^{o}C as well as consumes lot of energy. To overcome these constraints, attempts being made to carry out the test in short time, through the technique using BIO-SENSOR probes. This technique involves selection of suitable microbial composition for using Bio-sensor so as to degrade the wide range of wastes. In this endeavour, Central Pollution Control Board is attempting to develop BIO-SENSOR and instrument for rapid BOD test in collaboration with Institute of Genomics & Integrative Biology (IGIB) (IGIB), CSIR, Delhi. The BIO-SENSOR membrane has been developed and analysis was undertaken using GGA (Glucose Glutamic Acid) standards and various effluent samples. The analytical results obtained are comparable with conventional BOD values (Fig. 7.1 and 7.2**.)**

The BOD sensor was used to analyze the BOD values in different concentrations of the standard GGA solution. The typical response curves of the microbial electrode sensor have been prepared when the diluted standard solution of GGA was employed for the experiments. A linear relationship was observed between the current difference (between initial steady-state current and final steady-state current) and the 5-day BOD of the standard solutions. The lower limit of detection was 1 mg/l by the developed sensor. The developed BOD sensor was used to analyze real wastewater samples. For the same samples, 5-day BOD was also determined by the conventional analytical method for comparison with the BOD values estimated by the sensor.

BOD BIOSENSOR Experimental Set up

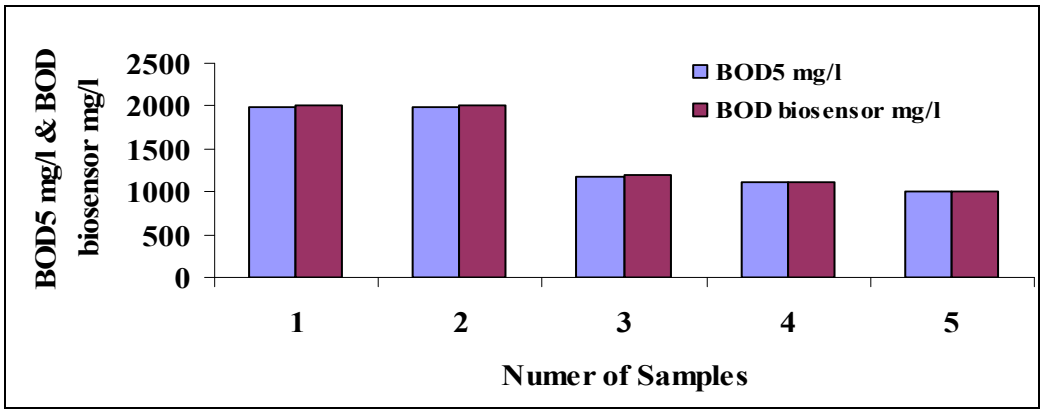


Fig.7.1: Comparison of BOD_5 & BOD Biosensor values of Pulp & Paper untreated wastewater

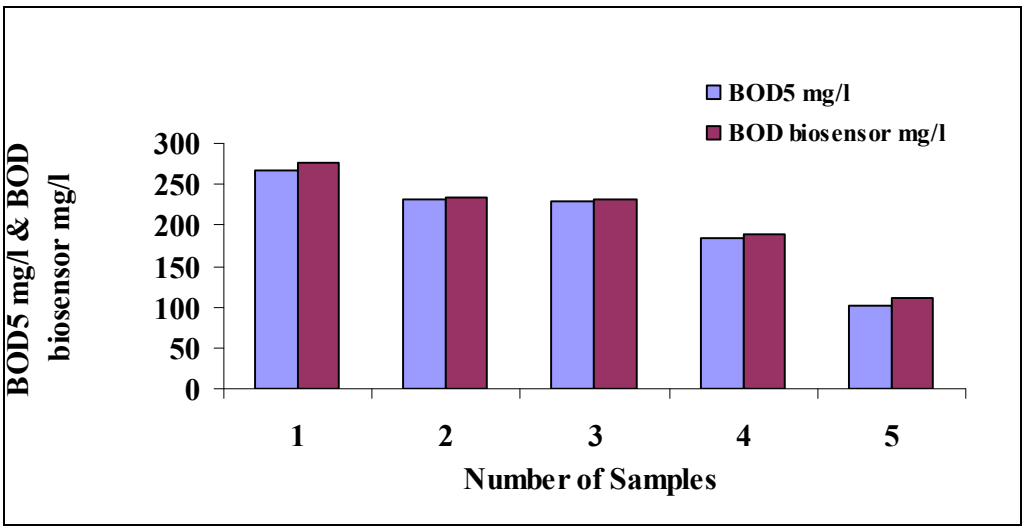


Fig.7.2: Comparison of BOD_5 & BOD biosensor values of Pulp & Paper treated wastewater

7.3 PILOT PLANT STUDY USING SLUDGE-REAGENT-PRODUCT (SRP) TECHNOLOGY

An innovative technology "Sludge-Reagent-Product (SRP) Technology" has been developed by Central Pollution Control Board for treatment of surface and ground water used in drinking / domestic purpose. By applying this technology, 80 to 90% of chemical coagulant (alum), could be recovered from discarded alum-treated-sludge for recycling and reuse. This technology is not only cost effective but also takes care of problems of disposal of huge volume of discarded alum contaminated sludge. The technology on adoption, reduces the volume of waste sludge generated substantially (60 to 70%). This technology also ensures that the treated water quantity is 90 – 95 % (V/V) in comparison to conventional technology i.e. 70-80 % only.

Construction work for 0.5 MLD pilot Water treatment plant, based on SRP technology at Bhagirathi Water Works (Delhi Jal Board), Yamuna Vihar, Delhi is under progress.

7.4 AIR QUALITY ASSESSMENT, EMISSION INVENTORY AND SOURCE APPORTIONMENT STUDIES FOR INDIAN CITIES

Under the project, studies on development of Emission Factors for vehicles, and Source Emission Profiles for vehicular as well as non-vehicular sources have been concluded.

Source apportionment studies had been carried out at six major cities viz. Delhi (NEERI), Mumbai (NEERI), Chennai (IITM), Bangalore (TERI), Pune (ARAI) and Kanpur (IITK) for assessing contribution of different source categories in the ambient air quality and subsequent preparation of Air Quality Management Plan. The studies have been completed and draft final reports prepared by all the six Project Executing Institutes. The findings and final report have been discussed in the Technical Committee (TC) meeting held on January 18-19, 2009. The revised draft final reports as per discussions held during the TC meeting have also been received. The reports comprise Air Quality monitoring results for three seasons, Chemical Speciation of PM_{10} & $PM_{2.5}$, particulates, source apportionment through factor analysis & CMB 8, Emission inventory with future projections, analysis of various control scenarios using dispersion modelling and action plans for the studied cities. A National Summary Report has also been prepared and the Final Reports will be discussed in the Technical and Steering Committees meeting.

7.5 CHARACTERIZATION OF PARTICULATE AEROSOL IN (TTZ)

Characterization of Particulate Aerosol provides general or basic information towards source apportionment study of particulates. During the year, series of investigations have been taken up at Taj Trapezium Zone to assess the probable sources of particulates. Some selected studies are mentioned ahead:

Ionic profile of $PM_{2.5}$ at Agra

The Fine Particulate Matter (PM2.5) in the ambient air being the primary nuclei for transition and transformation towards formation of agglomerated particulates, considered causative agent for respiratory ailments, $PM_{2.5}$ particulates have been analyzed for their chemical properties (elemental composition and carbonaceous matter composition) at Agra. It has been observed that organic carbon (organic carbon produced due to burning of hydrocarbons) dominates the composition having its mass to the tune of 24% i.e. about ¼ of total FPM mass (Fig. 7.3). The elemental carbon (EC), produced due to combustion of diesel, and other carbonaceous matter including plastic, polythene, municipal garbage etc) occupies 17% of the mass. The balance 27% of the mass could not be apportioned and may be referred as inert constituent of Fine Particulate Matter. Among elemental composition, the major elements recorded have been Na, Si, K, Cl etc. (mostly natural in origin and its ions are acting as neutralizing agent). Based on the study, it may be concluded that the Fine Particulate Matter in ambient air of Agra not only contain anthropogenic aerosols but also contains crystal-mass insoluble / non-reactive inorganic matter to the extent of 27% of total mass composition.

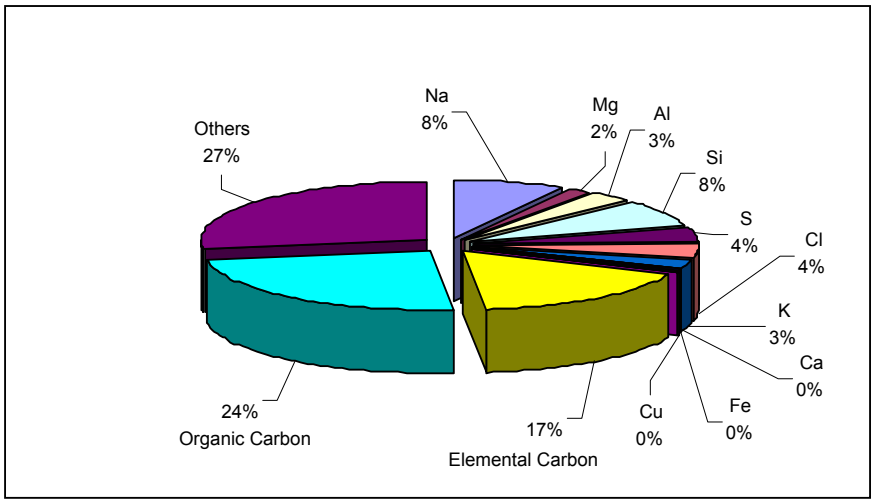


Fig. 7.3: Ionic Profile and Composition of $PM_{2.5}$ Particulate (%) at Agra

Poly Aromatic Hydrocarbon (PAH) Profile at Agra

With the rapid urbanization there has been an increase in the use of Liquefied Petroleum Gas and Compressed Natural Gas at a section of the society having modern living standard on one hand and there has been an increase in burning of other carbonaceous materials (wood, charcoal, rubber etc.) in other section of society having slum living standard. Thus, urban ambient air is a mixture of versatile volatile chemicals including poly-aromatics hydro carbons (PAH). To assess the PAH profile in ambient air of Agra, an investigation has been undertaken during winter months. The analytical results are presented in Table 7.1. It may be demonstrated that 'Benzo(b) Fluoranthene', 'Pyrene' and 'Benzo(a) Pyrene' have been the major constituent among Poly Aromatic Hydrocarbon at Agra and the source of these compounds may be the emissions from vehicles and gen-sets; emissions from open burning of coal, wood and cow dung; and emissions from vehicles respectively.

Table 7.1: PAH Profile of Respirable Suspended Particulate Matter (RSPM) at Agra during winter

Naphthalene	Acenapthylene	Acenapthalene	Fluorine	Phenenthrene	Anthracene	Fluoranthene	Pyrene
2.18	2.20	1.05	3.17	4.31	1.68	4.30	13.97
Benzo(a) Anthracene	Chrysene	Benzo(b) Fluoranthene	Benzo(k) Fluoranthene	Benzo(a) Pyrene	Indeno (cd) Pyrene	Dibenzo (ah) Anthracenes	Benzo(ghi) Peryllene
2.93	5.45	20.68	3.14	10.61	2.09	7.96	1.19

Remark: All values are reported in ng/m^3

7.6 COMPARISON OF AIR QUALITY DATA GENERATED THROUGH CORROSION STUDY (ASIA AND AFRICA)

A corrosion study had been initiated by Central Pollution Control Board at Tajmahal, Agra during the month of December, 2006 along with four locations in Asia (India, Iran, Nepal and Sri Lanka) and Africa (Mozambique and Tanzania) under RAPID-C

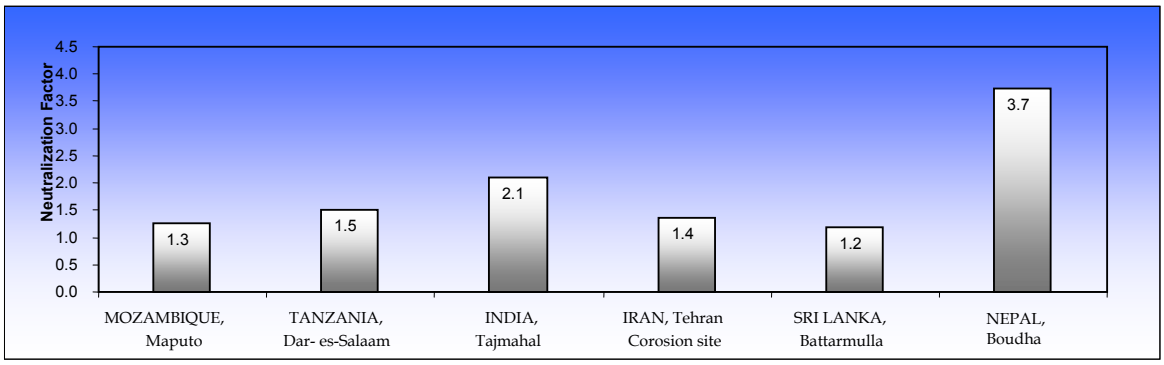
program sponsored by Swedish Industrial Development Agency (SIDA). The sample materials, which were exposed under the study, have been carbon steel, painted steel, zinc and copper. After completion of two year exposure of three sets of sample material were taken out and forwarded to Corrosion and Metal Research Institute, Sweden for analysis.

One year surveillance study on Air quality by exposing diffuser samplers at these locations for once in two months has also been completed and the data generated have been compiled. The parameters which were studied include SO_2, NO_2, O_3, HNO_3, particulate matter etc. The exposed samples have also been analyzed at Swedish Environmental Research Institute (IVL) uniformally for all the locations. The air quality data as obtained from exposed diffuser for Sulphur dioxide and Nitrogen dioxide was noted to be more or less at per with wet method, however concentration of Ozone was noted to be on higher side and requires further investigations. The pollutant concentration at Tajmahal, Agra was calculated for SO_2, NO_2, HNO_3 and O3 having concentrations of 6.57, 10.98, 0.74 and 63.5 µg/cm^3 respectively. The particulate samples were further investigated for major cations and anions, analyzed at the studied locations. The analytical data generated during the study is presented in Table 7.2.

Table 7.2: Air Quality at Selected Areas at Asia and Africa

Country & Stations	Passive Sample Exposure Data (avg. values expressed in µg cm^{-2} month^{-1})							
	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+	Ca^{2+}	Mg^{2+}	Na^+	K^+
MOZAMBIQUE, Maputo	15.73	1.10	8.95	0.05	6.53	0.98	8.85	0.57
TANZANIA, Dar-es-Salaam	3.90	0.31	2.44	0.02	2.52	0.24	2.26	0.23
INDIA, Agra	0.34	0.74	0.78	0.04	1.12	0.07	0.24	0.15
IRAN, Tehran Corrosion site	0.46	3.02	4.07	<0.008	3.28	0.08	0.58	0.06
SRI LANKA, Battarmulla	5.53	2.02	3.92	0.05	2.38	0.38	3.68	0.23
NEPAL, Boudha	0.16	0.50	0.69	0.05	1.75	0.05	0.09	0.07

The cation and anion concentration were further estimated for total equivalent cations and total equivalent anions for all the studied locations towards estimation of Neutralization ratio (Factor). It has been observed that Nepal had the highest self cleansing property in its ambient air, followed by India amongst all the investigating sites (Fig. 7.4).



Fig, 7.4: Neutralization Factor at various locations at Asia and Africa

7.7 RAIN WATER PROFILE AT AGRA CITY, UTTAR PRADESH

During the year, a series of rainwater samples (May to August 2008) have been collected at Agra and analyzed for pH, conductivity besides analyses of major cations (Ca, Mg, Na, Li, K, NH_4) and anions (SO_4, NO_3, PO_4, Br, F, Cl). The analyzed data were also used to calculate Respective Neutralization ratio. The calculated neutralization ratio clearly demonstrates no possibility of acid rains at Agra and its surroundings (Table 7.3).

Table7.3: Rain Water Characteristics at Agra during year 2008

Months	pH	Conductivity (µmhos/cm)	Sum of Cations (Eq.wt)	Sum of Anions (Eq. wt)	NR=Neutralization Ratio of Cations & Anions
May	7.07	100.0	0.8954	0.5303	1.7
	6.78	40.6	0.3558	0.1629	2.2
June	7.29	68.2	0.9216	0.3586	2.6
	7.60	76.0	0.9844	0.2108	4.7
	7.32	133.1	1.4781	1.0957	1.3
July	7.31	46.7	0.6527	0.2898	2.3
	7.23	44.2	0.9216	0.2450	3.8
	7.34	47.5	0.4285	0.2530	1.7
	7.23	35.3	2.0773	0.1809	11.5
August	7.28	46.7	0.4962	0.1822	2.7

7.8 MONITORING OF PESTICIDE RESIDUES AT NATIONAL LEVEL

The project on Monitoring of Pesticide Residues at National Level has been sponsored by Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, New Delhi and the All India Network Project (AINP) on Pesticide Residues, Indian Agricultural Research Institute New Delhi to Central Pollution Control Board. It is inter-ministerial scheme involving Ministry of Agriculture, Ministry of Health, Ministry of Chemicals and Fertilizers, Ministry of Commerce, Ministry of Environment and Forest and State Agricultural Universities.

73 locations in nine districts for collection of ground water were selected in National Capital Region i.e. Uttar Pradesh, Haryana and Delhi. Sampling of Ground water at various locations in Uttar Pradesh (Ghaziabad, Gautam Budh Nagar & Baghpat), Haryana (Sonepat, Faridabad & Ballabhgarh) and Delhi (Alipur Block, Kanjhawala Block, Najafgarh & Nizamuddin Bridge) have been undertaken on monthly basis.

Collection of Water Samples from Ground Water Structure

Four groups of pesticides viz. Organochlorines, Organophosphates, Synthetic Pyrethroids and Herbicides (Total 32 individual pesticides) are being analyzed in the ground water samples collected from various ground water abstraction sources within the National Capital Region Delhi. More than 60 ground water samples are collected and analyzed every month for following pesticides parameters:

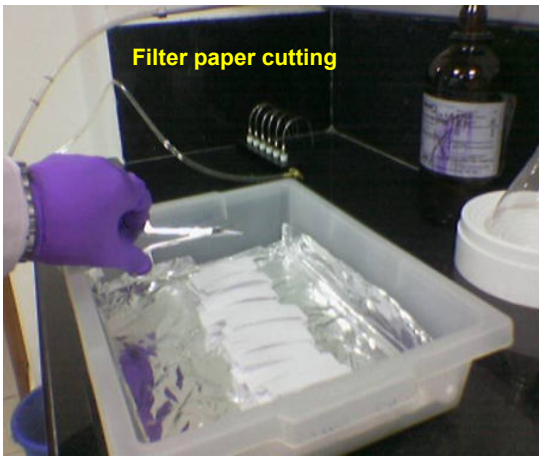
Group	Pesticides Analyzed
Organochlorines	α-HCH, β-HCH, γ-HCH, δ-HCH, Endosulfan-I, Endosulfan-II, Endosulfansulfate, Dicofol, *p,p'*-DDE, *p,p'*-DDD, *p,p'*-DDT, Aldrin, Heptachlor
Organophosphates	Chlorpyriphos, Dimethoate, Ethion, Malathion, Parathion-methyl, Phorate, Phosphamidon, Quinalphos, Profenophos
Synthetic Pyrethroids	α-Cypermethrin, Deltamethrin, Fenpropethrin, Fenvalerate, λ-Cyhalothrin, β-Cyfluthrin
Herbicides	Pendimethalin, Alachlor, Butachlor, Fluchlorali

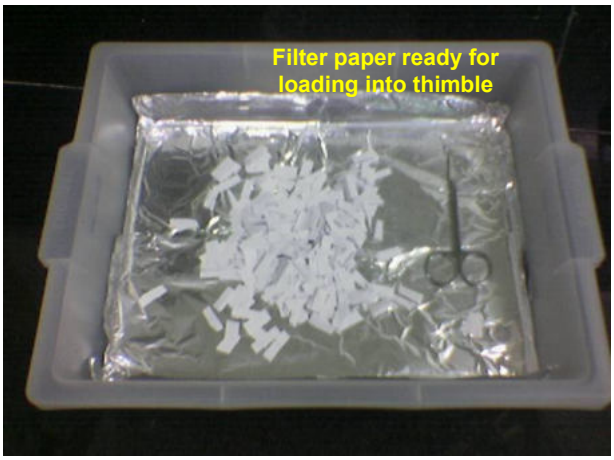
During year 2008-09, a total of 708 nos. of Ground water samples have been analyzed under the project for above mentioned pesticides and data reports regularly forwarded to Project Coordinator at IARI on monthly interval. Most of the Ground water samples collected and analyzed have been found free from pesticides residue contamination. The progress and project findings has been presented at 3rd Annual Meeting of All India Network Project, held at Kerala Agricultural University Vellayani, Kerala

Concentration of Sample Extracts through Rota Vapour and Quantification of Pesticides using Gas Chromatograph

7.9 ASSESSMENT OF LEVELS OF POLYCHLORINATED DIBENZO-P-DIOXINS (PCDDS) AND POLYCHLORINATED DIBENZOFURANS (PCDFS) IN RESPIRABLE SUSPENDED PARTICULATE MATTER OF AMBIENT AIR AT DELHI

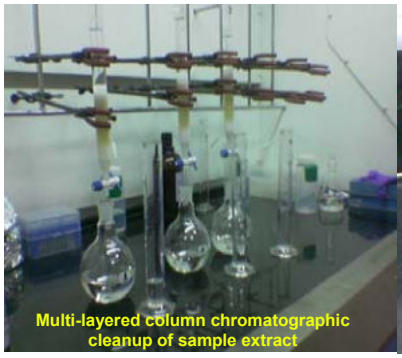
Central Pollution Control Board regularly monitoring Respirable Suspended Particulate Matter (RSPM) in ambient air of Delhi at several locations under National Ambient Air Quality Monitoring Programme (NAMP). During the study the assessment of levels of dioxins (PCDDs) and furans (PCDFs) in particulate phase of ambient air have been undertaken through analysis of RSPM collected on glass fibre filter papers from various NAMP locations. It is the internationally practiced convention to monitor only 7 congeners of dioxins and 10 congeners of furans with chlorine substituted at positions 2, 3, 7 & 8 out of total 75 chlorinated congeners of dioxins and 135 chlorinated congeners of furans. The study is being undertaken from January 2008 onward and analysis completed for samples corresponding up to August 2008. Further, studies are in progress.

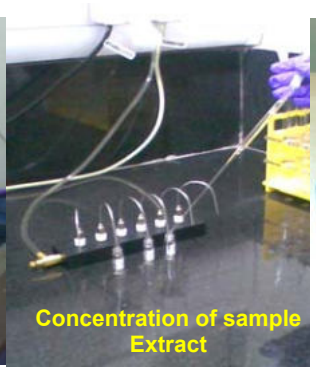


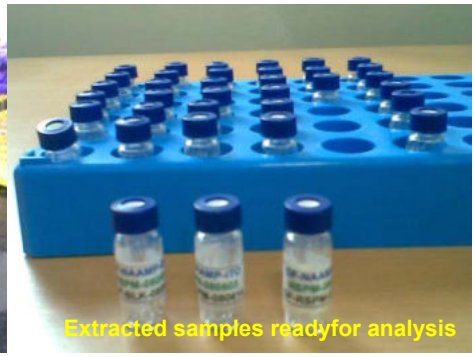



Soxhlet Extraction of Filter paper


Concentration of Extract with Rotavapor


Multi-layered column chromatographic cleanup of sample extract


Concentration of sample Extract


Extracted samples readyfor analysis

Dioxin & Furan on HRGC-HRMS

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Table 7.4: Levels of Dioxins (PCDDs) and Furans (PCDFs) in Ambient Air RSPM of Delhi

Average of Individual Congener Concentration for Samples Analyzed

s. No	Isomer Dioxin / Furan	Nizamuddin n=3	S. Bagh n=3	Pitampura n=5	Siri Fort n=13	Janakpuri n=13	ITO n=15	Shahdara n=10	Average n=62
					pg/m3				
1	2378 T4CDD			0.066	0.031	0.038	0.020	0.049	0.041
2	12378 P5CDD	0.006	0.019	0.091	0.119	0.168	0.116	0.219	0.105
3	123478 H6CDD	0.005	0.017	0.056	0.120	0.096	0.078	0.212	0.083
4	123678 H6CDD	0.016	0.064	0.098	0.145	0.148	0.194	0.446	0.159
5	123789 H6CDD	0.009	0.048	0.102	0.154	0.147	0.135	0.375	0.139
6	1234678 H7CDD	0.239	0.890	0.568	0.564	0.689	1.568	2.775	1.042
7	12346789 O8CDD	0.871	2.215	1.384	1.347	1.597	3.861	4.434	2.244
8	2378 T4CDF	0.026	0.033	0.041	0.095	0.130	0.383	0.209	0.131
9	12378 P5CDF	0.016	0.041	0.092	0.778	0.262	0.458	0.456	0.300
10	23478 P5CDF	0.025	0.075	0.119	0.401	0.374	0.764	0.701	0.351
11	123478 H6CDF	0.034	0.141	0.174	0.333	0.467	0.815	1.194	0.451
12	123678 H6CDF	0.029	0.121	0.170	0.269	0.437	0.746	1.090	0.409
13	234678 H6CDF	0.029	0.197	0.235	0.407	0.452	0.770	1.392	0.497
14	123789 H6CDF	0.012	0.078	0.145	0.263	0.260	0.217	0.597	0.225
15	1234678 H7CDF	0.162	0.853	0.937	1.081	1.541	2.807	6.249	1.947
16	1234789 H7CDF	0.022	0.164	0.226	0.759	0.283	0.351	1.414	0.460
17	12346789 O8CDF	0.119	0.788	1.055	0.543	0.757	1.539	6.778	1.654
Total	**PCDDs/PCDFs**	**1.618**	**5.744**	**5.559**	**7.410**	**7.847**	**14.822**	**28.590**	**10.227**

The average concentration of total PCDDs & PCDFs (sum of seventeen 2,3,7,8 substituted congeners) corresponding to all samples analysed was found as 10.227 pg/m^3 (n=62) (Table 7.4). The highest average concentration of total PCDDs & PCDFs was 28.590 pg/m^3 observed in ambient air RSPM samples (n=10) from Shahdara, which is close to industrial area followed by 14.822 pg/m^3 at Bahadur Shah Zafar Marg (n=15), 7.847 pg/m^3 at Janakpuri (n=13), 7.410 pg/m^3 at Siri Fort (n=13), 5.744 pg/m^3 at Shahzada Bagh (n=3), 5.559 pg/m^3 at Pitampura (n=5) and the lowest average concentration of total PCDDs & PCDFs was 1.618 pg/m^3 recorded at Nizamuddin (n=3). The congener distribution profile in RSPM of ambient air of Delhi is presented in Fig. 7.5.

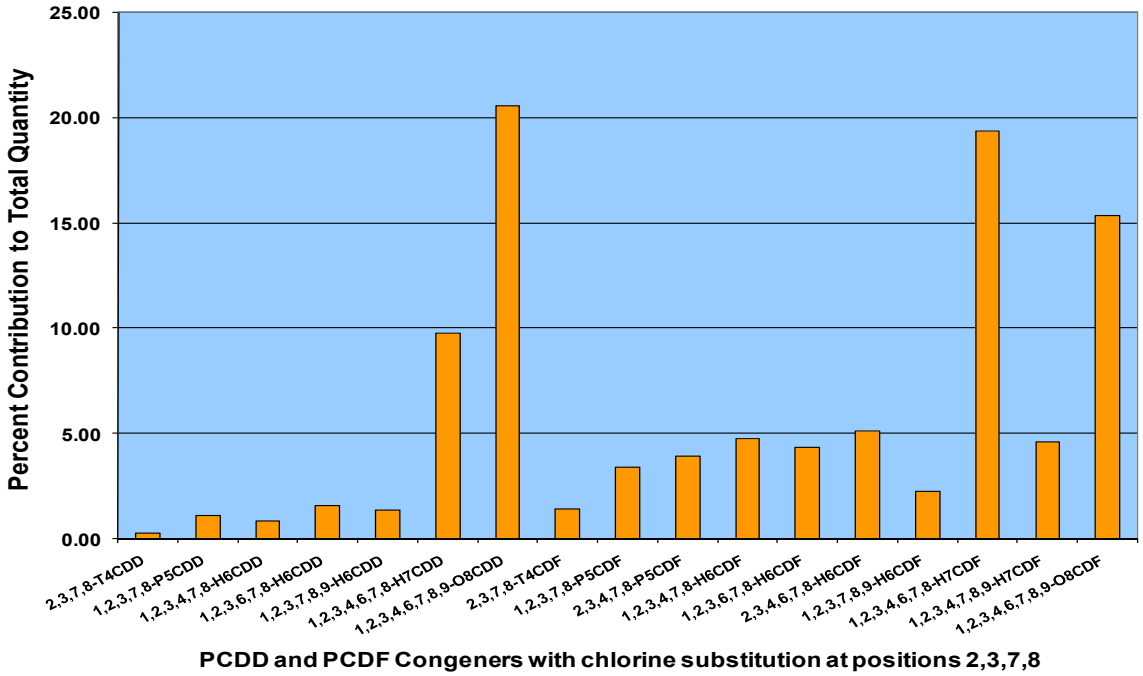


Fig. 7.5: Dioxin & Furan Congener Distribution profile in Respirable Suspended Particulate Matter of ambient air of Delhi

The toxicity of all the seventeen Dioxin & Furan congeners (2, 3, 7, 8 substituted) is different, the absolute concentration of individual congener is multiplied by their respective Toxic Equivalence Factor (TEF) to drive Toxic Equivalence Quotient (TEQ). Globally two most common sets of TEFs are used to represent data from view point of health significance one from NATO-CCME denoted as I-TEF and another from World Health Organization known as WHO-TEF. In this study the I-TEF have been used to calculate TEQ for all absolute concentrations resulted from the analysis of samples.

Table 7.5: Levels of Dioxins (PCDDs) & Furans (PCDFs) in Ambient Air Respirable Suspended Particulate Matter of Delhi

Average of Individual Congener TEQ for Samples Analyzed

No	Isomer	Compound	Nizamuddin n=3	S. Bagh n=3	Pitampura n=5	Siri Fort n=13	Janakpuri n=13	ITO n=15	Shahdara n=10	Average n=62
						pg I-TEQ/m3				
1	2378	T4CDD			0.066	0.031	0.038	0.020	0.049	0.041
2	12378	P5CDD	0.003	0.009	0.046	0.060	0.084	0.058	0.110	0.053
3	123478	H6CDD	0.000	0.002	0.006	0.012	0.010	0.008	0.021	0.008
4	123678	H6CDD	0.002	0.006	0.010	0.015	0.015	0.019	0.045	0.016
5	123789	H6CDD	0.001	0.005	0.010	0.015	0.015	0.014	0.037	0.014
6	1234678	H7CDD	0.002	0.009	0.006	0.006	0.007	0.016	0.028	0.010
7	12346789	O8CDD	0.001	0.002	0.001	0.001	0.002	0.004	0.004	0.002
8	2378	T4CDF	0.003	0.003	0.004	0.009	0.013	0.038	0.021	0.013
9	12378	P5CDF	0.001	0.002	0.005	0.039	0.013	0.023	0.023	0.015
10	23478	P5CDF	0.012	0.038	0.060	0.201	0.187	0.382	0.350	0.176
11	123478	H6CDF	0.003	0.014	0.017	0.033	0.047	0.081	0.119	0.045
12	123678	H6CDF	0.003	0.012	0.017	0.027	0.044	0.075	0.109	0.041
13	234678	H6CDF	0.003	0.020	0.023	0.041	0.045	0.077	0.139	0.050
14	123789	H6CDF	0.001	0.008	0.015	0.026	0.026	0.022	0.060	0.022
15	1234678	H7CDF	0.002	0.009	0.009	0.011	0.015	0.028	0.062	0.019
16	1234789	H7CDF	0.000	0.002	0.002	0.008	0.003	0.004	0.014	0.005
17	12346789	O8CDF	0.000	0.001	0.001	0.001	0.001	0.002	0.007	0.002
Total	**PCDDs/PCDFs**		**0.036**	**0.141**	**0.236**	**0.529**	**0.535**	**0.851**	**1.187**	**0.502**

The average TEQ of total PCDDs & PCDFs (sum of seventeen 2,3,7,8 substituted congeners) corresponding to all samples analysed was found as 0.502 pg I-TEQ/m^3 (n=62) (Table 7.5). The highest average TEQ of total PCDDs & PCDFs was 1.187 pg I-TEQ/m^3 observed in RSPM samples (n=10) of Shahdara and minimum (0.036 pg I-TEQ/m^3) Average TEQ of total PCDDs & PCDFs has been observed at Nizamuddin (n=3). The percent contribution of individual congener TEQ in ambient air RSPM of Delhi is presented in Fig. 7.6.

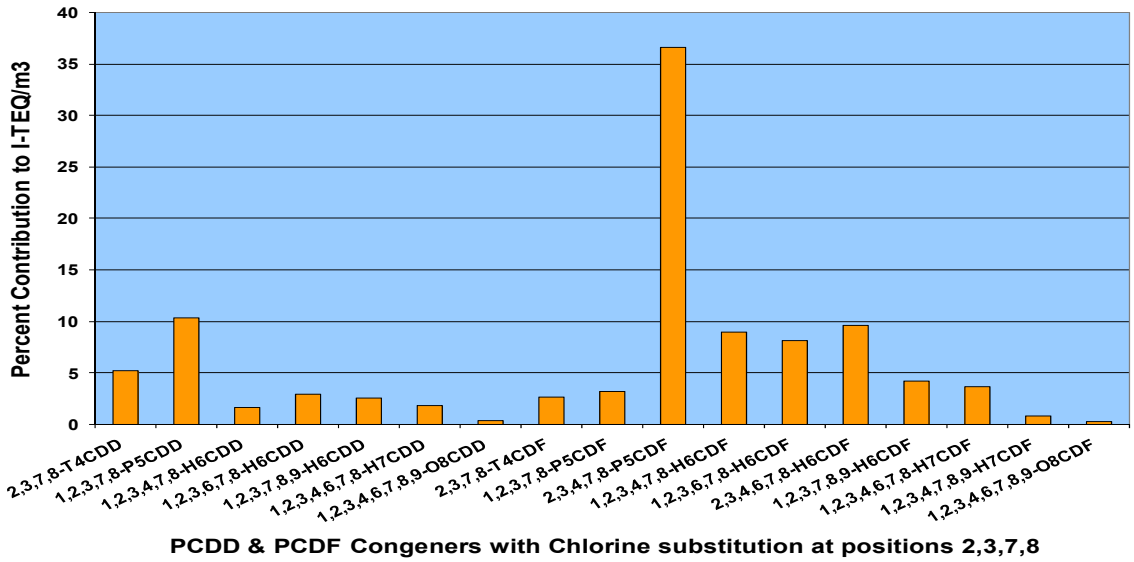


Fig. 7.6: Individual congener TEQ in Ambient Air Respirable Suspended Particulate Matter of Delhi

PCDD / PCDF Levels at Shahdara

The average concentration of total PCDDs & PCDFs at Shahdara was 28.590 pg/m^3 (range from 1.769 to 80.449 pg/m^3). The average TEQ was 1.187 pg I-TEQ/m^3 (range from 0.055 to 3.994 pg I-TEQ/m^3) during the period between February to August 2008. The average TEQ was 2.209 pg I-TEQ/m^3 (range from 1.107 to 3.994 pg I-TEQ/m^3) during the period between February to March, 0.673 pg I-TEQ/m^3 (range from 0.530 to 0.786 pg I-TEQ/m^3) during the period between April to June and 0.339 pg I-TEQ/m^3 (range from 0.055 to 0.626 pg I-TEQ/m^3) during the period between July and August of 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Shahdara is presented in Fig. 7.7.

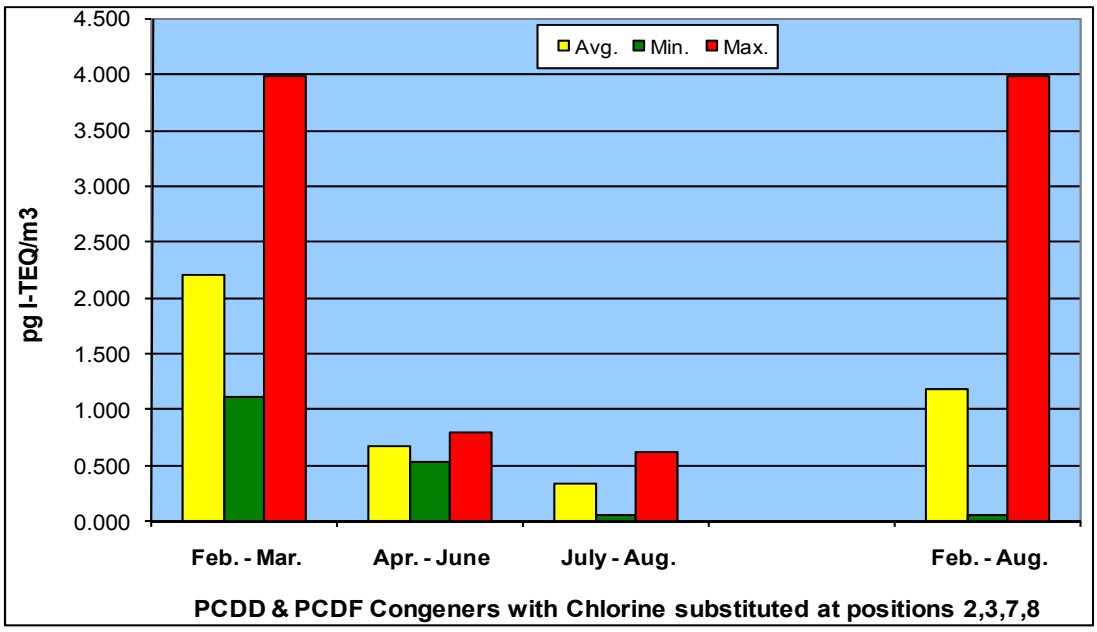


Fig. 7.7: PCDDs & PCDFs in ambient air RSPM at Shahdara, Delhi

PCDD / PCDF Levels at Bahadur Shah Zafar Marg Intersection

At BSZ Marg Intersection the concentration of total PCDDs & PCDFs was 14.822 pg/m^3 (ranging from 1.201 to 61.602 pg/m^3). The average TEQ was 0.851 pg I-TEQ/m^3 (ranging from 0.034 to 4.361 pg I-TEQ/m^3) during the period between January to August 2008. The average TEQ was 1.866 pg I-TEQ/m^3 (ranging from 0.182 to 4.361 pg I-TEQ/m^3) during the period between January to March, 0.258 pg I-TEQ/m^3 (ranging from 0.034 to 0.558 pg I-TEQ/m^3) during the period between April to June and 0.069 pg I-TEQ/m^3 (ranging from 0.044 to 0.092 pg I-TEQ/m^3) during the period between July and August of 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Bahadur Shah Zafar Marg Intersection is depicted in Fig. 7.8.

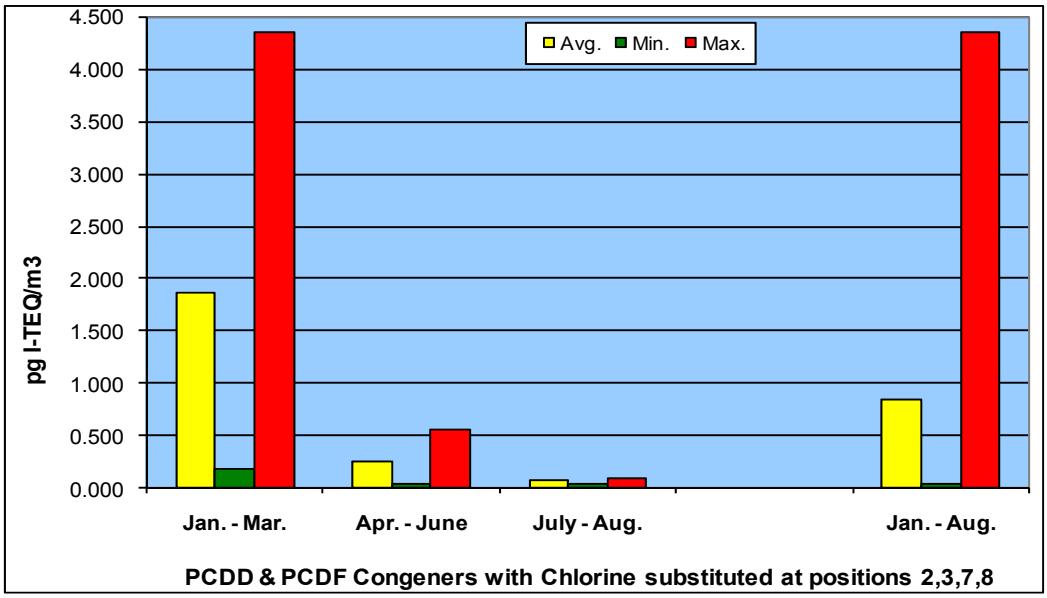


Fig. 7.8: PCDDs & PCDFs in Ambient Air Respirable Suspended Particulate Matter at Bahadur Shah Zafar Marg Intersection, Delhi

PCDD / PCDF Levels at Janakpuri

The concentration of total PCDDs & PCDFs was 7.847 pg/m^3 (range from 0.594 to 32.041 pg/m^3) at Janakpuri. The average TEQ was 0.535 pg I-TEQ/m^3 (range from 0.020 to 2.153 pg I-TEQ/m^3) during the period between February to August 2008. The average TEQ was 1.481 pg I-TEQ/m^3 (range from 0.616 to 2.153 pg I-TEQ/m^3) during the period between February to March, 0.156 pg I-TEQ/m^3 (range from 0.047 to 0.576 pg I-TEQ/m^3) during the period between April to June and 0.031 pg I-TEQ/m^3 (range from 0.020 to 0.041 pg I-TEQ/m^3) during the period between July and August of 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Janakpuri is depicted in Fig. 7.9.

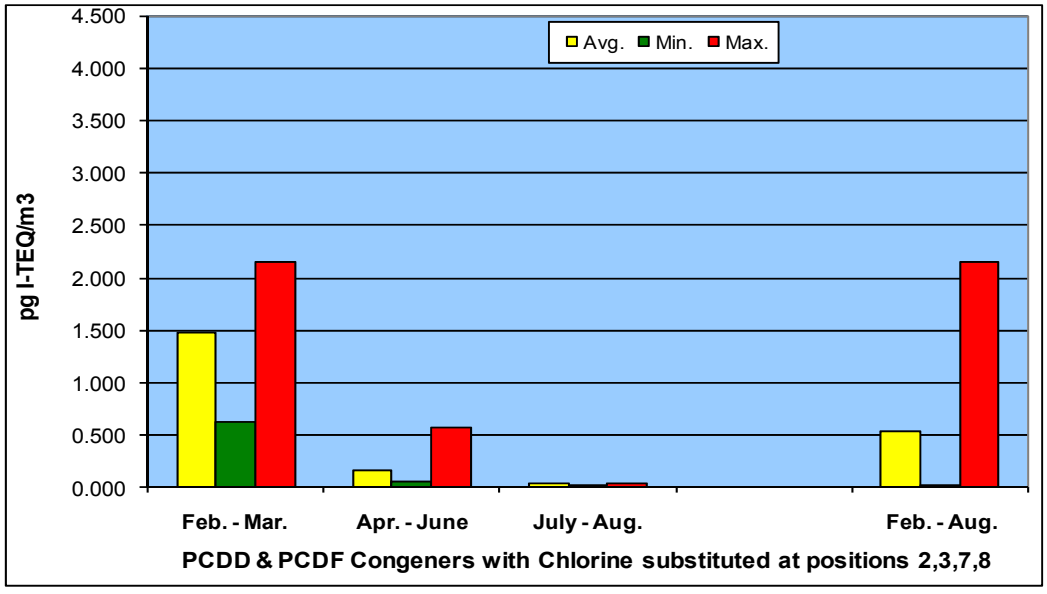


Fig. 7.9: PCDDs & PCDFs in Ambient Air Respirable Suspended Particulate Matter at Janakpuri, Delhi

PCDD / PCDF Levels at Siri Fort

The concentration of total PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter was 7.410 pg/m^3 (range from 0.509 to 42.046 pg/m^3). The average TEQ was 0.529 pg I-TEQ/m^3 (range from 0.005 to 2.817 pg I-TEQ/m^3) during the period between February to August 2008. 1.527 pg I-TEQ/m^3 (range from 0.200 to 2.817 pg I-TEQ/m^3) during the period between February to March, 0.105 pg I-TEQ/m^3 (range from 0.005 to 0.443 pg I-TEQ/m^3) during the period between April to June and 0.045 pg I-TEQ/m^3 (range from 0.032 to 0.058 pg I-TEQ/m^3) during the period between July and August of 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Siri Fort is depicted in Fig. 7.10.

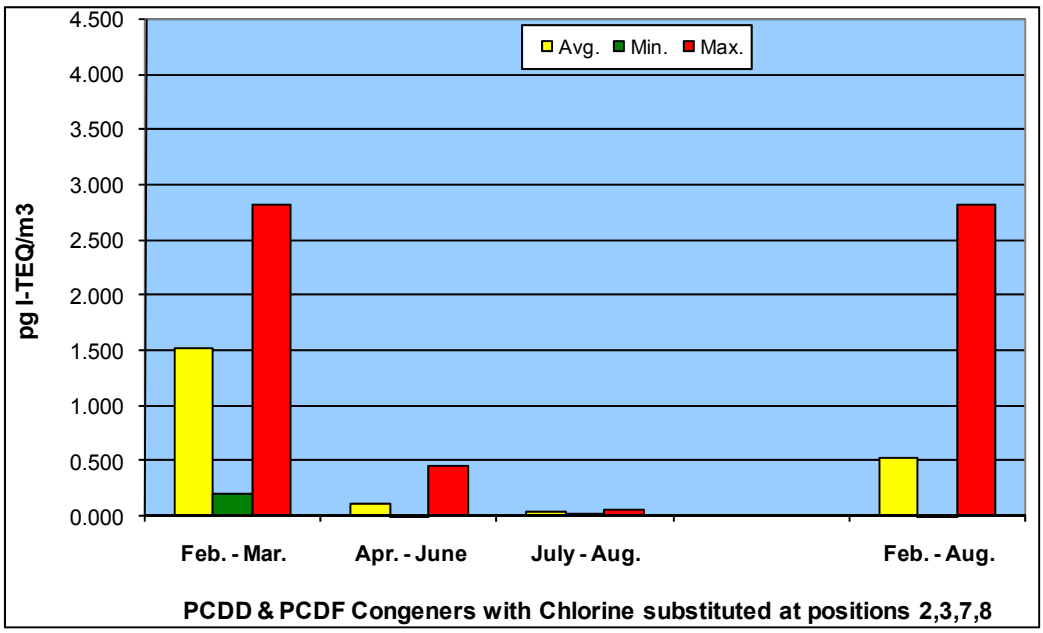


Fig. 7.10: PCDDs & PCDFs in Ambient Air Respirable Suspended Particulate Matter at Siri Fort, Delhi

PCDD / PCDF Levels at Pitampura

The concentration of total PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter was 5.559 pg/m^3 (range from 2.818 to 10.362 pg/m^3). The average TEQ was 0.236 pg I-TEQ/m^3 (range from 0.067 to 0.584 pg I-TEQ/m^3) during the period between June to August 2008. The average TEQ was 0.215 pg I-TEQ/m^3 (range from 0.182 to 0.248 pg I-TEQ/m^3) during June and 0.250 pg I-TEQ/m^3 (range from 0.067 to 0.584 pg I-TEQ/m^3) during the period between July and August of 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Pitampura is presented in Fig. 7.11.

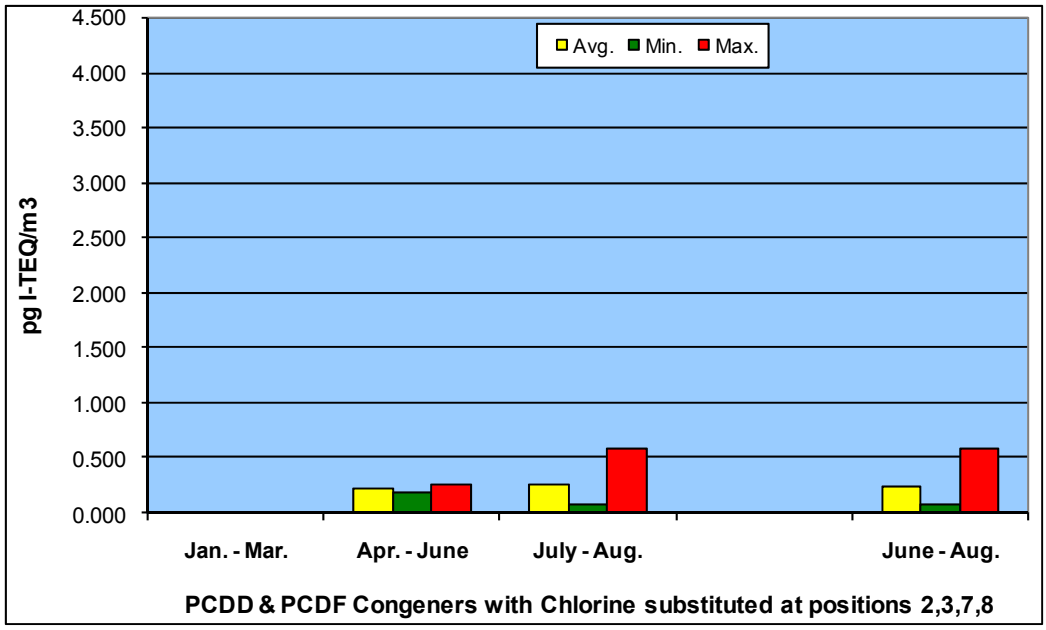


Fig. 7.11: PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter at Pitampura, Delhi

PCDD / PCDF Levels at Shahzada Bagh

The concentration of total Dioxins (PCDDs) & Furans (PCDFs) was 5.744 pg/m^3 (range from 4.679 to 7.174 pg/m^3). The average TEQ was 0.141 pg I-TEQ/m^3 (range from 0.099 to 0.189 pg I-TEQ/m^3) during the period between July to August 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Shazada Bagh is presented in Fig. 7.12.

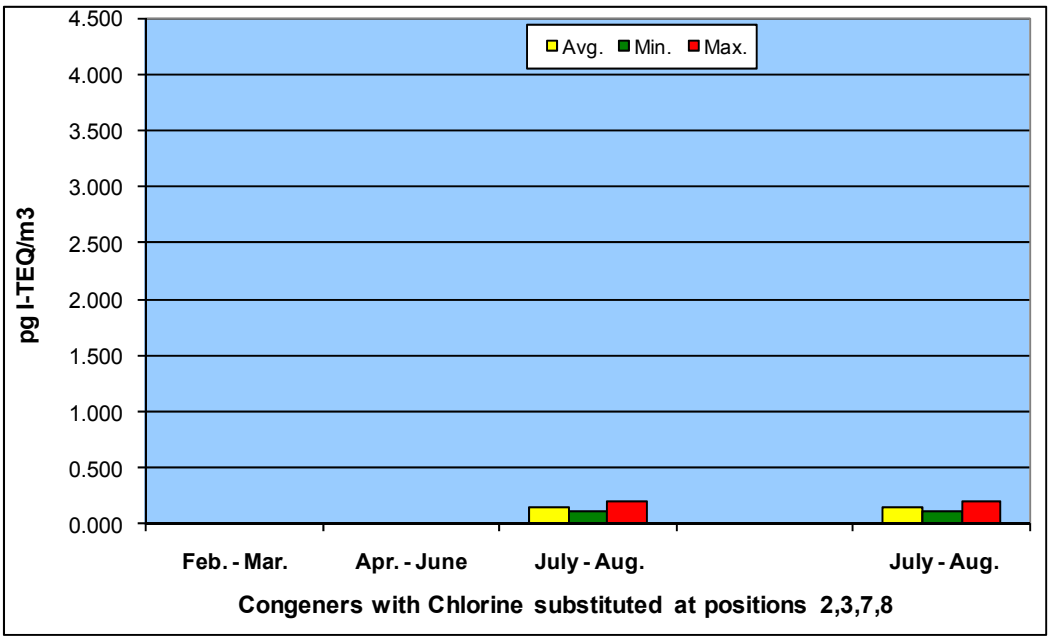


Fig. 7.12: PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter at Shahzada Bagh, Delhi

PCDDs / PCDFs Levels at Nizamuddin

The concentration of total PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter was 1.618 pg/m^3 (range from 0.924 to 2.750 pg/m^3). The average TEQ was 0.036 pg I-TEQ/m^3 (range from 0.017 to 0.067 pg I-TEQ/m^3) during the period between July to August 2008. Seasonal trend of range and average of PCDDs and PCDFs in ambient air Respirable Suspended Particulate Matter at Nizamuddin is presented in Fig. 7.13.

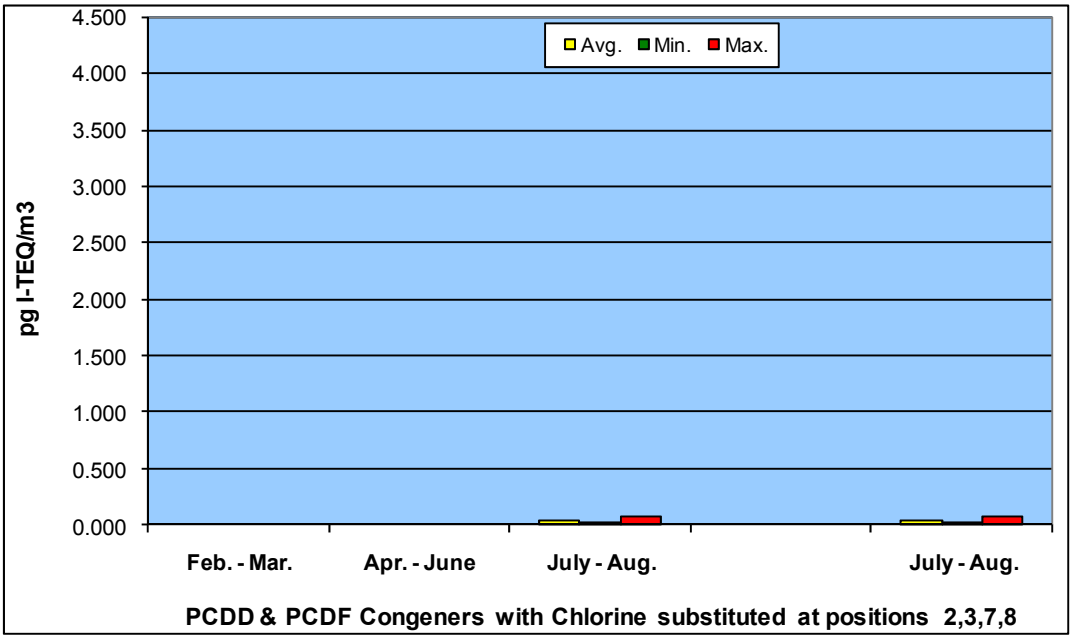


Fig. 7.13: PCDDs & PCDFs in ambient air Respirable Suspended Particulate Matter at Nizamuddin, Delhi

The results indicate a clear decreasing trend against rising ambient temperature of the periods and this may be due to low mixing height and more distribution of dioxin / furan in particulates phase rather than vapour phase during winter. During summer and post monsoon periods, there is increased possibility of dilution in ambient air of upper atmospheric strata due to high velocity wind movement.

7.10 ASSESSMENT OF PHASE DISTRIBUTION OF PCDDS & PCDFS IN AMBIENT AIR OF DELHI

The dioxin – furan congeners have been studied by numerous researchers to have a tendency to get distributed between particulate and vapor phase of the ambient air as well as stationary source emission. National Reference Trace Organics Laboratory of Central Pollution Control Board has undertaken assessment of phase distribution of 17 congeners (2,3,7,8 substituted congeners) between particulates and vapor phase by sampling of ambient air using PUF Samplers, which have the inbuilt provision to collect particulate phase and vapour phase PCDDs and PCDFs .

The sampling of ambient air has been undertaken fortnightly through PUF Sampler at Bahadur Shah Zafar Marg traffic intersection and East Arjun Nagar for 24 hourly periods during December, 2008. The congener profile in respective phase distribution is presented in Fig.7.14 to 7.17.

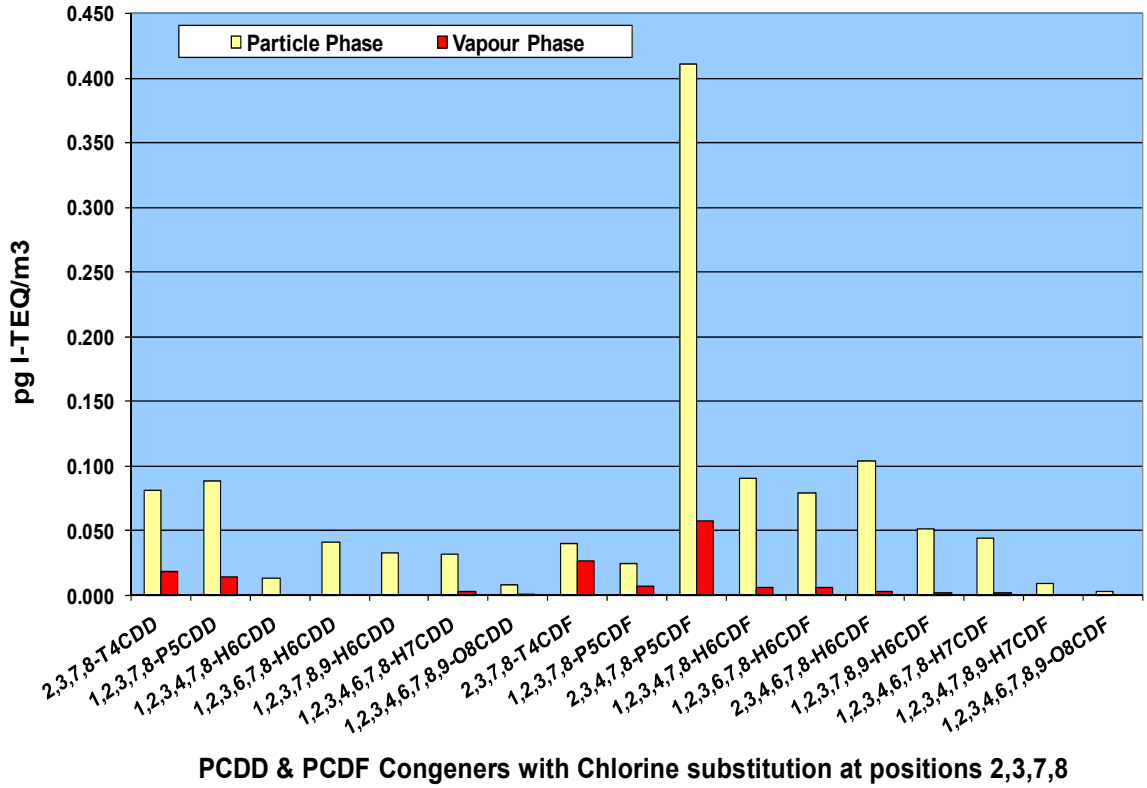
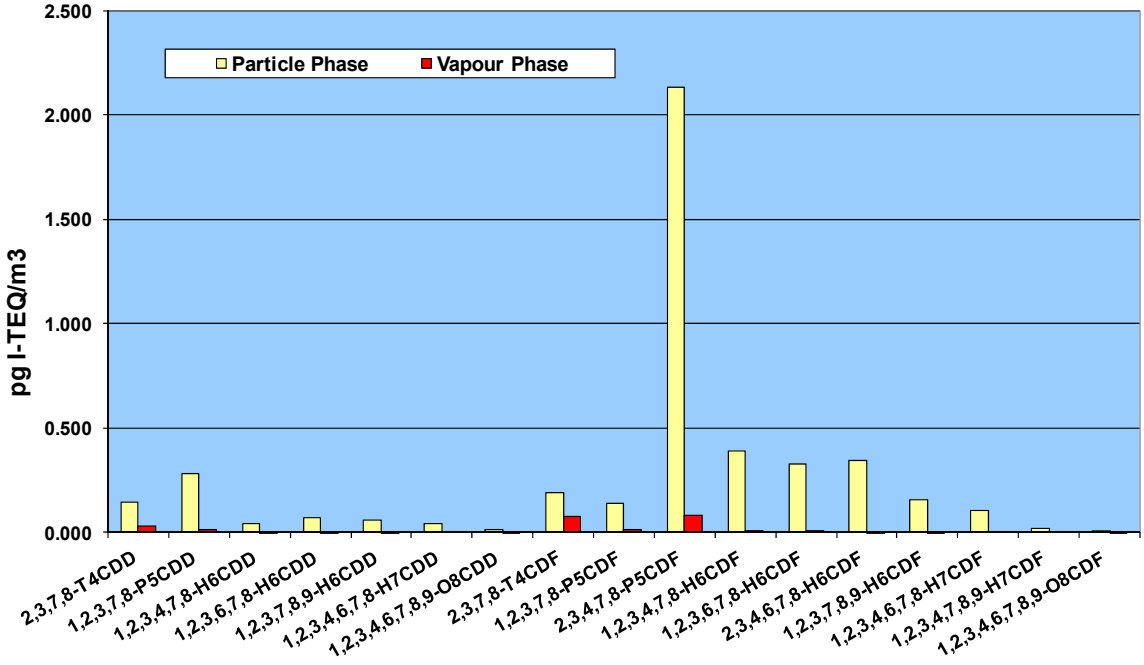
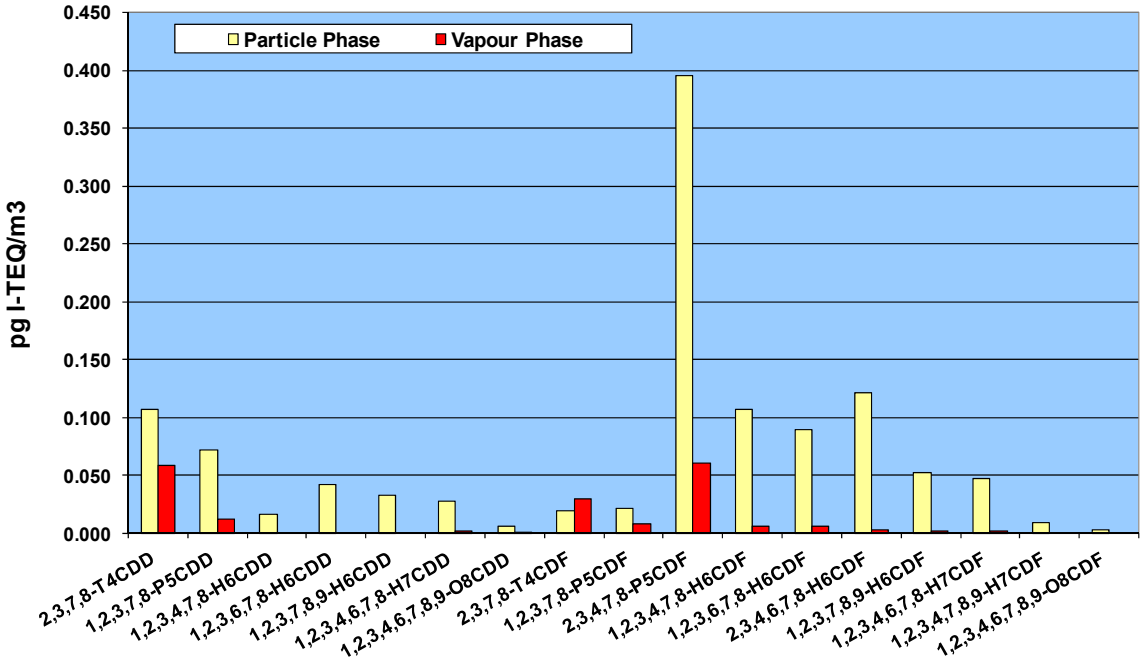


Fig. 7.14: Partition of PCDDs/PCDFs in Particle and Vapour Phase of Ambient Air at Bahadur Shah Zafar Marg Traffic Intersection (11-12 Dec. 2008)



PCDD & PCDF Congeners with Chlorine substitution at positions 2,3,7,8

Fig. 7.15: Partition of PCDDs/PCDFs in Particle and Vapour Phase of Ambient Air at Bahadur Shah Zafar Marg Traffic Intersection (22-23 Dec. 2008)



PCDD & PCDF Congeners with Chlorine substitution at positions 2,3,7,8

Fig. 7.16: Partition of PCDDs/PCDFs in Particle and Vapour Phase of Ambient Air at East Arjun Nagar (11-12 Dec. 2008)

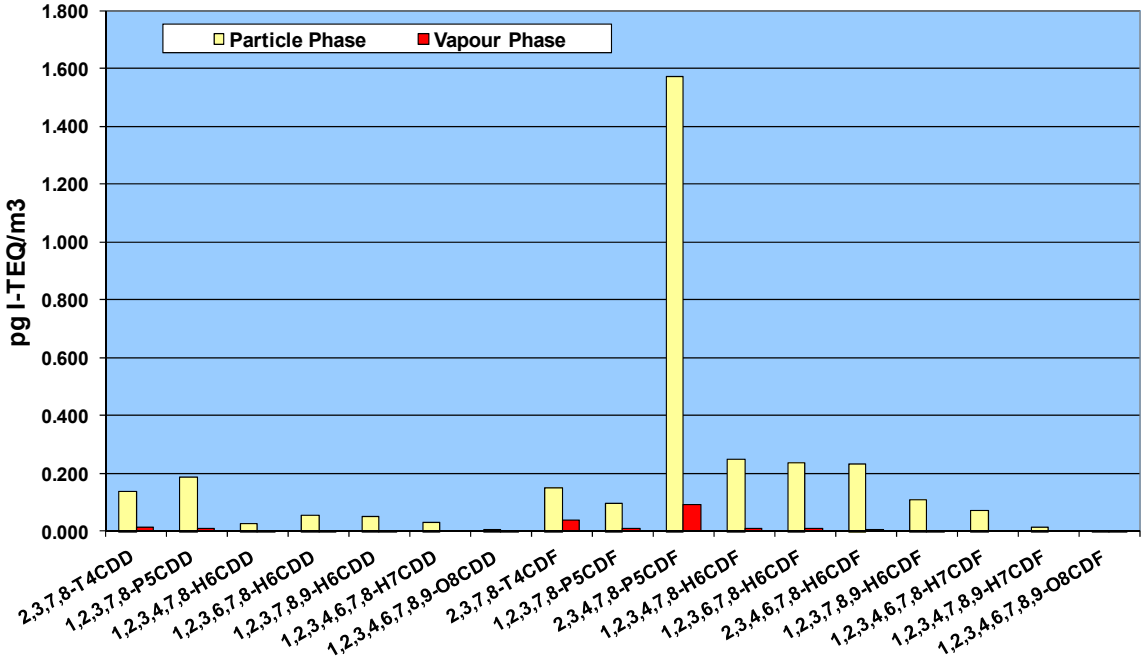


Fig. 7.17: Partition of PCDDs/PCDFs in Particle and Vapour Phase of Ambient Air at East Arjun Nagar (22-23 Dec. 2008)

7.11 DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOCS) BY PURGE AND TRAP PRE-CONCENTRATION FOLLOWED BY GAS CHROMATOGRAPH - MASS SPECTROPHOTOMETER ANALYSIS

VOCs are organic compounds that readily evaporate at normal air temperature. Fuel oils, gasoline, industrial solvents, paints, and dyes are the major sources of VOCs. There are 60 individual compounds (Table 7.6) of which the 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 chemicals are also mobile, but are generally less toxic and persistent than the chlorinated solvents.

Table 7.6: Typical Analytes for Volatiles Organic Compounds Analysis – Target Compounds

S. No.	Volatile Organic Compounds	S. No.	Volatile Organic Compounds	S. No.	Volatile Organic Compounds
1.	Benzene	21.	1,2-Dichlorobenzene	41.	Naphthalene
2.	Bromobenzene	22.	1,3-Dichlorobenzene	42.	Propylbenzene
3.	Bromochloromethane	23.	1,4-Dichlorobenzene	43.	Styrene
4.	Bromodichloromethane	24.	Dichlorodifluoromethane	44.	1,1,1,2-Tetrachloroethane
5.	Bromoform	25.	1,1-Dichloroethane	45.	1,1,2,2-Tetrachloroethane
6.	Bromomethane	26.	1,2-Dichloroethane	46.	Tetrachloroethylene
7.	Butylbenzene	27.	1,1-Dichloroethylene	47.	Toluene
8.	*sec*-Butylbenzene	28.	*cis*-1,2-Dichloroethylene	48.	1,2,3-Trichlorobenzene
9.	*tert*-Butylbenzene	29.	*trans*-1,2-Dichloroethylene	49.	1,2,4-Trichlorobenzene
10.	Carbon tetrachloride	30.	Dichloromethane	50.	1,1,1-Trichloroethane
11.	Chlorobenzene	31.	1,2-Dichloropropane	51.	1,1,2-Trichloroethane

S. No.	Volatile Organic Compounds	S. No.	Volatile Organic Compounds	S. No.	Volatile Organic Compounds
12.	Chloroethane	32.	1,3-Dichloropropane	52.	Trichloroethylene
13.	Chloroform	33.	2,2-Dichloropropane	53.	Trichlorofluoromethane
14.	Chloromethane	34.	1,1-Dichloro-1-propene	54.	1,2,3-Trichloropropane
15.	2-Chlorotoluene	35.	*cis*-1,3-Dichloropropene	55.	1,2,4-Trimethylbenzene
16.	4-Chlorotoluene	36.	*trans*-1,3-Dichloropropene	56.	1,3,5-Trimethylbenzene
17.	Dibromochloromethane	37.	Ethylbenzene	57.	Vinyl chloride
18.	1,2-Dibromo-3-chloropropane	38.	Hexachloro-1,3-butadiene	58.	*o*-Xylene
19.	1,2-Dibromoethane	39.	Isopropylbenzene	59.	*m*-Xylene
20.	Dibromomethane	40.	p-Isopropyltoluene	60.	*p*-Xylene

Though some studies have indicated low concentrations of naturally occurring VOCs, such as chloroform and toluene in some aquifers but most VOCs found in the environment are the result of human activities. VOCs are very mobile and readily dissolve and leach into the ground water. The most common sources of VOCs in ground water include gasoline and fuel oils from leaking tanks and spills; solvents, paints, pigments, and dyes from leaking tanks and improper waste storage and disposal; leaching of chemicals from atmospheric deposition of automotive and industrial emissions; and residuals from well disinfection.

National Reference Trace Organics Laboratory (NRTOL) of Central Pollution Control Board has initiated the Standardization of methodology and assessment of levels of Volatile Organic Compounds (VOCs) in Surface Water, Drinking Water and Ground Water by Purge & Trap sample pre-concentration followed by GC-MS analysis. The following activities have been undertaken in the project:

- Purge & Trap System for sample pre-concentration and auto-injection has been configured with the existing Agilent GC-LRMS. The Purge & Trap dynamic headspace technique will be employed after extraction and concentration of volatile organics from large volume of water sample providing high sensitivity.

- The VOC calibration mixtures and individual compounds reference standards have been procured as per the method requirements of USEPA.

- Optimization of instrument operating parameters of Purge & Trap and GC-LRMS has been completed. Establishment of Retention Time and Mass Spectra of individual compound have been completed.

- The multi-level calibration of the instrument and analysis of samples from various surface water, drinking water and ground water is proposed to be undertaken for assessment of levels of individual VOCs with qualitative confirmation using Mass Spectrometry.

7.12 MONITORING OF TRIHALOMETHANES (THMS) AT DELHI WATER TREATMENT PLANTS

Trihalomethanes (THMs) are most commonly occurring and toxic disinfection byproduct generated during chlorination process of potable water. Chlorination is the most widely used for disinfection of water because of its effectiveness in controlling

water borne diseases, its economics and easy availability. However, chlorine also reacts with biogenic organic matter, such as humic and fulvic acids, present in all natural surface water supplies resulting in formation of various disinfection byproducts (DBPs) such as Chloroform ($CHCl_3$); Dichloroboromomethane (CH $BrCl_2$); Dibromochloromethane (CH Br_2Cl); Bromoform (CH Br_3). The most commonly occurring constituent is chloroform. The disinfection byproducts (THMs) are of serious concern from human health view point.

Raw and finished / final water samples from various Delhi Jal Boards Water Treatment Plants in Delhi were collected during 14 rounds of sampling between November 2004 to November 2007 from Inlet (raw water) and outlet (finished/final water/treated water). Subsequently monitoring of Trihalomethanes from 19 consumer points have also been undertaken during the study.

The generated data for total trihalomethane were analysed during the year 2008-2009. The out come of analysis indicates that maximum concentration of total trihalomethane was 76.95 µg/l recorded at Chandrawal Water Works-1 while minimum < 1 µg/l at Bhagirathi and Chandrawal water works (Fig.7.18 and 7.19), while at consumer supply points the maximum trihalomethane concentrations level (97.02 µg/l) was found at Paschim Vihar. The analysis data have also been calculated adopting WHO Guidelines for treated water of various water works as detailed below:

$$\text{WHO G.V. for Total THMs} = \frac{{}^{C}\text{Chloroform}}{{}^{GV}\text{Chloroform}} + \frac{{}^{C}\text{DCBM}}{{}^{GV}\text{DCBM}} + \frac{{}^{C}\text{CDBM}}{{}^{GV}\text{CDBM}} + \frac{{}^{C}\text{Bromoform}}{{}^{GV}\text{Bromoform}} \leq 1$$

The study indicates that though there is presence of Total Trihalomethanes as well as individual halo-methane in treated water. However, these have been found well within the guideline value of World Health Organization (WHO). The total THMs in all the water samples (at all the locations and all the rounds) were found well within the permissible limits of USEPA, European Union and Environment Canada.

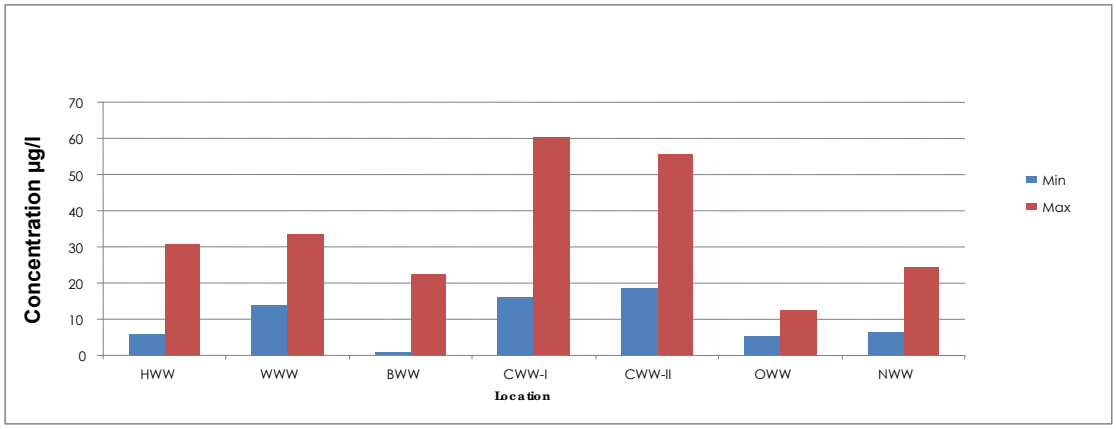


Fig. 7.18: Minimum & Maximum of average Total Trihalomethanes (µg/l) in Potable Public Water Supply for six rounds of sampling at Delhi (November, 2004 to July, 2006)

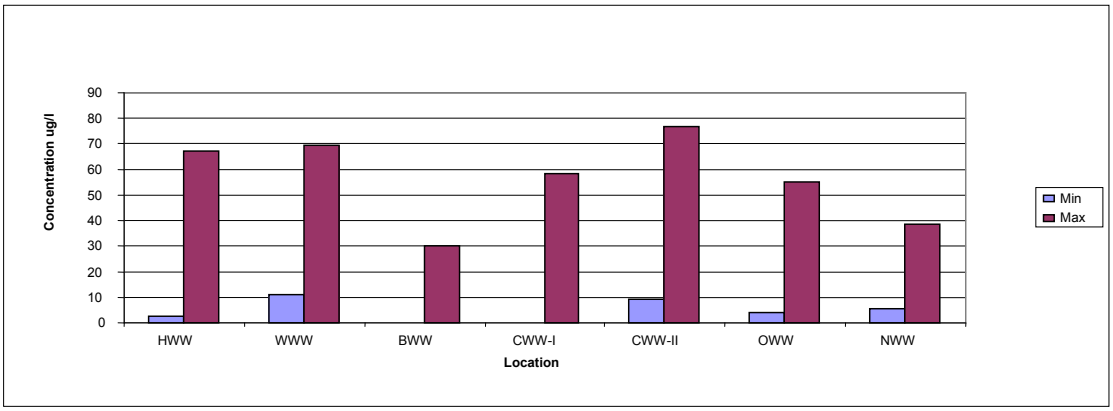


Fig. 7.19: Minimum & Maximum of Trihalomethanes in Potable Public Water Supply for eight rounds of sampling (September, 2006 to November, 2007)

7.13 TRIHALOMETHANES (THMS) IN DRINKING WATER SOURCES AT BANGALORE (KARNATAKA)

The raw potable water for public supply at Bangalore is obtained from Arkavathi and Cauvery rivers. After treatment / disinfection the treated water is supplied to distribution points viz. TG Halli, TK Halli, Tavanakere and Tataguni. Potable water samples were collected at the outlets of these distribution points for further analysis and found that Dichlorobromomethane was found high in all samples (among the four THMs). All the values were well below the permissible standard limits (80ppb) of United States Environment Protection Agency. The concentration of THM at various locations is presented in Table 7.7.

Table 7.7: THMs concentration in drinking water sources of Bangalore city

Sampling point		Total THM Concentration PPB	USEPA Standard
TK Halli	Stage-1	9.31	80 ppb
	Stage-II	10.55	
	Stage-III	12.54	
	Stage-IV	18.13	
Tataguni	Stage-1	34.73	
	Stage-II	14.99	
	Stage-III	36.99	
	Stage-IV	21.84	
TG Halli outlet		12.26	
Tavanakere Pumping Station		29.51	

7.14 RISK ASSESSMENT OF PESTICIDE RESIDUES IN HUMAN WITH SPECIAL REFERENCE TO ADVERSE REPRODUCTIVE OUTCOMES IN DELHI (COLLABORATIVE PROJECT WITH UCMS & GTB HOSPITAL)

Pesticides are all pervasive and becoming almost inescapable part of our environment. Most of the organo-chlorine pesticides are persistent toxic contaminant having long half-life and tendency to accumulate in fatty tissues. Women having higher body fat percentage are prone to bioaccumulation of pesticides due to exposure. The hormonal changes during pregnancy, lactation and menopause mobilizes the bio-accumulated pollutants in the body. The organo-chlorine pesticides can interfere in normal endocrine system, resulting into reproductive disorders and breast cancers.

The study have been undertaken in collaboration with University College of Medical Sciences & GTB Hospital, Delhi with view to provide insight about prenatal pesticide residue exposure, effect on adverse reproductive outcome and present status of pesticide pollution in Delhi. The project has facilitated study of pesticide residue levels in various human body fluids as detailed below:

- Maternal and cord blood in 5 groups viz. mother with normal birth weight babies (control), Mothers delivering pre-term babies, IUGR babies; Still birth babies and Babies with birth defects.

- Blood samples from mothers with abortions and primary infertility.

- Breast milk from healthy lactating mothers.

The salient findings of study are as below:

- Higher levels of organo-chlorine pesticides observed in pre-term delivery cases. Therefore, high levels of OCP may be a risk factor for pre-term birth (Fig. 7.20 & 7.21).

- Significant levels of OCP were observed in cord blood samples indicating trans-placental transfer of these pesticides and this may adversely effect foetal development.

- Higher levels of organo-chlorines were also found in infertility cases.

- Preliminary data analysis shows a possible correlation of organo-chlorines with reproductive defects.

- The findings suggest an association between organo-chlorine pesticide exposure and adverse reproductive outcomes and the existence of increased placental transfer of such pesticides may be a matter of great concern for the child health.

- The trans-placental transfer of these pesticides through cord blood may be the risk factor for the neonates.

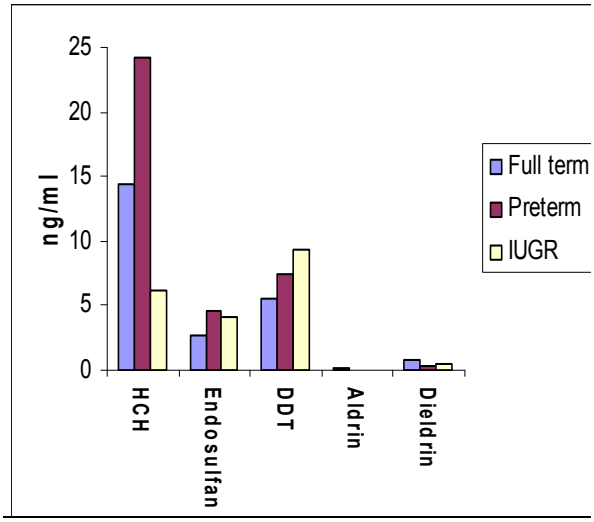


Fig.7.20: Organo-chlorine Pesticides Residue in Maternal Blood in Maternity cases

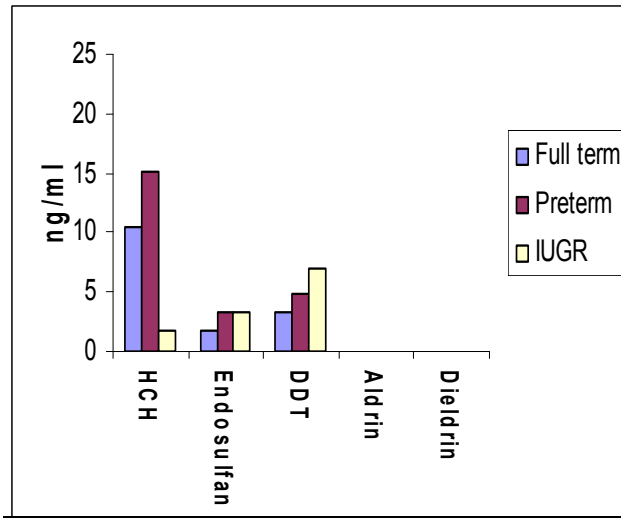


Fig.7.21: Organo-chlorine Pesticides Residue in Cord Blood in Maternity cases

7.15 HUMAN HEALTH RISK ASSESSMENT STUDIES IN ASBESTOS BASED INDUSTRIES IN INDIA

Various products like asbestos-cement sheets, asbestos-cement pipes, brake lining, asbestos ropes require asbestos as raw material. The report provides detailed information on human risk of asbestos exposure and its health effects. Central Pollution Control Board has published a document “Human Health Risk Assessment Studies in Asbestos based Industries in India”. The study for this document was undertaken through the Indian Institute of Toxicology Research, Lucknow. The study included asbestos monitoring at work environment, characterization and toxicity of indigenous asbestos, occupational and personal histories of workers, their clinical examinations, lung function tests and chest radiological examinations. The report also recommends various preventive measures to reduce the risk of workers exposed to asbestos.

CHAPTER VIII

ENVIRONMENTAL TRAINING

8.1 TRAINING - MAJOR ACHIEVEMENTS DURING THE YEAR 2008-09

- Environmental Training Unit (ETU) of Central Pollution Control Board organized 23 planned training programmes (Table 8.1) through various training / R&D institutes during the year 2008-09 in various priority areas related to environment. Main target groups for CPCB sponsored training programmes were participants from CPCB, SPCBs/PCCs, Laboratories recognized under EPA, Industries, Hospitals, Universities, NGO's, etc.

- CPCB officials have been nominated for various planned training programmes and miscellaneous training programmes (inland) organized by other organizations as detailed in Table 8.1.

- ETU also facilitated participation of officials in various international workshop / seminars / training programmes which were sponsored by CPCB and other organizations is presented in Annexure-VII.

- Four one-day training programmes on Effective Communication, Self Development, Stress Management and Interpersonal Relationship were also organized exclusively for CPCB officials.

Table 8.1: Inland Training Programmes organized during year 2008-09

S. No.	Programme	Duration & Place	Organized by
Planned Trainings			
1.	Training on "Environmental Impact Assessment Studies"	Jul. 12-14, 2008 Patna	CENC, Patna
2.	Training on "Water & Wastewater Quality Analysis"	Jul. 14-16, 2008 Roorkee	IIT, Roorkee
3.	Training on "Concept and Application of Advanced Instrumentation Monitoring – GC-MS, GLC, HPLC, AAS, ICP, TCLP and Air Monitoring Instruments"	Jul. 21-25, 2008 Lucknow	IITR, Lucknow
4.	Training on "Interpersonal Skills"	Jul. 28 - Aug.01, 2008 Hyderabad	IIIT, Hyderabad
5.	Training on "Air Dispersion Modelling – Fundamentals & Applications"	Aug. 04-08, 2008 Kanpur	IIT, Kanpur
6.	Training on "Mercury Management in Fluorescent Lamps"	Aug. 06-08, 2008 Lucknow	IITR, Lucknow
7.	Training on Analysis of Toxic Metals in Environmental Samples"	Aug. 11-13, 2008 Lucknow	IITR, Lucknow
8.	Training on "Air Quality Monitoring Network Design, Air Sampling, Analysis and Quality Assurance"	Aug. 26-30, 2008 Haridwar	PCRI, Haridwar
9.	Training on "Noise Pollution, Emission, Control and Health Impact"	Sep. 03-05, 2008 Ahmedabad	NIOH, Ahmedabad
10.	Training on "Contaminated Ground Water Monitoring	Sep. 15-19, 2008	NGRI,

S. No.	Programme	Duration & Place	Organized by
	and Soil Assessment"	Hyderabad	Hyderabad
11.	Training on "Municipal Solid Waste Management"	Sep. 22-26, 2008 Haridwar	PCRI, Haridwar
12.	Training on "Environmental, Health and Safety Management in Process Industry"	Oct. 20-22, 2008 Roorkee	IIT, Roorkee
13.	Training on "Analysis of Pesticides and Other Organic Chemicals in Environmental Samples"	Oct. 20-24, 2008 Lucknow	IITR, Lucknow
14.	Training on "Environmental Policy, Law, Education and Economics"	Nov. 04-06, 2008 Bhopal	DMI, Bhopal
15.	Training on "Solid Hazardous and Bio Medical Waste Management"	Nov. 10-14, 2008 Chennai	NPC, Chennai
16.	Training on "Hazardous Waste, Batteries Waste and E-Waste Management"	Nov. 13-15, 2008 Roorkee	IIT, Roorkee
17.	Training on "Hazardous Waste Characterization, Minimization, Treatment & Disposal Facility"	Nov. 15-19, 2008 Patna	CENC, Patna
18.	Training on "Treatment and Reuse of Textile Effluents"	Dec. 10-12, 2008 Delhi	IIT, Delhi
19.	Training on "Hazard Identification and Risk Assessment in Industries"	Dec. 15-19, 2008 Bhopal	DMI, Bhopal
20.	Training on "Bio Medical Waste Management"	Jan. 12-16, 2009 Roorkee	IIT, Roorkee
21.	Training on "Solid Waste Management"	Jan. 12-16, 2009 Roorkee	IIT, Roorkee
22.	Training on "Environmental Data Interpretation Compilation, Analysis, Presentation and Reporting"	Jan. 19-23, 2009 Delhi	ISI, Delhi
23.	Training on "Interlab Comparison and Proficiency Testing Programme for Environmental Testing Laboratories"	Mar. 04-06, 2009 Delhi	ISI, Delhi
Miscellaneous Trainings			
24.	Training on "Planning, Implementation & Documentation for ISO 9001: 2000"	Apr. 09-11, 2008 Jaipur	IIQM, Jaipur
25.	Training on "Environmental Audit & Statement"	Apr. 18-19, 2008 Gujarat	Gujarat SPCB
26.	Training on "Effective Communication"	May 15, 2008 Delhi	CBWE, Delhi
27.	Training on "Water Quality Management"	Jun. 10-20, 2008 Pune	National Water Academy, Pune
28.	Training on "Interpersonal Skills"	Jul. 28 – Aug.01, 2008 Hyderabad	IIIT, Hyderabad
29.	Training on "Developing Skill to Communicate Effectively"	Aug. 21-25, 2008 Goa	DPC, Delhi
30.	Training on "Internal Auditors on Integrated Management System (ISO 9001 + ISO 14001)"	Sep. 22-26, 2008 Jaipur	IIQM, Jaipur
31.	Training on "Self Development"	Oct. 24, 2008 Delhi	CBWE, Delhi
32.	Training on "Art of Managing Life"	Dec. 13-17, 2008 Munnar, Kerala	DPC, Delhi
33.	Training on "Laboratory Quality System, Management & Internal Audit as per IS/ISO17025"	Dec. 15-18, 2008 Noida	NITS, Noida
34.	Workshop on "Role of Pesticide Application	Jan. 20-22, 2009	IPFT, Gurgaon

S. No.	Programme	Duration & Place	Organized by
	Technology in Crop Protection: Towards Sustainability in Agriculture"	Gurgaon	
35.	Training on "Information Technology Tools"	Feb. 09-13, 2009 Goa	NPC, Delhi
36.	Training on "Stress Management"	Jan. 29, 2009 Delhi	CBWE, Delhi
37.	Workshop on "Implementation of National Environment Policy 2006"	Jan. 30, 2009 Delhi	MoEF, Delhi
38.	Training on "Vigilance"	Feb. 16-20, 2009 Ghaziabad	CBI Academy, Ghaziabad
39.	Training on "Interpersonal Relationship"	Feb. 26, 2009 Delhi	CBWE, Delhi
40.	Lead Auditors Training on "Environmental Management System as per ISO 14001: 2004"	Mar. 17-21, 2009 Delhi	RITES, Gurgaon

8.2 TRAINING OF OFFICIALS OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICE – BHOPAL

- Sh. R. D. Patil, AEE attended Central Pollution Control Board sponsored 5- day training programme on 'Air Dispersion Modeling' at IIT Kanpur.

- Sh. Rajeev Sharma, Sr. Technician attended a three days CPCB sponsored training programme on Noise pollution, emission, control and health impact organized by NIOH, Ahmedabad.

- Sh. A. Sudhakar, EE attended a training programme on hazardous waste contamination – Mathematical modeling studies organized by NGRI, Hyderabad. He also attended a workshop on 'Hazardous Waste (management, Handling & Trans-boundary Movement Rules, 2008, Batteries (Management & Handling) Rules 2001 & Proposed Amendment to the Fly Ash Notification at Jaipur.

- Sh. P Jagan, EE attended the awareness – cum- Training workshops on 'Bio Medical Waste Management' at Indore & Ujjain.

- Sh. Raman Nitesh, JRF attended CPCB sponsored training programme on "Environmental Law, Policy and Economics" at DMI, Bhopal.

- Dr. Y. K. Saxena, JSA attended a training programme on 'Hazard identification and Risk Assessment in Industries' organized by DMI, Bhopal.

- Dr. P. K. Shrivastava & Dr. Anoop Chaturvedi were attended the awareness programme conducted by Central Water Commission on 'World Water Day' and also presented a paper on 'Impact on Water Quality due to Idol Immersion in upper lake, Bhopal'

8.3 TRAININGS OF OFFICIALS OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICE – KOLKATA

The officials of Central Pollution Control Board Zonal Office - Kolkata attended various training programmes, meetings, exhibitions during the year 2008–09. The details are:

S. No.	Official	Designation	Training Programme	Period	Place
1.	Dr. S.S. Bala	Senior Scientist & Zonal Officer	War on Attraction & Retaining Talent in Organisation	29-30th April, 2008	Indian Chamber of Commerce, Kolkata
2.	Sh. K.K. Hembrom	Assistant	Effective Communication	15th May, 2008	H.O., Delhi
3.	Dr. D. P. Mukhopadhyay	Senior Scientist	Assessment of contaminated plumes of the hazardous waste dumpsites using Mass Transport Modeling for Remediation of HW Dumpsites	Sept. 80 - 12, 2008	NGRI, Hyderabad, AP
4.	Sh. Sukhendu Biswas	Junior Scientific Assistant	Contaminated ground water monitoring and soil assessment	Sept. 15 - 19, 2008	NGRI, Uppal Road, Hyderabad
5.	Sh. Sundeep	Environmental Engineer	Internal Auditors on Integrated Management System (ISO 9001 + ISO 14001)	Sept. 22-26, 2008	IIQM, Jaipur
6.	Ms. Shradha Gupta	Junior Research Fellow	Solid Hazardous & Bio Medical Waste Management	November 10-14, 2008	National Productivity Council, Chennai
7.	Sh. K.K. Hembrom	Assistant	Stress Management	January 29, 2009	CPCB HOs, Delhi
8.	Sh. B. Gayen	Senior Driver	- do -	January 29, 2009	CPCB HOs, Delhi
9.	Sh. A. Mukherjee	Senior Attendant	- do -	January 29, 2009	CPCB HOs, Delhi
10.	Sh. G.P. Singh	Assistant Environmental Engineer	Interpersonal Relationship	February 28, 2009	CPCB HOs, Delhi
11.	Sh. B. Ghosh	Assistant	- do -	February 28, 2009	CPCB HOs, Delhi
12.	Sh. A.K. Naskar	Senior Scientific Assistant	Interlab Comparison and Proficiency Testing Programme for Environmental Testing Laboratories	March 04-06, 2009	ISI, New Delhi

Meetings:

S. No.	Official	Designation	Meeting	Place	Period
13.	Dr. S. S. Bala	Senior Scientist & Zonal Officer	10th Session of Inter-government meeting on Male Declaration and 5th Regional Stakeholders cum Regional Coordination meeting	Colombo, Sri Lanka	19-21st August, 2008

Participation in Exhibitions:

S. No.	Workshop	Organiser	Place	Period
14.	12th National Expo - Preparing India as an Advanced Nation	Central Calcutta Science & Culture Organisation for Youth	Central Park Maidan, Salt Lake, Kolkata	05th – 10th September, 2008
15.	National Seminar & Exhibition on 'Climate Change: Challenges and Mitigation'	Central Calcutta Science & Culture Organisation for Youth	Science City, Kolkata	27th – 28th February, 2009

8.4 TRAININGS OF OFFICIALS OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICE – BANGALORE

S. No.	Officials	Designation	Training	Place	Period
1.	Sh. V. Pattusami	Scientist 'C'	Interpersonal Skills	Hyderabad	July 28 -Aug 1st -2008
2.	Sh. G. Dharmalingam	Scientist 'B'	-do-	-Do-	July 28 -Aug 1st - 2008
3.	Sh. S. Suresh	E.E	Sustainable Solid Waste Management	Bangalore	Jan 5-6 - 2009

8.5 TRAININGS OF OFFICIALS OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICE – VADODARA

S. No.	Officials & Designation	Training Programme	Place	Period
1.	Sh. Manoj Sharma, JSA Sh. N. Semwal, SSA	Air Quality Monitoring Network Design, Air Sample Analysis & Quality Assurance	PCRI, Haridwar	26th-28th August 2008.
2.	Sh. Manoj Sharma, JSA Sh. B. D. Pandey, SLA	Inter Lab Comparison & Proficiency Testing Programme for Environmental Testing Laboratory.	Bureau of Indian Standard, Delhi	04th – 06th March 2009.
3.	Sh. Ajay Aggarwal, EE	Environmental Data Interpretation Compilation, Analysis & Reporting	Bureau of Indian Standard, Delhi	19th to 23rd January 2009.
4.	Sh. Pratik D. Bharne, EE	Hazardous Waste, Bio-medical Waste, E-waste Management	IIT, Roorkee	13th – 15th November 2008.

S. No.	Officials & Designation	Training Programme	Place	Period
5.	Dr. D. Brahmaiah, Scientist "C" Sh. D. K. Markandey, Scientist 'C'	Solid Waste, Hazardous Waste & Bio-medical Waste Management	NPC, Chennai	10th – 14th November 2008.
6.	Sh. V.K. Sachan Scientist 'B'	Biomedical Waste Management	IIT, Roorkee	12th – 16th January 2009.
7.	Sh. V.K. Sachan Scientist 'B'	Air Dispersion Modelling	IIT Kanpur	04th – 08th August 2008
8.	Sh. A. Gopalkrishnan, LDC	Stress Management	CPCB, Delhi	January 2009.

8.6 TRAININGS OF OFFICIALS OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICE – LUCKNOW

S. No.	Officials & Designation	Training Programme	Place	Period
1.	Sh. Runa Oraon, AEE Ms. Deepika, JRF	Bio Medical Waste Management	IIT, Roorkee	Jan. 12-16, 2009
2.	Sh. J. P. Meena, AEE	Solid Waste Management	IIT, Roorkee	Jan. 12-16, 2009
3.	Sh.Rakesh Saxena, JLA Sh R.K.Mishra JLA Mrs. Manju Srivastav,SLA	Water and Wastewater Quality Analysis	IIT, Roorkee	May 14-16, 2008
4.	Sh. V. K. Shukla, Sc 'B' Mrs. Nivedita, SRF	Environmental Data Interpretation Compilation, Analysis, Presentation and Reporting	ISI, Delhi	Jan. 19-23, 2009
5.	Dr. D.K. Soni, Sc. 'B'	Interlab Comparison and Proficiency Testing Programme for Environmental Testing Laboratories	ISI, Delhi	Mar. 04-06, 2009
6.	Sh. J. P. Meena, AEE	Environmental Policy, Law, Education and Economics	DMI, Bhopal	Nov4-6,2008
7.	Sh. Runa Oraon, AEE	Hazardous Waste Characterization, Minimization, Treatment & Disposal Facility	CENC, Patna	Nov. 15-19, 2008
8.	Smt. Namita Mishra, SSA Ms Jyoti Tiwari JRF	Analysis of Pesticide and other Organic Chemicals in Environmental Samples.	IITR, Lucknow	Oct. 20-24, 2008
9.	Sh. Deepak, JRF Sh. Sunil Bhargav, JRF	Analysis of toxic metals in environmental samples	IITR, Lucknow	Aug. 11-13, 2008
10.	Sh. V.K. Shukla, Sc 'B' Sh. Ajay Verma JRF	Concept & application of advance Instrumentation Monitoring – GC-MS, HPLC, AAS, ICP, TCLP, and Air Monitoring Instruments	IITR, Lucknow	July 21-25, 2008
11.	Sh. R.K. Singh, Scientist C	Contaminated Ground Water Monitoring and Soil	NGRI, Hydrabad	Sep,2008

S. No.	Officials & Designation	Training Programme	Place	Period
		Assessment		
12.	Sh. R. Rajkumar, AEE	Solid Hazardous and Bio Medical Waste Management	NPC, Chennai	Nov 10-14,2008
13.	Dr. D.K. Soni, Sc'B' Smt. Namita Mishra, SSA	Laboratory Quality System Management and Internal Audit as per ISO/IEC 17025.	NITS (BIS) Noida	---
14.	Sh. R. Rajkumar, AEE	Noise Pollution, Emission, control and Health Impact.	NIOH, Ahmedabad	Sep 2-5,2008
15.	Sh. S. K. Arora, Sc 'C'	Treatment and reuse of textile effluents	IIT Delhi	Dec. 10-12, 2008
16	Sh. Sunil Bhargav, JRF Sh.Rakesh Saxena,JLA Sh B.M.Singh Sr.Tech.	Effective Communication	CBWE, Delhi	May, 2008
17.	Sh C.S.Meena Sr. Tech Ms Jyoti Tiwari JRF Sh. V.K.Kanaujia, Account Asst.	Self Development	CBWE, Delhi	Sep., 2008
18.	Sh Rajiv Kumar DEO Sh. Ajay Verma JRF Sh. Shreeram Shah, LDC	Stress Management	CBWE, Delhi	Nov., 2008
19.	Sh. Vinay Aggarwal LDC Sh R.K.Mishra JLA	Interpersonal Relationship	CBWE, Delhi	Feb., 2009
20.	Dr H P S Rathore Sc'B'	Interpersonal skills	IIIT, Hydrabad	August, 2008

8.7 QUALITY AND ENVIRONMENT MANAGEMENT SYSTEMS (ISO 9001 & ISO 14001)

Central Pollution Control Board has hired services of M/s RITES Ltd., Gurgaon for developing and implementing Quality and Environmental Management Systems corresponding to requirements of ISO 9001: 2000 and ISO 14001: 2004 at Central Pollution Control Board. Awareness and training programmes on Integrated Management System (IMS) for all levels of staff have been organized. Quality Manuals and Quality and Environmental Management System Procedures have been prepared and issued for implementation. Standard Operating Procedures (SOPs) have been drafted as per requirement of implementation of quality system.

CHAPTER IX

ENVIRONMENTAL AWARENESS AND PUBLIC PARTICIPATION

9.1 ACTIVITIES OF NGO CELL DURING YEAR 2008 - 2009

An NGO Cell had been 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 year 2008-09, 14 NGOs were additionally enlisted with Central Pollution Control Board subject to concurrence of concerned CPCB Zonal Offices in addition to 668 NGOs enlisted till previous year. A rebate @ 50% for the purchase of CPCB publications is extended to NGOs enlisted with Central Pollution Control Board.

9.2 PUBLIC COMPLAINTS RECEIVED & DISPOSED DURING YEAR 2008 – 09

A total of 235 Public Complaints were received and disposed off during the Year 2008-09 as well as two VIP references were received and disposed.

9.3 APPLICATIONS UNDER RIGHT TO INFORMATION ACT, 1995

1. Applications received and addressed during the year (including cases transferred to other Public Authority) - 177
2. No. of applications transferred to other Public Authorities - 15
3. Decisions where requests / appeals accepted - Nil

9.4 MASS AWARENESS ACTIVITIES

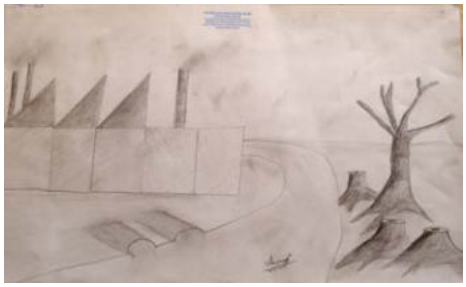
9.4.1 Mass Awareness Activity at Bangalore

An intensive Mass Awareness Programme was organized at Sri Aurobindo Vidya Mandir School, Mahalakshmipuram, Bangalore on 7th January, 2009 for middle and high school students. As a part of the programme, drawing and essay competitions were conducted on 19th and 20th December 2008. The themes of the competition were Environmental Pollution (drawing) and Pollution & its effects on Environment (essay).

A total of 106 and 135 students participated in drawing and essay competitions. In the function held on 7th January, 2009, the importance of adopting 3 R (Reduce, Reuse & Recycle) concept to reduce the pollution effects was stressed. Various types of pollution and methods of controlling the same has explained to students.

The prizes - trophies and certificates - were distributed to winning students from VII to X standards. A shield was also presented to the school for participating in the programme.

As part of the programme, instruments and equipment were displayed in an exhibition and the same were demonstrated and explained. Pamphlets with selected quotes on environment were printed and issued to the students, teachers and parents.



9.4.2 Mass Awareness Activities at Vadodara

Training programme for School Teachers

One-day training programme for school teachers was organized at Vadodara on 31st January, 2009. The Dean, Faculty of Science, Maharaja Sayajirao University of Baroda inaugurated the programme. The training was imparted on various aspects of environment including need of environmental education, teacher's role, air, water, hazardous waste, bio-medical waste, legislation etc. The issues related with pollution due to festivals like Diwali, Navratri has also been discussed in the programme.

Demonstration of monitoring and analytical instruments / equipments was also arranged for the participants. The course reference material prepared in-house was distributed to the participants with training kits. The teachers also shared their environmental activities undertaken at their schools.

Awareness programme on Bio-medical Waste Management for Nursing Students

An awareness programme was arranged for Vadodara based Nursing training institute on 13th March, 2009. Video show on management and handling of bio-medical waste was arranged at Central Pollution Control Board Zonal Office - Vadodara. Visit to the laboratory of Central Pollution Control Board Zonal Office was arranged alongwith demonstration of various monitoring & analytical instruments.

Awareness programme on Bio-medical Waste Management

Students during video show on Bio-medical waste management

9.4.3 Mass Awareness Activities at Agra

Lecture-cum-discussion with Delegates from Germany

On the request of Dr. Heinrich Wilhelm Wormann office organized a lecture-cum-discussion for 29-delegates from an organization in Germany, Arbeit und Leban, Berlin, "on the Central Pollution Control Board role in protection of Tajmahal and peoples participation with emphasis on India between High Techs and Traditions". Dr Heinrich-Wilhelm Wormann, the team leader of the group appreciated the efforts of Central Pollution Control Board.

Training-cum-Exposure Program for Students

Central Pollution Control Board organized a Training-cum-Exposure program for 20 diploma students from Dayal Bagh Educational Institute, Agra & demonstrated working of instruments like SODAR, Ion Chromatograph, FPS and Meteorological system besides role, functions and achievement of Central Pollution Control Board on prevention and control of air pollution.

Other Mass Awareness Activities

Central Pollution Control Board routinely participated in various mass awareness activities organized at Agra locally by various organizations like NGOs, schools (both primary & secondary), colleges; local govt. organizations like Jal Nigam, Nagar Nigam; awareness programs under Yamuna action plan phase-II etc. Some important mass awareness activities are as below:

- "World Environment Day" (5th June, 08) celebrated with distribution of brochures, stickers on Petrol pumps, Road Crossing, Parks etc. to the peoples.

- "Ground Water Day" (10th June, 08) was celebrated by distribution of brochures in the workshop of "Ground Water Day" at Commissioner's

Office for the awareness among different Govt., Non-Govt. and NGOs representatives.

- "Ozone day" (09th September, 08) was celebrated in office and a brochure was released in Hindi for Environmental Pollution awareness.

- A brochure was released in Hindi for people's awareness about Pollution Control (Air & Noise pollution) during Deepawali and also released to Local newspapers.

- Celebrated and released Brochures - "Prithvi Divas" (April 22, 2008) and "Biodiversity Day" (May 22, 2008) - for the awareness towards prevention and control of pollution and protection of environment.

9.4.4 Participation in Exhibitions

Central Pollution Control Board has participated in the Exhibition Envirotech 2008 held at Pragati Maidan organized by International Trade Promotion Organization (ITPO). Central Pollution Control Board bagged second prize in the Exhibition.

9.5 NATIONAL AWARD FOR PREVENTION OF POLLUTION AND RAJIV GANDHI ENVIRONMENT AWARD FOR CLEAN TECHNOLOGY FOR THE YEAR 2007-08

The Ministry of Environment and Forests has instituted the National Award for Prevention of Pollution and Rajiv Gandhi Environment Award for Clean Technology during 1992 and 1993 respectively. These Awards are provided annually to encourage industrial units, particularly those in highly polluting categories for taking significant steps towards adoption and use of clean technologies and practices that prevent, eliminate or substantially reduce environmental pollution.

The Ministry of Environment and Forests (MoEF) has received five nominations for National Award for Prevention of Pollution and Rajiv Gandhi Environment Award for Clean Technology during year 2007-08. MoEF sent these nominations to Central Pollution Control Board for screening and further inspection along with State Pollution Control Board. On screening, four nominations qualified for further inspection. Central Pollution Control Board in association with State Pollution Control Boards inspected four nominated units to verify the claims made by them. Evaluation reports submitted to MoEF for consideration by the selection Committee.

9.6 IMPLEMENTATION OF RAJ BHASHA

Central Pollution Control Board is making continuous efforts for implementation of Rajbhasa Program. During the year 2008-09 "Hindi Rajbhasa Week" was celebrated successfully in the second week of September and various workshops were organized at Head Office and Zonal

Offices. The competitions of easy writing, noting drafting, film show etc. were also organized at some Zonal Offices.

भारत सरकार

नगर राजभाषा कार्यान्वयन समिति, आगरा

राजभाषा विभाग (गृह-मंत्रालय)

सचिवालय : आयकर आयुक्त का कार्यालय, संजय प्लेस, आगरा - 2

प्रशस्ति–पत्र

प्रमाणित किया जाता है कि वर्ष 2007-08 में आगरा नगर स्थित समस्त केन्द्र सरकार के कार्यालयों/बैंकों/ निगमों/उपक्रमों में केन्द्रीय प्रदूषण नियंत्रण बोर्ड का कार्य राजभाषा हिंदी के प्रगामी प्रयोग में विशिष्ट स्थान पर रहा। विभाग इस उपलब्धि पर बधाई का पात्र है। आशा की जाती है कि राजभाषा विकास में आगे भी केन्द्रीय प्रदूषण नियंत्रण बोर्ड प्रयासरत रहेगा।

दिनांक : 30.04.2008

आयकर आयुक्त
अध्यक्ष
नगर राजभाषा कार्यान्वयन समिति
आगरा

Implementation of Rajbhasha at CPCB Project Office - Agra

9.7 CPCB PUBLICATIONS DURING THE YEAR 2008-09

1. Comprehensive Industry Document for Refractory Industries : COINDS/68/2007

2. Study of Environmental Problems of Aravali Hills and Preparation of Action Plan for Restoration of Environmental Quality – Alwar District : PROBES/116/2007

3. Study of Environmental Problems of Aravali Hills and Preparation of Action Plan for Restoration of Environmental Quality – Gurgaon District : PROBES/115/2007

4. Development of Standards for Rubber Products Manufacturing Industry : COINDS/67/2007

5. Assessment of Fugitive Emissions & Development of Environmental Guidelines for Control of Fugitive Emissions in Cement Manufacturing Industries : PROBES/118/2007

6. Guidelines for Optimum Water Consumption in Bulk Drugs Manufacturing Industry : PROBES/117/2007

7. Estimation of Levels of Benzene in Ambient Air and its Impact on Health in Mumbai : NAAQMS/31/2007

8. Status of Pollution Control and Environmental Issues of Hill States : CUPS/67/2007

9. Comprehensive Industry Document for Cashew Seed Processing Industries : COINDS/75.2007

10. Phyto-remediation of Particulate Matter from Ambient Environment Through Dust Capturing Plant Species : PROBES/119/2007-08

11. Comprehensive Industry Document on Iron Ore Mining: COINDS/77/2007-08

12. Suitability of Lignin Removal Process (LRP) for Treatment of Black Liquor in Small Scale Agro-based Pulp & Paper Mills

13. CPCB Annual Report 2006-07

14. Guidelines for Recognition of Environmental Laboratories under the Environment (Protection) Act, 1986 : LATS/9/2008-2009 (Revised and Updated Version)

15. Guidelines on Odour Pollution & its Control : PROBES/121/2008

16. Guidelines for Environmentally Sound Management of E-Waste : HAZWAMS/34/2008

17. Requirement and Procedure for Monitoring Ambient Noise Level due to Aircrafts

18. Comprehensive Industrial Document with Environmental Standard & Guidelines for Pulse, Wheat and Rice Mills : COINDS/76/2008-09

19. Guidelines and Check-list for Evaluation of MSW Landfills Proposals with Information on Existing Landfills : PROBES/124/2008-2009

20. Performance Evaluation of Polymer Coated Bitumen Built Roads : PROBES/122/2008-2009

21. Human Health Risk Assessment Studies in Asbestos Based Industries in India : PROBES/123/2008-2009

9.8 OTHER PUBLICATIONS

1. Annual Action Plan
2. PARIVESH Newsletters
   - Water Quality Management in India
   - Highlight 2007

CHAPTER X

ENVIRONMENTAL STANDARDS INCLUDING SCHEDULE FOR THEIR ENFORCEMENT

10.1 DEVELOPMENT OF ENVIRONMENTAL STANDARDS, NOTIFIED / REPORTS PUBLISHED

10.1.1 Revision of Emission Standards for Sulphuric Acid Plant

Revised emission standards have been notified on May 07, 2008 vide G.S.R. 344(E) in Schedule-I of The Environment (Protection) Act, 1986. These revised standards have been linked to production capacities and for existing & new units separate set of standards notified. These standards are also posted on CPCB's website.

10.1.2 Comprehensive Industry Document on Sponge Iron Plants

The Central Pollution Control Board (CPCB), has published a document entitled 'Comprehensive Industry Document on Sponge Iron Plans' under COINDS series. The document covers inventorization of Sponge Iron Plant in the country, process technology, status of Environmental Management and data of in-depth studies carried out during the preparation of the document. Guidelines / Code of Practice for Sponge Iron Plants, which enable them to achieve the Standards have also been provided in the document. The document provides a base to develop the National Environmental Standards and to specify Guidelines / Code of Practice for Pollution Prevention for the Industry. On the basis of the studies undertaken for preparation of this document, CPCB proposed the National Environmental Standards for Sponge Iron Industry. The Standards have been notified by Ministry of Environment & Forests vide Notification No. G.S.R. 414(E), dated the 30th May 2008 in the Gazette of India.

10.1.3 Development of Standards and Guidelines for Chemical/ Hazardous Waste Incinerator in Pharmaceutical Industry

Bulk drug manufacturing processes use numerous raw material including solvents and generate solid wastes, liquid effluents and air emissions. The nature of the wastes and emissions depend on the raw material and equipment used, as well as the manufacturing process employed. Desired products are carefully recovered in each step from the system. Unwanted products are discarded either in the form of liquid and solid. The wastewater generated is of high TDS and high COD. Such waste streams may not be easily bio-degradable or may be partially bio-degradable and thus wastewater streams need to be destroyed thermally. The hazardous waste generated also required to be thermally destroyed as many constituents of these wastes are of high calorific value. Many industries have installed incinerators to treat these liquid and solid wastes. Central Pollution Control Board had taken up the task to collect, collate information related to design and operation of incinerators installed in bulk drug industries, and conducted performance studies in order to evolve emission standards for incinerators in respect of Bulk drug industry sector. The

Environmental Standards for sector specific incinerator for Pharmaceutical industry so developed have been notified by Ministry of Environment & Forests on March 04, 2009.

10.1.4 Development of Standards and Guidelines for Chemical / Hazardous Waste Incinerator in Pesticide Industry

The Central Pollution Control Board had taken up the task to collect, collate information related to design and operation of incinerators installed in pesticide industries, and conducted performance studies in order to evolve emission standards for incinerators in respect of pesticide industry sector. The environmental standard for sector specific incinerator for pesticide industry so developed have been notified by Ministry of Environment & Forests on August 18, 2008.

10.1.5 Emission Standards and Guidelines for Petrochemical Industry

Central Pollution Control Board had taken up a study to develop National Emission Standard for petrochemical manufacturing units - basic and intermediate products. Considering the status of emission control by Indian industries and best practicable technology, the proposed emission standards has been finalized in Expert Committee of Ministry of Environment & Forests on 27.02.2009. The results of the study and guidelines have been placed on CPCB website.

10.1.6 Environmental Standards for Cashew Seed Processing Industry

India is the largest exporter of cashew nuts in world and accounts for over 66% of the world exports of cashew kernels. The cashew seed processing industrial units are categorized as small scale/cottage industry for, the capital investment in a unit varies between 6.0 lakhs – 15.0 lakhs. Cashew seed processing units are mostly located in the southern part of the Country. There are around 1500 such industrial units of which about 300 units are scattered in Nagercoil district, Tamilnadu, about 270 units in Kollam district, Kerala and about 130 units at Palasa-Kasibugga, Andhra Pradesh. There are also concentrations of these industries in Cheerla - Andhra Pradesh, Mangalore - Karnataka and few units in Goa. The cashew Seed processing Industry has been identified as polluting industries because the magnitude of pollution problem from the cluster of units is very high even though the pollution load from individual unit is relatively low.

Since no conventional and techno-economically cost effective pollution abatement systems are in operation elsewhere, a project has been undertaken to study the entire cashew nut processing industry sector in India and suggest techno-economically feasible environmental standards. Based on the studies, Environmental standards for cashew seed industry have been discussed and approved in the Expert Committees of Central Pollution Control Board and Ministry of Environment & Forests.

Air Pollution Emission Standards

Parameter	Roasting Process Stack (2 –4 hrs of operation and 560 - 640 kg/hr of cashew nut processing)	Cooking Process – Steam Boiler (4 –6 hrs of operation)		Borma Oven Heater (4 –6 hrs of operation)	
		Roasted Shell **	Deoiled Cake	Roasted Shell **	Deoiled Cake
Particulate Matter	* 150mg/Nm^3 at 4% CO_2	150 ** mg/Nm^3 at 4 % CO_2	150 mg/Nm^3 at 4 % CO_2	150 ** mg/Nm^3 at 4 % CO_2	150 mg/Nm^3 at 4 % CO_2
Minimum Stack Height, m	20 m from ground level	15 m from ground level or 2 m above the height of the nearest building, which ever is higher		15 m from ground level or 2 m above the height of the nearest building, which ever is higher	

* Emissions are also to be directed together with the roasting drum emissions to wet scrubber to meet the emission standard.

**The units have to install bio-gassifier to meet the emission standard specially wherever roasted shell is used for firing

Waste Water Discharge standards

S. No.	Parameter	Discharge Limit, mg/l
1.	BOD (27 ^{0}C and 3 days)	100
2.	Oil & Grease	10
3.	Suspended solids	100
4.	Phenol	1.0
5.	pH	6.5-8.5

STUDIES / PROJECTS COMPLETED

10.1.7 Comprehensive Industry Document for Plaster of Paris

A project on “Comprehensive Industry Document for Plaster of Paris (PoP) was undertaken by the Central Board. The main objectives of the study include:

(i) to provide the information on the status of PoP industry
(ii) to study the environmental problems
(iii) to assess all four types of pollutions viz air, water, soil contamination & noise.
(iv) to develop minimal national standards which could be achieved by the industry techno-economically;
(v) to identify appropriate pollution control system duly considering the capital and operating costs.

The study is completed and proposed standards for Plaster of Paris have been approved by the Peer & Core Committee and subsequently by the Central Pollution Control Board & Expert Committee of the Ministry of Environment & Forests. The approved standards for Plaster of Paris Industry are finalized as below:

S. No.	Source	Emission Standard for Particulate Matter (mg/Nm^3)	Load/ Mass based Standard (Kg/ tonne of finished product)	Minimum Stack Height
A. Small Scale Units (upto 30TPD)				
1.	Raw Material Crushing	500	1.5	10 m from Ground level or 3 m from top of building whichever is higher.
2.	Calciner Furnace	500	1.5	
3.	Product Grinding	150	1.0	
B. Large Scale Units (more than 30TPD)				
1.	At All Unit operations and Processes.	150	0.5	30 m from ground level or based on modeling in consultation with local PCB so that excessive concentrations (*) of pollutant will not result.

10.1.8 Development of Environmental Standards for Iron Ore Mining

Central Pollution Control Board (CPCB) has completed a study entitled "Description of Clean Technology for Iron Ore Mines and Development of Environmental Standards" to prepare a comprehensive document. The Comprehensive Document has been published by the CPCB under series COINDS/77/2007-08 in May 2008. The document will be useful for the industry, regulatory agencies, consultants and others interested in the environmental management and pollution control and Iron Ore Mines. On the basis of the study CPCB has also developed environmental standards and submitted to Ministry of Environment and Forests (MoEF) for Notification under The Environmental (Protection) Act, 1986. The proposed Standards have been discussed and approved in the meeting of Expert Committee constituted by MoEF to evolve Environmental Standards held on September 2, 2008.

10.1.9 Revision of Ambient Air Quality Criteria/Standards

Central Pollution Control Board had taken up revision of existing National Ambient Air Quality Criteria/Standards in association with the Indian Institute of Technology, Kanpur (IITK). The work involved review of criteria and standards followed by various countries including WHO guidelines, dose-response relationships of different pollutants, existing criteria and standards, current levels of pollutants in ambient air, Indian studies on health effects of air pollutants, etc. A steering Committee, comprising various experts in the field, prepared draft revised standards during September, 2007. In order to get public comments/opinion, the draft Standards were circulated to the leading NGOs, industry associations, State Pollution Control Boards and other stakeholders and were also made available on CPCB's website. Subsequently, comments received by Central Pollution Control Board were

discussed in detail by the Steering Committee. The draft revised standards have been finalized in 22nd meeting of the Peer & Core Committee, held on May 10, 2008 and approved by the Central Board in its 148th meeting held on July 24, 2008.These standards were then discussed at 'Expert Committee on Standards' constituted by MoEF on February 14, 2009. The information regarding status of air quality monitoring in other countries have been sought by MoEF and has been forwarded.

10.1.10 Standards for Faecal Coliforms in Treated Sewage

The predominant concern relating to water pollution of surface waters in India is the presence of faecal coliform. It is mainly due to large amount of untreated sewage discharged into water bodies. Ministry of Environment, Govt. of India had constituted a Committee in the year 1999 to recommend coliform standards for treated sewage discharged into the river and lakes. The Committee had recommended limits for faecal coliform along with limit for BOD. Subsequently a High Powered Committee appointed by the Hon'ble Supreme Court constituted a sub-committee chaired by Chairman, CPCB to recommend coliform standards in treated sewage discharged into river Yamuna in Delhi stretch.

As a follow up of the recommendations of the above two Expert committees studies was undertaken by CPCB in association with IIT Roorkee and Anna University, Chennai to evaluate reduction of coliform in conventional treatment technologies being adopted in India. This study included assessment of various type of STPs in North and South India. It was observed that about 90 to 99% reduction in coliform density can be achieved by the conventional methods of treatment provided the treatment plants are operated in a satisfactory manner. However, even after 99% reduction in coliform density the effluent does not meet the requirements specified by WHO and USEPA for use to irrigate food crops or discharged into the rivers having very little or no dilution. The results of the study were presented before the Peer & Core Committee for their consideration to set standards. The Peer & Core committee decided that the matter require further deliberations and constituted a sub-committee. The sub-committee deliberated on the subject and proposed draft standards. These draft standards were cleared by the Peer & Core Committee and were further approved by Central Pollution Control Board. The draft standards, as detailed below, were forwarded to Ministry of Environment & Forests for consideration for their notification. However, the same are under review.

The proposed draft standards are:

- *Fecal Coliform level in treated sewage should not exceed 10,000 MPN or CFU per 100 ml.*

- *State Pollution Control Boards/ Pollution Control Committees may make the standards more stringent considering the following :*

    1) *Availability of dilution* in order to ensure that the Faecal Coliform density does not exceed 2,500 MPN or CFU per 100ml in the receiving water body.*
    2) *Use of water in the immediate downstream of outfall particularly if it is for drinking or mass bathing.*
    3) *Use of treated sewage for irrigation:*

- *Edible crops eaten raw : shall not be grown.*
- *Community parks : 2,500 MPN or CFU per 100ml*

- *Treated sewage should be utilized, wherever possible, for flushing of toilets, agricultural/ horticultural purposes and industrial purposes including air-conditioning as specified in section 17 of Water Act, 1974.*

** In case of rivers, lean flow should be considered.*
** In case of lakes, retention time should be considered.*

10.1.11 New Environmental Standards for Petroleum Oil Refineries

A proposal for revision of load based standards for Sulphur Recovery Units (SRU) in oil refineries has been forwarded to Ministry of Environment & Forests for notification. These load based standards for SRU are prescribed based on capacity of SRU and their sulphur removal efficiencies.

10.1.12 Review of Effluent Standards for Soda Ash Industries

Soda Ash industries are located in western coast in Gujarat. The maximum permissible limit of 500 mg/l for Total Suspended Solids (TSS) in effluent standards prescribed by CPCB/MoEF is not being achieved by Soda Ash manufacturing units. The Soda Ash industries, therefore, represented to relax the same. Central Pollution Control Board, therefore, constituted an Expert Committee to suggest the remedial measures. As suggested by the Expert Committee, a study was conducted through National Institute of Oceanography (NIO), Goa to assess the effect of discharge of effluent by Soda Ash Industries in the coastal area and possible point of discharge in the sea so that affect is minimised. The Expert Committee also looked into the possibility of taking up the solids back into the mines. After several discussions and considering report from National Institute of Oceanography the Expert Committee has recommended the following standards**:**

Solvay process based Soda Ash plants

- The total suspended solids (TSS) of effluent will be 100 mg/l in case of discharged to inland surface water.
- The total suspended solids (TSS) of effluent will be 200 mg/l in case of discharged to estuary.
- The total suspended solids (TSS) of effluent will be 500 mg/l in case of discharged to creek beyond low tide level.
- The total suspended solids (TSS) of effluent will be 1000 mg/l in case of discharged to marine water with minimum depth of 5m below low tide level and exist velocity of 3 m/s.
- The standards for other parameters will remain same as notified earlier.

Dual process based Soda Ash plants

- The standards notified earlier will be remained same.

The following **Guidelines** are also recommended for Soda Ash Industry:

- The coastal monitoring points of creek/estuary are central point of discharge and 100 m East and West of central point of discharge (three points).
- Costal monitoring will be done once in a month at all the three points by SPCBs/PCCs.
- The monitoring points of deep sea ocean are central point of discharge, 500 m North of the central point of discharge and 500 m East and West of central point of discharge along the low tide level (four points).
- Deep sea ocean monitoring will be done once in a three month at all the four points by SPCBs/PCCs.
- The State Board may prescribe mass based standards for the soda ash industry.

10.1.13 Comprehensive Industry Document (COINDS) on Stone Crushers

CPCB has prepared a document entitled "Comprehensive industry document for Stone crushers" under COINDS series, which was designed to cover the status of each type of stone crusher industry in the country in detail, covering all environmental issues. These documents facilitate the concerned units in the Sector to improve their environmental performance and also compliance with the National Environmental Standards.

The main objective of this Document, apart from giving an overall view of Stone Crushers operating in the country, is to develop the National Environmental Standards, to provide cleaner technologies and to specify Guidelines / Code of Practice for Pollution Prevention & Control. The Report has been finalized after a series of discussion with the industry representatives, industry associations, State Pollution Control Boards and other statutory bodies associated with the Stone Crushing Sector. This Document will be useful to the Industry, Regulatory Agencies, the Consultants and others interested in pollution control in Stone Crushing Sector.

The Emission Standards and Guidelines for the Pollution Prevention for Stone Crushers have also been reviewed and revised by CPCB and submitted to Ministry of Environment & Forests for notification under The Environment (Protection) Act, 1986.

10.1.14 Environment Standards for Electric Arc & Induction Furnaces

A study for 'Development of Environment Standards and Good Practices for Electric Arc Furnace (EAF) and Induction Furnace (IF)' was undertaken by the Central Pollution Control Board. The main objectives of the study include:

(i) to study and characterize the fumes and emission
(ii) to recommend suitable environmental norms for emission and good practices for EAFs and IFs.

(iii) to suggest measures for reduction of fugitive emissions.

The study has been completed and proposed standards for both electric Arc & Induction furnaces have been approved by the Peer & Core Committee and by the Central Board. Under the study, basic scheme for fume extraction has been evolved with a cost effective control technology for minimization and control of emissions. Recommendations have been made also for energy conservation and control of primary and secondary emissions.

10.1.15 Guidelines on Mercury Management in Fluorescent Lamp Sector

Central Pollution Control Board assisted Ministry of Environment & Forests in finalization of report of the Task Force on Mercury Management in Fluorescent Lamp sector. The report along with guidelines have been published and placed on CPCB website. An Inter-Ministerial Group has been formed by MoEF for effective Mercury Management and Implementation.

Task Force report also scrutinized for list of CPCB action points and CPCB is working on the recommendations prepared by the Task Force on Mercury Management. Letters have been written to all SPCBs informing them about the Guidelines and requesting them to incorporate in the consent orders issued to Fluorescent Lamps manufacturers and feedback requested.

10.1.16 Viable Scales of Operation of Pulp & Paper Industry for Waste Treatment Options including Chemical Recovery to Achieve Discharge Norms

Central Pollution Control Board has undertaken a study to assess the viable scale of operation of pulp mills for having Chemical Recovery system in small scale agro based pulp & paper mills and also to evaluate other options for treatment of black liquor and other waste water to meet environmental discharge standards. During the study eight selected pulp and paper mills were surveyed and monitored.

Salient Observations

- Some mills with capacity around 70 - 100 tpd or more have adopted conventional / modified chemical recovery process.
- The ETPs based on anaerobic plus aerobic treatment are effective and sufficient enough for treatment of mill effluent particularly where chemical recovery is in practice.
- The chemical recovery system undoubtedly is the only proven technology to overcome the pollution problem associated with black liquor. The system helps the mills to improve the cost competitiveness as well as environmental sustainability of any pulp & paper mill.
- Some of the agro based mills manufacturing 40-50 tpd paper have installed either full scale or pilot scale Lignin Recovery Process (LRP) for separation of lignin from black liquor by employing lignin separation plants by devices such as Drum Vacuum Filter, Filter Press, Dissolved Air Floatation (DAF) & Filter beds.

- The LRP treated black liquor is suitable for recycle / reuse into pulp mill for pulp dilution, waste paper processing etc as well as for further treatment by subsequent Activated Sludge Process.
- If Lignin Separation Process is practiced to treat the black liquor, the ETPs based on Activated Sludge Process are found capable and adequate for treatment of mill effluent to the acceptable discharge norms provided the system operates under optimal conditions.
- Most of the mills studied at present are utilizing a major part of separated lignin as fuel along with rice husk/ coal in boilers as it has a very good calorific value.

Recommended Options for Black Liquor Management

Option I: Chemical Recovery System

- The agro based mills having pulp mill capacity above 75 tpd should adopt modified chemical recovery system for black liquor management. and should also keep provision for adding recausticisation unit for recovering caustic from soda ash in case of any problem arises in market demand of soda ash.
- The agro based mills having pulp mill capacity above 200 tpd can consider the adoption of conventional chemical recovery system as it recovers both the chemical and energy from black liquor.
- Mills should employ an effective raw material cleaning / washing system for removal of non process elements) and also consider adoption of Desilication Plant for removal of silica etc to further improve the performance and sustainability of the chemical recovery system.
- The mills having pulp mill capacity between 50-60 tpd should expand their pulp mill capacity to a suitable size for adoption of modified chemical recovery system.

OPTION II: Lignin Separation Technology

- For the agro based mills having pulp mill capacity below 50 tpd, chemical pulp lignin separation technology can be considered for black liquor treatment.
- The mills may also explore the possibility of adoption of post treatment of black liquor after lignin removal through biomethanation process in order to tap the bio-energy from the biodegradable organic matter contained in the black liquor.

10.1.17 Odour Control in Pulp & Paper industry

Central Pollution Control Board has undertaken a study to assess the level of non condensable gases in pulp & paper industry and evaluate the options available for its reduction and control. During the study monitoring has been carried out in six selected pulp and paper mills. Salient observations and recommendations are:

- Odor Control is a priority agenda before all the large integrated pulp & paper mills using kraft pulping process after inclusion in CREP
- The major part of non condensable gaseous (NSG) emissions consists of Total Reduced Sulphur (TRS) emissions which include: hydrogen sulphide, methyl mercaptan, dimethyl sulphide and dimethyl disulphide, along with a part of methanol.
- The formation of NCG emissions is considerably affected by the percentage of Sulphidity used as well as type of fibrous raw material used. The magnitude of NCG emissions from different raw materials is in the order : Mixed Hardwood > Bamboo > Bagasse
- Pulping aid / additive like anthraquinone helps in reducing the NCG emissions by 10- 15 %.
- The Sulphur balance study indicates that out of total sulphur used for pulping only 1-5% contributes to NCG formation during digester blow.
- The major sources of NCG emissions in order of magnitude in large integrated pulp & paper mills are: evaporater vent > digester blow > digester relief > black liquor storage tank > smelt dissolving tank.
- NCG emissions from Continuous digesters is relatively lower than Batch digesters
- The various control options for odorous emissions include: Dispersion, Incineration, Catalytic oxidation, Biofiltration, Wet scrubbing, and Chemical treatment. Among these incinerations using lime kiln, recovery boiler or dedicated incinerator are the most preferred and practiced option for destruction of TRS emissions.
- Only two paper mills have till date installed full scale incineration system for destruction of TRS emissions. The information available on other control technologies and options for destruction of TRS emissions specially in Indian context is very limited.
- Mill must ensure proper vent out of TRS emissions particularly HVLC from black liquor storage tank, smelt dissolving tank etc to avoid continuous exposure of workers to TRS emissions.
- Non availability of indigenous NCG incineration system is a major reason for high cost. In this context, further R & D is needed for development of indigenous incineration or other suitable control systems.
- At present there are no norms related to odorous emissions in pulp and paper industry except for H_2S emission from Large Pulp & Paper Mills, which is 10 mg / Nm^3.
- Proposed Odour based standards for TRS emissions for Indian pulp & paper industry using kraft pulping process:

Compounds	**Emission Norms in Ambient Air, mg/Nm^3**
Hydrogen sulphide	10
Methyl Mercaptan	20
Di Methyl Sulphide & Di Methyl Disulphide	30
OR	
TRS	75

10.1.18 Pilot Scale Demonstration of Electro-flocculation Process for Color Removal from Agro-based Pulp & Paper Mill Effluent

Central Pollution Control Board has undertaken a project with an objective to demonstrate the electro-flocculation technology on pilot scale in a selected mill to assess the techno-economic viability of the process. Salient observations and recommendations are:

- The electro-flocculation process is technically feasible to remove color from all types of colored effluents generated in Pulp & Paper Industry.

- Besides color, the process also removes lignin, COD, BOD, Toxicity in terms of AOX and Total solids. The achievable efficiency are-

    - 65-80% lignin removal
    - 45-65% COD removal
    - 20-35% BOD removal
    - 70-75% AOX removal
    - 15-20% Total solids removal

- As per the pilot scale studies the cost of treatment for bleach plant effluent to achieve discharge colour of around 100 PCU is Rs. 11/m^3 or Rs. 110/t of paper. The cost of treatment for washer effluents generated in Rayon Grade Pulp Mills, which is a major source of dissolved color was Rs. 9/m^3 or Rs. 130/t of paper to achieve a final colour of around 100-150 PCU.
- The cost of treatment for treating Black liquor generated from Agro-based Mills producing unbleached kraft paper is high and is between Rs. 11-26 /m^3 or Rs. 2300-2750/t of paper to achieve a discharge color in the range of 150-450 PCU.
- The cost of treatment for treating Agro-based mills producing writing/printing papers and do not have a chemical recovery system is exceptionally high and is in the range of Rs. 11-26 /m^3 or Rs. 7206-9850 per tonne of paper to achieve a discharge color in the range of 150-450 PCU.
- For adoption of Electro-flocculation technology for effluent decolorisation, it is recommended that individual pulp & paper mills shall make their own evaluation and conduct pre-feasibility studies before adoption in each case.

10.1.19 Utilization of treated effluent from paper mills for crop irrigation and its impact on crop productivity and soil health

Central Pollution Control Board has undertaken a study to develop guidelines for utilization of treated mill effluent in agriculture ensuring no threat to environment. Three pulp and paper mills were identified for detailed soil health monitoring and experimental work to study the impact of paper mill effluent on crops and soil. Experiments were carried out using selected variety of crops at agricultural plots near the paper mills by applying treated effluent mixed with ground water in four different proportions in four replications for irrigation purpose during crop growth. Selected variety of crops were for irrigation during the study to evaluate the impact of treated effluent of paper mill:

Salient Findings:

(i) No significant variation was observed on the pH, Electrical Conductivity and Organic Carbon however the soil salinity and Sodium Absorption Ratio (SAR) increased significantly, still the values of SAR and ESP remained lower than critical levels in all the samples pertaining to different treatments. Total Nitrogen and Phosphorus was found higher under 100% effluent concentrations in short term effluent application however, no significant variation in long term effluent application observed.

(ii) The field experiments revealed that the continuous long term effluent irrigation from a large paper mill did not show any marked change in soil quality parameters particularly pH, ESP and SAR while short term experiments of 3 years with a small paper mill effluent has shown marked changed in soil parameters.

(iii) The pot experiments indicated that rice and wheat are more sensitive to effluent irrigation at the initial stages as crop growth is declined with increase in effluent concentrations indicating physiological stress. However, plants were able to tolerate and yield is almost same for T_1 to T_5 after 20 applications, yield is not affected and no difference was observed in total biomass, test weight and grain yield.

(iv) The study indicated that paper mill effluent affects adversely at the initial crop establishment and is desirable to avoid application of effluent during first 30 days after sowing.

(v) Irrigation with effluent does not inhibit soil microbial diversity and soil enzymatic activity, instead of experimental fields have shown that microbial growth, activity and diversity of micro-organisms and enzymatic activity increased linearly due to accumulation of organic compounds upto 75% effluent application along with irrigation water.

(vi) Content of heavy metals in grain and straw of wheat and rice plant was in safe limit.

Recommended protocol for using treated paper mill effluent for irrigation

Crop	Desirable doses for effluent irrigation		Permissible doses for effluent irrigation	
	Quantity of effluent	No. of irrigation	Quantity of effluent	No. of irrigation
Rice	25%	4	50%	3
Wheat	25%	3	50%	2
Maize	25%	3	50%	2
Sugarcane	50%	5	75%	4
Mustard	25%	2	50%	2
Flower	25%	2	50%	1

Crop	Desirable doses for effluent irrigation		Permissible doses for effluent irrigation	
	Quantity of effluent	No. of irrigation	Quantity of effluent	No. of irrigation
Pulses	Avoid	-	25%	2
Vegetables	Avoid	-	25%	2

Recommended monitoring parameters and the upper limits of treated paper mill effluent (at the mill exit) and soil (irrigation filed)

Parameters	Upper limit for effluent	Monitoring frequency	Upper limit for soil (after harvest)
pH	8.5	Weekly	8.0 (1:2)
Electrical Conductivity (dS m^{-1})	3.5	Weekly	1.5 (1:2)
BOD_5 mg/l	100	Monthly	--
COD mg/l	500	Monthly	--
Total Dissolved Solids ppm	2100	Weekly	--
SAR	10	Weekly	4
Exch. Sodium (%)	--	--	10
Sodium ppm	300	Weekly	--

10.1.20 COINDS for coal based thermal power plants

The study for preparation of a Comprehensive Industry Document (COINDS) for coal/lignite based Thermal Power Plants has been completed. The document includes the present and future scenario of electricity production in the country, combustion technologies including latest development in the field, pollution potential (particulate matter, SO_2 and NO_X emissions) and water pollution. Ash disposal and its utilization have also been assessed. The COINDS also includes details about the pollution prevention technologies being practiced and being developed. International experience about pollution prevention control technologies has also been covered in the study. The study has suggested code of practices for control of pollution vis-a-vis need for developing standards for SO_2 and NO_X emissions and reduction in water consumption for various purposes.

PROGRESS OF ONGOING STUDIES / PROJECTS

10.1.21 Assessment of Green house gas emission potential of various clean coal technologies (Supercritical, IGCC and CFBC) in comparison to conventional (sub critical) power generation technology in Indian context

Field studies have been completed. The findings of the study will be helpful in selecting future technologies for power generation which will have low potential of green house gas emissions. Study is an advance stage of completion.

10.1.22 Development of Guidelines and code of practice for control of fugitive emissions from coal and flyash storage and transfer points in Thermal power Plants

The findings of the study will be helpful in developing guidelines/ Code of practices for Control of Fugitive Emissions from thermal power plants. Study is an advance stage of completion.

10.1.23 Review of effluent standards & Development of Emission Standards for Dye and Dye Intermediate Industry

Dyes and dye intermediates sector is vital in Indian chemical industry, as the sector accounts for more than half of the total export value of Indian chemical industry. A remarkable feature of the Indian dyestuff industry is the co-existence of units in the small (unorganized) and medium & large (organized) sectors, actively involved in the manufacture and export of dyes and dye Intermediates. The sector is also regarded as one of the highly polluting industrial sectors due to its potential to generate (i) liquid effluent containing non-biodegradable dyes, acid/alkali/toxic trace metals/aromatic amines, high amount of dissolved solids and colour; and (ii) hazardous solid waste including iron sludge, gypsum and sludge from effluent treatment plant containing organic and inorganic impurities. Besides, batch process with small batch size, frequent switch over from one product to other, manual material handling, poor process control and consequent high process losses, lack of proper environmental management practices, particularly by small-scale industries, cause considerable environmental problems.

Effluent Standards for Dyes and dye intermediates sector were notified in the year 1987 under the Environment (Protection) Act, 1986. No emission standards were prescribed. Revision of effluent standards as well as development of emission standards for Dyes and dye intermediates sector has been taken up in association with National Chemical Laboratory, Pune. The base work is completed and report is under finalization.

NEW STUDIES / PROJECTS INITIATED

10.1.24 Development of Standards and Guidelines for Paint Industry

Paint manufacturing process use numerous raw material like organic chemicals, solvents, heavy metal based pigments or complex resins which results in air emissions (volatile organic compounds and dust), wastewater and solid waste/ sludge containing heavy metals and toxic organic chemicals.

Central Pollution Control Board had prepared Comprehensive Industrial Document (COINDS) in the year 1990-91. Since then the sector has undergone fundamental changes in terms of raw materials consumption, technological up-gradation, demand growth potential, and diverse product range. Also, the critical pollutants listed by CPCB and USEPA are varying and therefore the existing COINDS needed review.

The Central Pollution Control Board in association with National Productivity Council, New Delhi has initiated a study on 'Preparation of Comprehensive Industrial Document and Status of Paint Industries' to review the environmental standards.

10.1.25 Development of Environmental Standards for Plywood industry

There are approximately 2500 plywood industries in India manufacturing about 15 million metric tons per annum of plywood. Plywood is made from thin sheets of wood veneer, called plies or veneers. The plies are bonded under heat and pressure with strong adhesives, usually phenol formaldehyde resin, making plywood a type of composite material. Formaldehyde, a key ingredient in the glue that holds plywood together, has long been linked to health problems including asthma and cancer. Emission of the fine particle from these types of industry are other major pollutant.

Central Pollution Control Board has undertaken a study for documenting the process of plywood manufacturing and the environmental issues related to this industry.

10.1.26 Comprehensive Industry Document on Cement Plants

Cement manufacturing industry sector is one of the major air polluting industry sectors in the country. There are about 130 cement plants in the country with the production capacity of 198 MTPA. During the various operations of cement manufacturing, substantial quantum of dust is emitted, if air pollution control device is not operating efficiently, which poses serious problem. Considering the above, a study on "Development of COINDS on cement plants" has been undertaken in association with National Council for Cement and Building Materials, Ballabhgarh. Based on the study, standards for particulate matter shall be revised. It is also proposed to develop emission standards for SO_2 & NOx and load based emission standards for particulate matter from cement plant.

10.1.27 Reduction of Green House Gas Emission from Cement Plants

Cement production is a highly energy intensive production process. The energy consumption by the cement industry is estimated at about 2% of the global primary energy consumption. Due to the dominant use of carbon intensive fuels, the cement industry is also a major emitter of CO_2 emissions. Besides energy consumption, the clinker making process also emits CO_2 due to the calcining process. The cement industry contributes 5% of total global carbon dioxide emissions. CO_2 is the major green house gas emitted from cement plants. Green house gas emissions contribute to the global warming.

The study on "Assessment of green house gas emission from cement plants" has been initiated in association with M/s C P Consultants Pvt. Ltd., New Delhi. The study will monitor the CO_2 emission from cement plants and will suggest various measures for reduction of green house gas emission.

10.1.28 Description of Clean Technology and Development of Environmental Standards for Limestone Mining

Limestone is being extensively used in various industries including cement. Hence limestone mining has become an important sector under mining. During mining, substantial quantity of dust emissions are generated which pose environmental problem in the region. It may also result in underground water pollution in the vicinity of mining area, particularly in terms of hardness. Therefore a study has been undertaken on "Description of clean technology and development of environmental standards for limestone mining" in association with Central Institute of Mining & Fuel Research, Dhanbad. The study will generate the baseline emission data and recommend preventive measures for dust emissions, clean technology and environmental standards for limestone mining.

10.1.29 Environmental Standards and Guidelines for Automobile Service Station, Workshop and Bus Depots

Several environmental issues like air, water, noise and solid waste pollution are associated with automobile service stations and bus depots. Central Pollution Control Board initiated a project "Development for Environmental standards and Good Practices for Automobile Service Station, Bus Depots, Workshop; Guidelines for disposal of Waste Oil, used Lead Battery, etc." with the help of M/s Aditya Environmental Services, Mumbai. The visits and monitoring of workshops, bus depots and service stations has been completed in Delhi, Maharashtra, Kolkata and Bangalore regions.

10.1.30 Computation of Societal Risk Abatement Cost and Long Run Marginal Financial Cost of Common Hazardous Waste Incinerator

Central Pollution Control Board in association with M/s UPL Environmental Engineers Ltd has initiated a study for computation of societal risk abatement cost and long-run marginal financial cost of Common Hazardous Waste Incinerator. The objective of the study is to find out what the user will need to pay for reaching the range of alternative levels of emissions of total dioxins and furans. The study involves a comparative study of societal risk abatement cost incurred by the organizations concerned with the costs of mitigation of risk posed by epidemic, rail accident and sewage exposure etc. and comparing the costs of these with the costs due to enforcement of Dioxins and Furans standards.

10.1.31 Guidelines for Vapour Recovery Systems at Gasoline Filling Stations

Volatile Organic Compounds (VOCs) are emitted in the atmosphere due to the activities carried out at Gasoline Filling Stations (GFS), loading of fuel for storage and filling of fuel in vehicles. Gasoline vapours contain hydrocarbons which are known carcinogens (e.g. benzene). People, particularly those who are involved in the fuel filling operations, associated with the activity may get exposed to these harmful compounds. Besides VOCs can give rise to low-level ozone and promote the formation of photochemical smog. These forms of air pollution can affect a wide range of people. In view of the above, a project has been taken-up on 'Guidelines for vapour recovery systems at gasoline filling stations'.

10.1.32 Guidelines for Underground Petroleum Product Storage Tanks

Petroleum products at retail outlets are being stored in underground tanks that are mostly constructed using mild or carbon steel. These retail outlets are spread over a large geographical area in the country. It is understood that there is no system existing to detect if the tanks are leaking. It is quite possible that the petroleum products, particularly the gasoline and diesel, might find their ways through leakages in the underground storage tanks to the groundwater aquifers and pollute with respect to oil, hydrocarbons, tetra-ethyl lead (TEL), methyl tertiary-butyl ether (MTBE), etc. The study for 'Monitoring of ground water and soil quality near old petrol pumps and formulating guidelines for underground storage tanks' being undertaken by Central Pollution Control Board.

10.2 ENFORCEMENT OF ENVIRONMENTAL STANDARDS AND ACTIONS FOR CONTROL OF POLLUTION

10.2.1 Environmental Surveillance Squad (ESS) Programme

The Central Pollution Control Board (CPCB) has initiated Environmental Surveillance Squad (ESS) programme for carrying out surprise inspections of industrial units, wherein the 17 categories of highly polluting industries such as distilleries, pulp & paper industries, tanneries, pesticide formulation, drug industries etc. are inspected through computerized random number generation system. This comprehensive programme of environmental surveillance ensures installation and regular operation of the effluent / emission control facilities in polluting industries. Since August 2007 to March 2009, Central Pollution Control Board has inspected 419 industrial units under the Environmental Surveillance Squad (ESS) programme.

10.2.2 Inspections of Cement Plants under ESS activities

During the year 2008-09, 37 cement plants were inspected under Environmental Surveillance Squad by CPCB, Zonal Offices. As a follow up action, major observations and recommendations were communicated to respective SPCBs for taking necessary action. In two cases, directions were issued u/s 18(1)(b) of the Air (Prevention and Control of Pollution) Act, 1981 to State Pollution Control Boards while in one case direction u/s 5 of the Environment (Protection) Act, 1986 was issued to the cement industry.

10.2.3 Inspection of Thermal Power Plants under ESS programme

Fifteen thermal power plants (Out of 89 plants) were inspected under Environmental surveillance Programme (ESS). Directions under Section 18 (1) (b) of Air (Prevention and Control of Pollution) Act, 1981 were issued to State Pollution Control Boards (Gujarat Pollution Control Board, Jharkhand State Pollution Control Board and U. P. Pollution Control Board) to direct three thermal power plants to take immediate measures for control of pollution.

10.2.4 Enforcement Action Taken

The actions taken by CPCB include (i) issuing directions under Section 18 (1) (b) of the Water (Prevention and Control of Pollution) Act, 1974 or the Air (Prevention and Control of Pollution) Act, 1981 to the SPCBs/PCCs requiring them to ensure implementation of the observations/ recommendations in respect of the concerned industries/areas, and (ii) direct action against the industries by issuing directions under Section 5 of the Environment (Protection) Act, 1986.

Based on the findings of the inspections, Central Pollution Control Board has issued directions under section 5 of the Environment (Protection) Act, 1986 to 59 industrial units and also issued directions under section 18(1)(b) of the Water (Prevention and Control of Pollution) Act, 1974 or the Air (Prevention and Control of Pollution) Act, 1981 to concerned SPCBs/ PCCs in respect of 60 industrial units during the period August 2007 to March 2009.

10.2.5 Industrial Pollution Control in relation to National River Action Plan (NRAP)

The Industrial Pollution Control Programme along the rivers and lakes was initiated in the year 1997 to ensure compliance in the polluting industries discharging their effluent into water bodies. The State Pollution Control Boards (SPCBs) / Pollution Control Committees (PCCs) in Union Territories were requested by the Central Pollution Control Board (CPCB) on July 14, 1997 to take necessary action and send the list of defaulting units. The criteria defined for identification of grossly polluting industries (GPIs) covered all those industries which (i) discharge their effluents into a water course including rivers and lakes, and (ii) are either involved in handling of hazardous substances or discharge effluents with a BOD of 100 kg/day or more. Due to the vigorous follow up taken by Central Pollution Control Board with the SPCBs / PCCs, installation of requisite effluent treatment plants (ETPs) has been completed during year 2002 in 746 out of 851 GPIs identified in August 1997 and since then the rest have also installed requisite ETPs for providing treatment to their effluent to meet the desired effluent discharge standards. Industrial units commissioned after year 1997 have also installed and operated the requisite ETPs. Central Pollution Control Board has been interacting regularly with the SPCBs/ PCCs since April, 2002 for getting information on status of pollution control in GPIs and complied information has been forwarded to the Ministry of Environment & Forests (MoEF). The issue of pollution control along rivers and lakes has also been discussed with the SPCBs/ PCCs in the subsequent conferences of the Chairmen & Member Secretaries of SPCBs/PCCs. Compliance Status of Grossly Polluting Industries as on March 31, 2009 is as below:

Total Grossly Polluting Industries – 1357
Complying – 898
Closed – 269; and
Defaulting – 190

10.2.6 Pollution Control in Problem Areas

There are 24 problem areas identified in the country and action plans for pollution control in these problem areas had been prepared and implemented. These areas are Singrauli, Kala Amb, Parwanoo, Mandi Gobindgarh, Vapi, Ankleshwar, Chembur, Tarapur, Nagda-Ratlam, Pali, Jodhpur, Korba, Najafgarh Basin, Manali, North Arcot, Bhadravathi, Visakapatnam, Patancheru- Bollaram, Greater Cochin, Durgapur, Howrah, Dhanbad, Digboi and Angul- Talcher.

The Central Pollution Control Board (CPCB) has taken a number of initiatives for an effective implementation of these action plans. The initiatives include meeting with industries, coordination with SPCBs/ PCCs, review for implementation of action plans and their revision wherever necessary.

During the year 2008-09, status of implementation of Action Plans have been reviewed for the Problem Areas of Digboi, Manali, Parwanoo, Singrauli, Tarapur, North Arcot, Bhadravathi, and Patancheru- Bollaram.

10.2.7 Pollution Control in 17 categories of highly polluting industries

There are 2982 large and medium scale industries identified under 17 categories of polluting industries. Out of these, 2121 industrial units are complying with the prescribed standards, 383 industrial units are having ETPs but were not complying with the prescribed standards during the last monitoring and 478 industrial units are closed, as on March 2009.

10.2.8 Inventorization of Red Categories of Industries

Two projects each of one year duration have been initiated during August, 2008 for invetorization of Red Categories of industrial units in Karnataka and Jharkhand in association with the Environmental Management & Policy Research Institute (EMPRI), Bangalore and the Jharkhand SPCB, respectively. Format has been developed for inventory of data and red categories of industries have been identified. Inventory / data collection & collation work has been initiated.

10.2.9 Studies on Environmental Status of Industrial Estates

A study on ‘Assessment of industrial pollution load discharges in Ghaziabad area’ has been initiated with Department of Civil Engg., IIT, Delhi in August 2008. Monthly monitoring of river Hindon water quality at eight stations and ambient air quality monitoring at two monitoring stations have been carried out on monthly basis since October 2008. Industry specific data collection has also been carried out in association with of Uttar Pradesh SPCB.

10.2.10 State wise Inventorization of Small Scale Industries

Inventorisation of small-scale units in India has been initiated through the State Pollution Control Boards. This exercise will be useful in identifying the important problems and making proper policy for pollution control from SSIs. The Project has been awarded on MoU basis to 17 State Pollution Control Boards namely “Assam,

Bihar, Karnataka, Rajasthan, Jharkhand, Gujarat, West Bengal, Himachal Pradesh, Goa, Kerala, Orissa, Sikkim, Nagaland, Mizoram, Tamil Nadu, Haryana and Chandigarh Pollution Control Committee.

10.2.11 Corporate Responsibility for Environmental Protection

A Charter on Corporate Responsibility for Environmental Protection (CREP) has been agreed upon for each of the 17 highly polluting industrial sectors during the year 2003. The charter includes specific actions that are to be taken within the specified timeframe. To ensure effective implementation and monitoring of the charter, task forces for different sectors are constituted. Meetings of task forces for fertilizer and chlor alkali sectors have been convened on June 19, 2008 and February 24, 2009.

10.2.12 Workshop –Cum- Training on Material Safety Data Sheet (MSDS)

Central Pollution Control Board undertook the task of compiling the safety data for the chemicals, that are categorized as hazardous, flammable and/or toxic chemicals under the "Manufacture, Storage and Import of Hazardous Chemical Rules 1989 and further amended in 2000"and Public Liability & Insurance (PLI) Rules, 1991 and notified by the MoEF, New Delhi.

The information has been compiled in a compact disc *MSDS 2007©*. The compact disc *MSDS 2007©* is intended to provide the necessary safety information in a format according to the Schedule 9 of the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 and create safety awareness amongst the Indian chemical industry at large.

A one day training-workshop was organized by Central Pollution Control Board to disseminate the findings of the study and to train the potentials users of the hazardous, toxic and flammable chemical, for use of Material Safety Data Sheets followed by "Demonstration of CD for installation and operation of MSDS 2007 ©", to provide training in hand to SPCBs/PCCs officials.

10.2.13 Workshop on "Cleaner Productions in Electroplating Units"

Electroplating is one of the polluting SSI sector causing heavy metals pollution. The plating process is associated with discharge of toxic pollutants viz., acids and its fumes, cyanide and toxic metals such as chromium, zinc, copper, nickel, tin etc. Due to potential hazard associated in the electroplating process involving use of Cyanide based electrolyte solutions, two workshops have been organized at Madurai and Ludhiana by the Central Pollution Control Board in association with Tamilnadu SPCB and Punjab SPCB to create awareness among the industrial units to adopt clean technology. Nearly 50 electroplaters of Madurai and Ludhiana clusters attended the workshop in respective regions. The speeches on eco-friendly electroplating processes, waste minimization, effluent treatment, zero discharge system, etc., were delivered by the members from Central Electrochemical Research Institute, SPCBs and industry representatives. The industry representatives shared their experience in eco-friendly electroplating processes. The workshop has been found beneficial to

most of the electroplaters to understand the cleaner productions, waste minimization measures, water conservation measures being practiced in some industries, etc.

10.2.14 Task Force for Pollution Control in Electroplating Units

Electroplating units, thousands in number, are operating in various parts of the country. Most of these are operated in tiny / small scale sector. Electroplating process involves the usage of toxic chemicals viz., acids and their fumes, cyanide and toxic metals such as chromium, zinc, copper, nickel, tin etc.

In order to promote prevention and control of environment pollution caused from this sector, the Central Pollution Control Board has constituted a National Task Force vide Office Order dated July 7, 2008 for a period of two years with the following Terms of Reference:

i) Identifying specific problems/ issues of this sector and suitable approach in solving the problem

ii) Identification of cleaner technologies in electroplating sector

iii) Implementation of cleaner technologies/ waste minimization measures in electroplating industries

iv) Implementation of environmental discharge standards

v) To develop action plan for phase wise reduction of cyanide and chromium in electroplating.

vi) Implementation of pollution control measures and compliance to environment standards in unorganized sector

The first meeting of the Task Force was held on October 21, 2008 at Delhi.

10.2.15 Expert Committee Recommendation on Phasing Out Cyanide Usage in Electroplating Units

Electroplating units in India follow cyanide based electroplating process. Due to potential hazard associated in the process, the Peer & Core Committee in its 20th meeting suggested to constitute a Committee for phasing out cyanide use in electroplating process. Accordingly the Central Pollution Control Board constituted an Expert Committee under the Chairmanship of Prof. J. M. Dave. A series of meetings were held with the SPCBs, Central Electrochemical Research Institute and Metal Finishers Association of India. It was learnt from the discussions that, non-cyanide copper and zinc plating electrolyte solutions / baths are available and the process is being practiced by many electroplaters and the same quality of the plating as produced by the cyanide based copper and zinc plating is being achieved. After detailed deliberations on the matter, the Committee has come out with a recommendation that usage of cyanide should be banned in zinc and copper plating with a time frame of three years throughout the Country.

10.2.16 Inventory of Red categories of Industries in Rourkela region

Central Pollution Control Board Zonal Office - Kolkata has initiated a study on inventory of red-categories of industries is in Rourkela (Orissa) and Durgapur (West Bengal) region.

There are about 65 red-category industries in Rourkela of which 22 units falls under 17-categories of highly polluting industry. Apart from this about 406 sponge iron industries are also included in the list. The type of industries falling under this category are Iron and steel plants, Power plants, Cement mills, Sponge iron units, ferro-alloys, refractory, inorganic chemicals, tar distillation and other miscellaneous units. Data sheets were sent to industries for collection of data, while detailed inventory of these industries is being prepared.

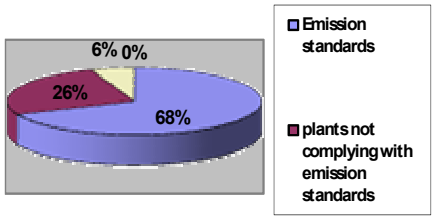
There are 56 red categories of industries in Durgapur. The types of industries falling under this category are mainly iron and steel plants, power plants, sponge iron plants and inorganic chemicals. Industries have been submitting the data in the prescribed format.

In-depth monitoring on selected industries has also being carrying out for cross verification of the data as well as for the calculation of pollution load caused due to the red categories of industries. Few industries have been visited in both the industrial areas for in-depth study.

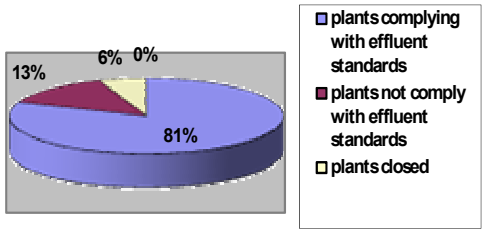
10.2.17 Pollution Control in Thermal Power Plants

Pollution Control Status

During year 2008-09, out of 89 plants, 61 and 72 plants were complying with the emission and effluent standards respectively.



Emission



Effluent

Use of Beneficiated / Blended Coal

Ministry of Environment & Forests, Govt. of India has promulgated a Gazette Notification (GSR 560(E) & 378(E), dated September 19, 1997 and June 30, 1998 respectively) on use of beneficiated/blended coal containing ash not more than 34 percent (annual average) w.e.f. June 2001 extended to June 2002 vide notification no GSR 407 (E) dated May 31st 2001) in the following power plants:

- Power plants located beyond 1000 km from pit head;
- Power plants located in critically polluted areas, urban areas and in ecologically sensitive areas.

The power plants using FBC (CFBC, PFBC & AFBC) and IGCC combustion technologies are exempted to use beneficiated coal irrespective of their locations

Requirements of Beneficiated/ Blended coal

Coal washing is an important area aiming at value addition. Considering the benefits of economics as well as environment, coal beneficiation of all types of coals is being carried out. Twenty Seven (27) plants (out of 39 identified) have initiated the use of beneficiated/blended coal. The present thermal coal washery capacity of about 103 MT per annum is envisaged to reach about 250 MT per annum in next five years time.

To meet the demand-supply gap of washed coal, guidelines for setting up of coal washeries on Public Sector Coal Company's land have been issued by Ministry of Coal. Coal India Limited (CIL) has also decided in principal to set up washeries with the State-of-the-art technologies on Build-Operate-Maintain (BOM) basis and CIL will provide the capital funding and other infrastructure facilities. Further, it has been decided that all new opencast projects of more than 2.5 million tonnes capacity, which are not linked to pithead power stations should be designed with an integrated washery.

Clean Coal Technologies initiatives

New areas of clean coal technologies are under focus and government is taking all the necessary steps in developing these areas within the existing legal frame work.

Pre- Combustion technologies

Coal Bed Methane (CBM) and Coal Mine Methane (CMM), underground coal gasification and coal liquefaction are main clean technologies which are being promoted. A demonstration project of CBM / CMM is being implemented with the help of United Nations Development Programme (UNDP)/Global Environment Facility (GEF) and the Government has already awarded 26 blocks for extraction of CBM to various entrepreneurs. Two of these blocks have already started trial production.

Combustion technologies

Under Ultra Mega Power Project scheme of Government of India, priorities are given to larger unit sizes (more than 660 MW) based on Supercritical technologies. Supercritical technology is more efficient than subcritical with added advantage of low CO_2 emission. Circulating Fluidised Bed Combustion based boilers are being given priorities while granting environmental clearance over subcritical technologies for coal having higher sulphur and ash content.

Medium / High Concentration Ash Slurry Disposal

New coal based thermal power plants are being granted environmental clearance with condition of adopting Medium / High Concentration ash Slurry Disposal system besides utilisation of ash as per requirement.

Utilization of Flyash

As per the notification, every power plant is required to submit Annual Implementation report by April 30th of the every year. During 2008-09, 344.74 million tonnes of coal and 21.5 million tonnes of lignite were consumed in the power sector. About, 137 million tonnes of flyash was generated, of which 47 percent was utilised.

New Plants Commissioned during the year

Yamuna Nagar (2x300 MW) of Haryana Power generation Corporation Ltd, Bellari (1x500 MW) of KPCL, Sipat (2x 500 MW) of NTPC and Jindal Power (4x250 MW) at Raigarh of Jindal power Ltd. were commissioned during the year.

10.2.18 Status of Thermal Power Station in West Bengal

The country goes about setting up more and more power plants to cope with the huge electricity demand. But at the same time it is equally important to use better technology and install better air pollution control devices to reduce pollutants like Particulate Matter and SO_2 as these are the biggest hazards of coal based thermal power stations. There are eleven thermal power stations in West Bengal, out of which the following four have been monitored till September 2008 mainly to evaluate the efficiency of Electro Static Precipitators (ESPs) and the handling of fly ash:

1) M/s CESC Ltd. Budge Budge, South 24 Paraganas
2) M/s Southern Generating Station, Garden Reach
3) M/s Titagarh Generating Station, Khardah
4) M/s National Thermal Power Corporation, Farakka

Stack monitoring was carried out to evaluate the compliance status of these Thermal Power Stations. During the monitoring, it has been found that Thermal Power Plants has been meeting the prescribed stack emissions standards (150 mg/Nm^3).

Ash content in the coal is reportedly varying from 30 to 37 percent. Details of the ash generation and utilization are given below:

Ash disposal / utilization in four Thermal Power Stations in West Bengal

Thermal Power Station	Power Generation (MW)	Coal consumed per day (MT)	Ash generation per day (MT)	Ash Disposal / Utilization
M/s CESC Budge Budge	500	7000	2600	85% exported to Bangladesh through agency and 15% transported by local agency.
M/s Southern Generating Station, Garden Reach	135	2400	900	80% transported by Ambuja Cement Ltd. Sankrail, Howrah. 20% transported by local agency.
M/s Titagarh Generating Station, Khardah	240	3400	950	20% used in road and embankment, 37% in land filling (non–project), and 42% in land filling (project).
M/s National Thermal Power Corporation, Farakka	1100	23200	9280	34% used in land development and 7% issued to cement industries. 19% Ash utilization

10.2.19 Performance evaluation of Ammonia Flue Gas conditioning system of M/s NTPC, Farakka

Central Pollution Control Board Zonal Office - Kolkata has monitored M/s NTPC, Farakka to study the performance of Ammonia Flue Gas Conditioning (AFGC) system for improving the efficiency of ESPs so as to meet the prescribed limit of particulate matter emission.

NTPC Farakka is a coal based TPS having once thorough cooling system and has five units to generate 1600 MW power (3 units of 200 MW in Stage I and 2 units of 500 MW in Stage II). All the units are equipped with ESPs having two passes with 28 fields in each unit in Stage I and 48 fields in each unit in Stage II. Besides this, the plant has installed AFGC system in the inlet of ESPs to meet the stack emission norm for particulate matter. The plant is using coal from Lalmatia Coal Mines, ECL, BCCL, Assam coal and also import from other countries. Ash content in the coal is about 40%. The ash generated of the Thermal Power Station is in the form of 80% fly ash and 20% bottom ash. Fly ash and bottom ash are sent to ash ponds in the form of slurry. To study the performance of Ammonium Flue Gas Conditioning System and ESPs, samples were collected from stack before and after the ammonia dozing to ESPs.

Effect of ammonia dozing in ESPs on Stack Emission Quality

(Particulate matter (PM) concentration in mg.Nm3)

Stack Particulate Matter when no ammonia dozing in ESPs					**Stack Particulate Matter with ammonia dozing in ESPs**				
Unit 2		**Unit 3**		**Unit 5**	**Unit 2**		**Unit 3**		**Unit 5**
Pass A	Pass B	Pass A	Pass B	1080	Pass A	Pass B	Pass A	Pass B	82
234	160	420	378		92	48	76	45	

Though the concentration of dust emission has been found within the prescribed limit after ammonia dosing at ESP, the stack analysis results may not be a representative one as huge fugitive emissions at ESP section was observed during the stack monitoring.

CHAPTER XI

PROSECUTION LAUNCHED, CONVICTION SECURED AND DIRECTIONS GIVEN FOR CLOSURE OF POLLUTING INDUSTRIES

POLLUTION BY FERTILIZER PLANT IN ORISSA

11.1 Special Leave to Appeal (Civil) No. 27858-62/2008, State Pollution Control Board, Orissa Vs Paradeep Phosphates Ltd.

The State Pollution Control Board, Orissa has filed the Special Leave to Appeal before the Hon'ble Supreme Court against the order passed by the High Court of Orissa. The Hon'ble Supreme Court after hearing the matter on 8.12.2008 requested the Central Pollution Control Board for inspection of the factory premises of M/s Paradeep Phosphates Ltd. Earlier, the Orissa State Pollution Control Board in its appeal alleged that these are serious violations on the part of M/s Paradeep Phosphates Ltd. as the said industry are discharging serious hazardous substances in the environment and thereby causing pollution. The fertilizer plant of M/s Paradeep Phosphates Ltd. is located at Paradeep, Orissa and is a NPK (Nitro phosphate) fertilizer unit. This unit is manufacturing mainly Sulphuric Acid, Phosphoric Acid and Di-Ammonium Phosphate and classified as red-category industry for having high pollution potential with reference to water pollution, air pollution and hazardous waste generation. In compliance of the Hon'ble Supreme Court's directions the Central Board has submitted its inspection report through an affidavit before the Hon'ble Supreme Court on 05.01.2009.

The Hon'ble Supreme Court on 25.03.2009 has examined the inspection report submitted by the Central Pollution Control Board. The Hon'ble Court has observed that though the Effluent Treatment Plant has been in operation for removing pollutants, there is still concentration of nitrogenous compound such as Total Kjeldahl Nitrogen (TKN) and Ammonical Nitrogen exceeding the stipulated norms. The stagnant creek water pools around the gypsum pond indicating that the water is still contaminated with high fluoride levels besides some other observations have also been made by the Central Pollution Control Board. After considering the request of the Central Pollution Control Board, the Hon'ble Court again requested the Central Board to make another inspection of the industry in the month of April and submit fresh report.

The Central Pollution Control Board has again inspected the industry on 24.04.2009 and submitted its report through an affidavit before the Hon'ble Court on 11.05.2009 and the report is yet to be considered by the Hon'ble Supreme Court.

NOISE POLLUTION BY FIRE CRACKERS

11.2 IA No. 57 & 58 filed in Writ Petition (Civil) No.72/1998 by the International Marwari Association, West Bengal in Noise Pollution implementation of the Laws for restricting use of loudspeakers and high volume producing sound systems Vs Union of India & Ors.

The International Marwari Association, West Bengal has filed an IA against the order, dated 03.10.1997 passed by the West Bengal Pollution Control Board through which the sale or manufacture or use of firecrackers were completely banned in West Bengal. The stringent noise standards without scientific reasoning were enforced by the West Bengal Pollution Control Board. The International Marwari Association, West Bengal has prayed before the Hon'ble Supreme Court that noise standards issued by the West Bengal Pollution Control Board may be quashed. The Hon'ble Supreme Court after hearing the matter on 25.07.2008 has directed to issue notices to the concerned Departments including the Central Pollution Control Board.

The Central Pollution Control Board after examination of the matter submitted its detailed reply before the Hon'ble Supreme Court through an affidavit on 04.08.2008. In its reply the Central Pollution Control Board has submitted that the order, dated 03.10.1997 passed by the West Bengal Pollution Control Board banning the use and sale of fireworks which produce noise more than 90 dB(A) impulse at 5 meter from the source, in the State of West Bengal. The Central Board has also submitted that the Central Pollution Control Board has constituted "Noise Pollution Control Committee" in the year 1988. One of the recommendation of the Committee was that the manufacturing and sale of crackers having an impulsive noise more than 90 dB(A) at 5 meters away from the site of firing should be banned. This recommendation remained as a guideline.

Subsequently, the Central Pollution Control Board has constituted another Committee in the year 1997 in the name of "National Committee on Noise Pollution Control" with an objective to formulate the noise standards and policies to be adopted in the country. This Committee after considering the study carried by the Central Pollution Control Board in collaboration with National Physical Laboratory and a similar study carried out by Defence Institute of Physiology and Allied Sciences, recommended the standards for fire-crackers. The main recommendation was that the manufacture, sale or use of fire-crackers generating noise level exceeding 125 dB(Ai) or 145 dB(C) peak at 4 meters distance from the point of bursting shall be prohibited. These recommendations were subsequently notified by the Ministry of Environment & Forests on 05.10.1999. Under the provisions of the Environment (Protection) Rules, 1986 the State Boards have powers to specify more stringent standards for the relevant parameters, with reference to specific industry or location. The matter is under consideration of the Hon'ble Supreme Court.

SLAUGHTER HOUSE IN DELHI

11.3 IA No.22, 40 & 41 filed in Civil Appeal No.3769 of 1996, Buffalo Traders Welfare Association Vs Union of India & Ors.

The Hon'ble Supreme Court is monitoring the progress of the construction of Ghazipur Slaughter House. The Ghazipur Slaughter House has modern slaughtering facilities, like lairage, air-conditioned slaughter house plant, live stock market for Buffalos and goats/sheep and Effluent Treatment Plant (ETP). During the hearing of the matter the Hon'ble Supreme Court on 14.01.2009 directed the Central Pollution Control Board to carry out an inspection of the entire Ghazipur Slaughter House Plant, both inside and outside and submit the report. The Central Pollution Control Board has inspected the premises of the Ghazipur Slaughter House on 21.01.2009 and submitted its inspection report through an Affidavit before the Hon'ble Supreme Court on 23.01.2009. The Central Board has submitted following observations for the consideration of the Hon'ble Supreme Court:-

(i) The Ghazipur Slaughter House is yet to operate on commercial scale.

(ii) The existing lairage facility available with the slaughter house is equivalent for slaughtering of not more than 340 buffaloes and 1,470 goat/sheep in a day as per the Prevention of Cruelty to Animals (Slaughter House) Rules, 2001 issued under the Prevention of Cruelty to Animals Act, 1960 (Act No.59 of 1960) which stipulates lairage area @ 2.8 m^2 per large animal and 1.6 m^2 per small animal, dictating the need for further increasing the lairage facility in proportion to slaughtering capacity.

(iii) The storage facilities for skins, hides and other inedible offal are yet to be provided.

(iv) The effluent streams generated from the slaughter house are yet to be properly connected to the ETP system.

(v) Biogas plant for treatment of solid waste generated from slaughter house and ETPs is yet to be planned.

(vi) The slaughter house is yet to obtain consent to establish/operate/ authorisation as required under the environmental laws and rules from the concerned authority namely, the Delhi Pollution Control Committee (DPCC).

(vii) There is a need to formulate closure plan of the sanitary landfill with time schedule for closure and its post care, including green belt development on the site.

(viii) The Delhi Pollution Control Committee needs to ensure that the slaughter house, rendering plant, sanitary land fill site, and poultry and fish market obtain Consent etc. referred to at Para (vi) above and take requisite pollution control measures.

(ix) Proper environmental management plan from the Delhi Govt. may be required as the entire site in present condition is far from satisfactory, particularly due to waste disposal facilities including the sanitary landfill and the rendering plant for dead/fallen animals and other activities, and also because the large population of nearby residential areas is constantly exposed to the site.

BIO-MEDICAL WASTE MATTER

11.4 Writ Petition (Civil) No.160/2005, Common Cause Vs Union of India & Ors.

A Public Interest Litigation was filed by the Common Cause which is the Society registered under the Society's Registration Act, 1860 and the Society raised Common problems of the people and secures redressal thereof. In this petition the Common Cause has alleged that the present method used for the disposal of bio-medical waste by incineration is causing environmental pollution and incinerators using for the disposal of the Bio-Medical waste consume fossil fuels and high amount of electrical energy. The operating cost of the incinerators is very high and it involves occupational health hazards. The Petitioner also alleged that incinerations though destroy the waste, it produces many other chemical ashes which will cause atmospheric pollution and also contribute to the global warming. It causes serious effect on soil and water resources.

The Petitioner prayed before the Hon'ble Court that the Central Government and Central Pollution Control Board be directed to stop giving permission for installation of incinerators and also stop the existing incinerators for the treatment of Bio-Medical Wastes and permit the use of the waste reduction by waste reduction (WR^2) technologies and other similar technologies other than the use of incinerations for treatment of Bio-Medical Wastes. The Central Board has submitted its counter affidavit before the Hon'ble Court for consideration.

The Hon'ble Court after considering the written submissions of the Central Pollution Control Board passed the final order on 22.10.2008 with the directions that the incinerators are installed for disposal of bio-chemical waste in accordance with the provisions of the Rules framed by the Central Government. The Bio-Medical Waste (Management & Handling) Rules, 1998 provided detailed procedure for the incineration of the Bio-Medical Waste categorized under Schedule I. The occupier/operator wishing to use other State-of-the-Art Technologies shall approach the Central Pollution Control Board. The Hon'ble Court has observed that the Petitioner Common Cause has not produced any scientific material or research result to show that existing incinerators are causing serious environmental pollution as alleged in their Petition. It would be open to the Petitioner to approach the concerned authorities, if the Petitioner feels that the present technology is not good or any other suitable technology could be used. The Petitioner is free to forward their suggestions to the concerned authorities, with these directions the Hon'ble Court dispose of the Petition.

ENVIRONMENTAL DEGRADATION BY HIGH COURT BUILDING, GUWAHATI

11.5 Writ Petition (Civil) No.235/2005, Abhiyatri & Ors. Vs Union of India & Ors.

This Petition has been filed by Abhiyatri with 06 other NGOs jointly against the construction of Multistoried building of Guwahati High Court. In its petition it is alleged by the Petitioners that the proposed site is earmarked as parks and playgrounds in the Master Plan of Guwahati city. The multistoried building of the Guwahati High Court is also been constructed against the recommendations of the Expert Committee constituted by the State of Assam. It was also alleged by the Petitioners that the High Court of Guwahati had cut at least 65 old trees from the site of the High Court building. The Central Pollution Control Board has submitted its counter affidavit on 12.09.2006. The matter was heard on 17.03.2009 by the Hon'ble Supreme Court. The counsel appearing on behalf of the Guwahati High Court submitted that the construction of the building was already partly over when this writ petition was filed by the Petitioner and the necessary clearances have been obtained for the construction of the High Court building. After hearing the counsels the Hon'ble Court observed that the construction of the Guwahati High Court building is nearly 80% already completed and therefore, at this stage this Court should not interfere with the construction of the building. The Hon'ble Court has directed that the Respondents to observe and follow all directions given by the Environmental Authorities while undertaking the construction and there is no further directions are necessary. The Hon'ble Court disposed of the writ petition on 17.03.2009.

YAMUNA POLLUTION IN DELHI

11.6 Writ Petition (Civil) No.725/1994, News Item 'HT' and Quite Flow Maili Yamuna Vs Central Pollution Control Board & Ors.

This writ petition is related to the pollution in river Yamuna in Delhi area. Pursuant to the directions of the Hon'ble Supreme Court, the Central Pollution Control Board is submitting its monitoring reports to the Hon'ble Supreme Court. The Monitoring Reports submitted by the Central Pollution Control Board are based on the water quality of the river Yamuna at Palla, Agra Canal and at Okhla. The Central Pollution Control Board also monitoring the drains at the point prior to discharge into the river Yamuna for assessing the wastewater quality and pollution load in river Yamuna. The Central Pollution Control Board monitoring the river Yamuna for its water quality at five locations along with 25 drains in compliance of the directions of the Hon'ble Supreme Court. The Central Pollution Control Board has submitted the results of 130 round of monitorings since year 1999 before the Hon'ble Supreme Court.

The matter is under consideration of the Hon'ble Supreme Court.

TAJ POLLUTION MATTER

11.7 Writ Petition (Civil) No.13381/1984, M.C. Mehta Vs Union of India & Ors.

This writ petition was filed by Shri M. C. Mehta as a Public Interest Litigation regarding pollution being caused by the Industries located in and around the city of Agra. The main source of air pollution in Agra region are from iron foundries, Ferro-alloys, rubber processing industries, lime processing, engineering, chemical industries, brick kilns, refractory units and automobiles. The Hon'ble Supreme Court is monitoring the status of pollution in Agra. The following important issues are presently under consideration of the Hon'ble Supreme Court:-

(i) Matter relating to brick kilns located in TTZ

The Hon'ble Supreme Court monitoring the pollution aspect of the brick kilns located in TTZ. Pursuant to the Hon'ble Supreme Court's directions the Central Board has constituted a Committee for brick kilns of TTZ. The Committee so constituted by the Central Pollution Control Board has considered number of issues pertaining to the brick kilns of TTZ. However, some of the brick kilns have filed number of cases before the District Court of Agra, Hathras and Etah. Upon the decision taken by the Committee for Brick Kiln of TTZ, the Central Pollution Control Board has filed an Interlocutory Application before the Hon'ble Supreme Court against the interim orders passed by the Civil Courts of District Agra, Hathras and Etah. The Hon'ble Supreme Court heard the IA filed by the Central Board on 09.02.2009 and directed that the Civil Court having territorial jurisdiction will have jurisdiction to decide the said suits in accordance with the provisions of the Civil Procedure Code. However, keeping in view the fact that the said suits and/or an interim order shall be dispose of for the purpose of giving effect to this Court's order, dated 22.08.2005. Therefore, in exercise of under Article 142 of the constitution of India directed that in the event of application is filed by the Special Committee and also by the State Pollution Control Board with respect to the jurisdiction of the said Civil Courts, the application should be disposed of as expeditiously as possible and not later than four weeks from the date of filing of application. With these directions the Hon'ble Supreme Court disposed of the Interlocutory Application filed by the Central Pollution Control Board.

(ii) Air Quality Monitoring Stations at Agra

Pursuant to the directions of the Hon'ble Supreme Court the Central Pollution Control Board had established four air quality monitoring stations and one Central Analytical-cum-Calibration Laboratory at Agra. The Central Pollution Control Board monitoring the ambient air quality at Taj Mahal, Edmad-Ud-Daula, Rambag and Nunhai. The air quality data so generated from these monitoring stations in Agra are being displayed at Taj Mahal and status of the pollution is being submitted before the Hon'ble Supreme Court.

SEWAGE TREATMENT

11.8 Writ Petition (Civil) No.3727 of 1985, M.C. Mehta Vs Union of India & Ors.

The Central Pollution Control Board has filed an Interlocutory Application maintenance and operation of the sewage treatment plants, sewage system, pumping stations, crematoria, low costs toilets, or other assets, infrastructure created under the Ganga Action Plan. The concerned Municipalities/Nagar Palikas/Local Bodies/Ganga Basin has to ensure the operation and maintenance of the assets created under the Ganga Action Plan to avoid the pollution of the water bodies.

CHAPTER XII

FINANCE AND ACCOUNT

Subject Material
to be included after Audit

CHAPTER XIII

ANNUAL ACTION PLAN FOR THE YEAR 2009 – 2010

13.1 INTRODUCTION

Central Pollution Control Board (CPCB) had been constituted under the Water (Prevention and Control of Pollution) Acts, 1974 is a 100% Grant-in-aid institution of the Ministry of Environment and Forests (MoEF), Govt. of India. CPCB serves as a technical wing of MoEF and coordinates with the State Pollution Control Boards (SPCBs)/ Union Territory Pollution Control Committees (PCCs) for implementation of plans and programmes relating to abatement of pollution. Project and programmes are executed through in-house efforts and with the assistance of Research Institutions like IITs, Engineering Colleges, Universities and R & D Institutions.

In addition to the implementation of The Water and Air Acts, CPCB has planned various programmes relating to implementation of Rules framed under The Environment (Protection) Act, 1986 such as Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, Bio-medical Waste, Municipal Solid Wastes Plastics Waste and others.

The plans and programmes identified for the year 2009-10 have been formulated based on the thrust areas identified by the Ministry of Environment and Forests under the National Environment Policy (NEP) 2006 and also as per the issues raised by SPCBs/ PCCs.

13.2 SALIENT ACHIEVEMENTS OF YEAR 2008-09

- Water Quality Monitoring is being carried out at 1429 stations under Water Quality Monitoring Programme (WQMP).
- Ambient Air Quality Monitoring is being carried out at 345 stations under National Ambient Monitoring Programme (NAMP).
- Studies on 'Risk assessment of pesticides residue in human reproductive system' completed and report is under finalization.
- Studies on 'Removal of heavy metals from wastewater treatment with bio-absorbent' completed.
- Six continuous ambient air quality monitoring stations (CAAQMS) commissioned at Chennai (2), Bangalore (1) and Delhi (3).
- Standards for incinerator for Dye and Dye intermediate, Bulk Drug and Organic Chemical industries evolved.

- Emission standards for Electric Arc furnace and Plaster of Paris industry evolved.

- Effluent standards for Pharmaceutical and Hotel industry evolved.

- Review of National Ambient Air Quality Standards (NAAQS) undertaken.

- Standards for Faecal Coliform in treated sewage evolved.

- Thirty eight (38) directions under section 18 (1) (b) of Water and Air Act, and thirty (30) directions under section (5) of The Environment (Protection) Act issued during the year.

- Organized four (4) Board Meetings and one Chairman and Member Secretary's Conference and follow-up of the decisions taken and suitable action has been taken against defaulters.

- Two Hundred fifty nine (259) industrial units inspected under ESS Programme for compliance of standards.

- Assessment of odour control in distilleries industries completed.

- Report on performance evaluation of pollution control measures in textile industries under printing.

- Report on 'Performance study of plastics coating over aggregate road built using waste' published.

- Guidelines and check-list for evaluation of MSW landfill proposals with information on existing landfills published.

- Study on 'Assessment and Establishment of Biodegradability of plastics films' completed and report is under printing.

- Regular inspection of TSDF sites, Bio-medical facilities are being carried out at various places for verification of compliance as per Rules.

- Source apportionment studies have been completed in six cities and report finalized.

13.3 THRUST AREAS FOR THE YEAR 2009-10

1. Strengthening and increasing water and air quality monitoring stations to 1500 and 400 respectively.

2. Setting up of continuous ambient air quality monitoring stations in 16 polluted cities as per the directions of Hon'ble Supreme Court.

3. Development on GIS based Environment Information System (EIS) for EIA and Environment Clearance.

4. Hydro-geological interceptions through engineering innovation to recharge ground-water in order to ensure minimum flow of river.

5. Ensuring compliance of stipulated air and water quality standards in highly polluting 17 categories of industries through Environment Surveillance.

6. Enforcement and implementation of Municipal Solid Waste (Management and Handling) Rules,2000 Biomedical Waste (Management and Handling) Rules,1998 , Hazardous Waste (Management Handling and Trans-boundary Movement) Rules,2008, Battery Waste (Management and Handling) Rules, 2001 and Plastics Manufacture, Sale and Usage Rules,1999 as amended 2003 in States and Union Territories.

7. Strengthening of Central and Zonal laboratories of Central Pollution Control Board for monitoring of Hazardous Air Pollutants (HAPs) such as dioxins (PCDDs) and Furans (PCDs) etc.

8. Review and development of emission and effluent standards for highly polluting and critical industries such as distilleries, pulp and paper, tanneries etc.

9. Inventory of hazardous waste generating units and identification of hazardous waste streams in industrial sectors. Setting of TSDF sites in other States.

10 Development of road map for MSW, hazardous waste and plastics waste management as per the recommendations of CAG. Policy on co-processing of hazardous and plastics waste in cement kilns.

11 Implementation of sector-specific programmes for industrial pollution control in Distilleries, Refineries, Iron and Steel Plants, Petrochemical Industries etc.

12 Establishment of E-waste recycling facilities in States.

13 Implementation of Guidelines for mercury waste management.

13.4 BUDGET ALLOCATION OF THE SCHEMES FOR THE YEAR 2009-10

Part-A: HEAD OFFICE

Division/Section	Budget Allocation (Rs. in Lakh)
Pollution Assessment Survey & Monitoring	653.50
Laboratory Management	385.00
Pollution Control Implementation-I	75.00
Pollution Control Implementation-II	101.00
Pollution Control Implementation-III	162.05
SSI Division	136.60
Urban Pollution Control Division & ESS	61.25
Pollution Control Planning Division (PCP)	443.65
PR Hindi and Coordination Cell	86.00
Library	15.20
AS Section	23.00
Training Division	90.00
Hazardous Waste Management	66.00
Building Maintenance	228.50
Computer Division	39.00
TOTAL (A):	**2565.75**

Part-B: ZONAL OFFICES

Zonal Office	Budget Allocation (Rs. in Lakhs)
Bangalore	234.00
Bhopal	108.50
Kolkata	150.00
Lucknow & Agra	237.50
Shillong	51.00
Vadodara	103.25
TOTAL (B):	**884.25**

GRAND TOTAL (A+B)= 2565.75+884.25=Rs.3450.00 Lakh

CHAPTER XIV

OTHER IMPORTANT ACTIVITIES DEALT BY CPCB

14.1 STATUS OF WATER SUPPLY, SEWAGE COLLECTION/TREATMENT / DISPOSAL AND MUNICIPAL SOLID WASTE COLLECTION / PROCESSING / DISPOSAL IN CLASS-I CITIES AND CLASS-II TOWNS

The Central Pollution Control Board (CPCB) had brought out first report on the status of water supply and waste water generation, collection, treatment and disposal in class -I cities and class-II towns in the year 1978-79. This report was successively updated during the years 1989-90 and 1999-2000. To bring the next status report (fourth in the series), CPCB has initiated the collection of information on water supply, sewage collection/treatment/disposal and municipal solid waste collection/transportation/disposal through questionnaire survey from class-I cities and class-II towns. So far information from 229 class–I cities out of 426 and 255 class–II towns out of 499 is received. Compilation of the information received has been done. Information for the remaining cities/towns for which data has not yet been received has been estimated based on population estimated as on March, 2008. Report is under final stage of preparation. State wise information on water supply, sewage generation / treatment capacity in India and Municipal Solid Waste generation/ collection are presented in Figs. 14.1 to 14.3:

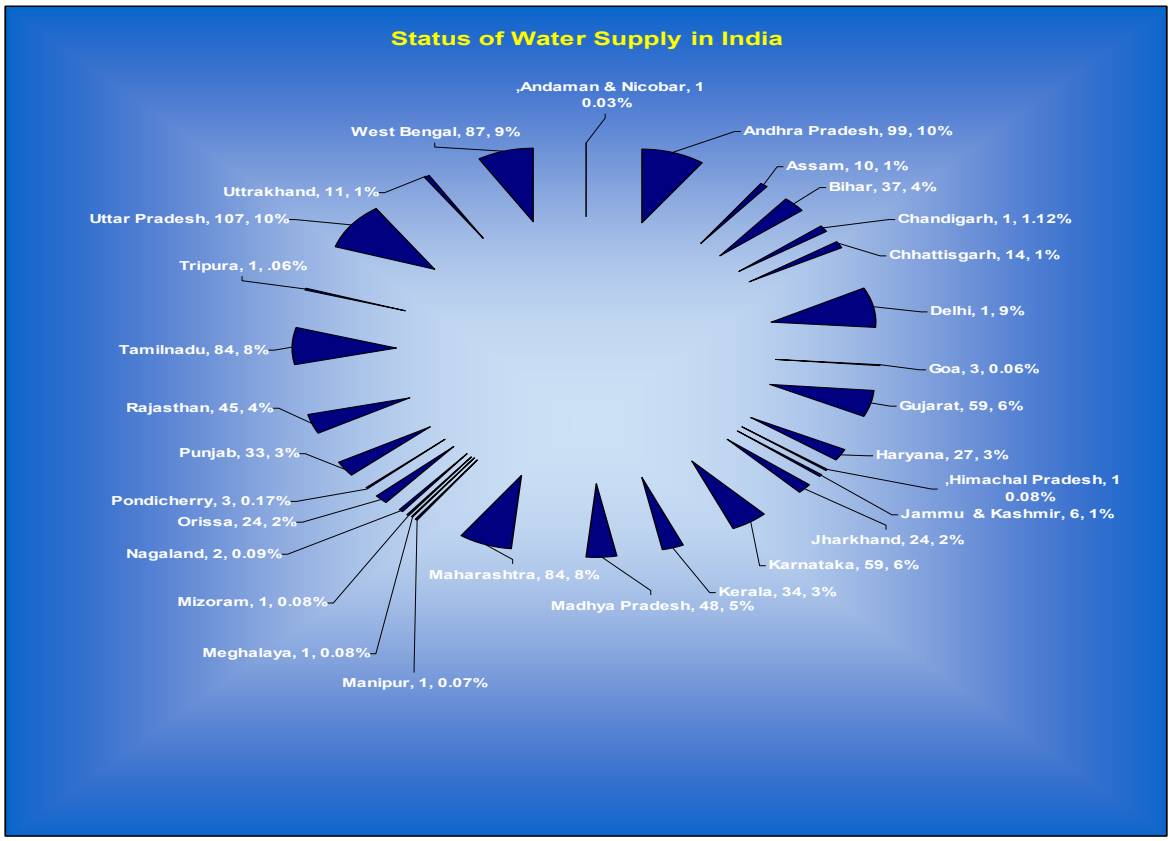


Fig. 14.1: State-wise water Supply (in percent) including number of Class-I Cities & Class-II Towns

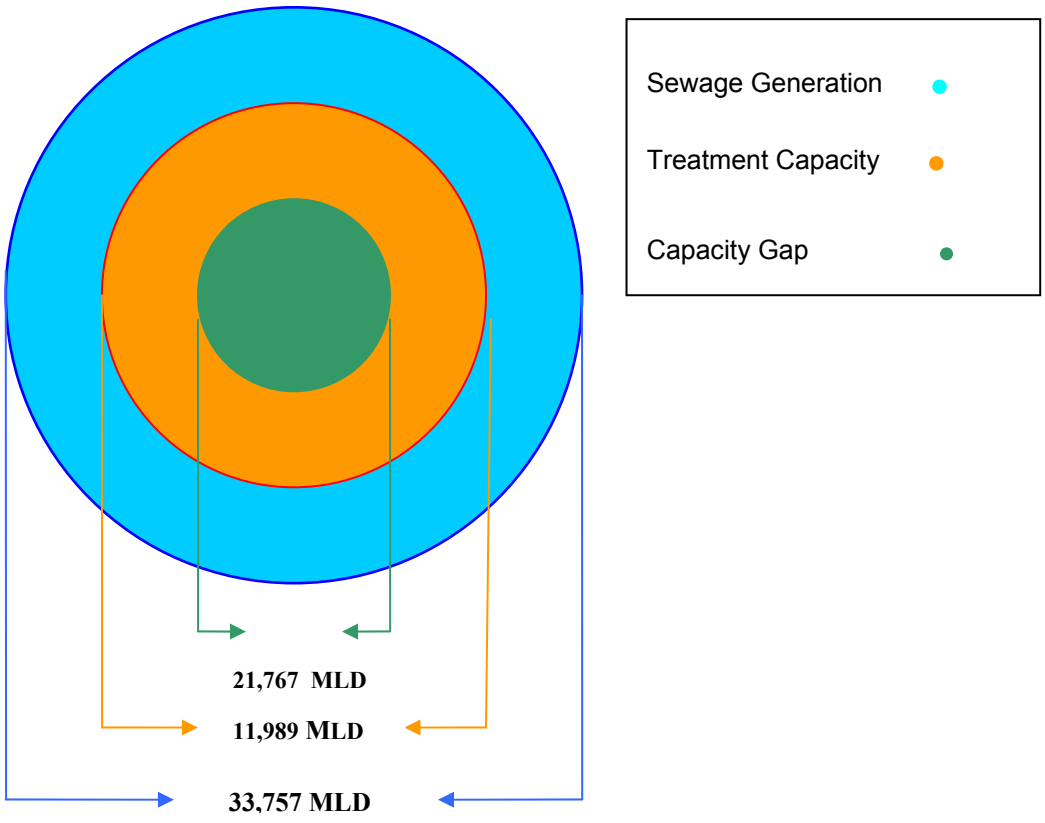


Fig. 14.2: Status of Sewage Generation, Treatment Capacity and Capacity Gap in Class-I Cities & Class-II Towns

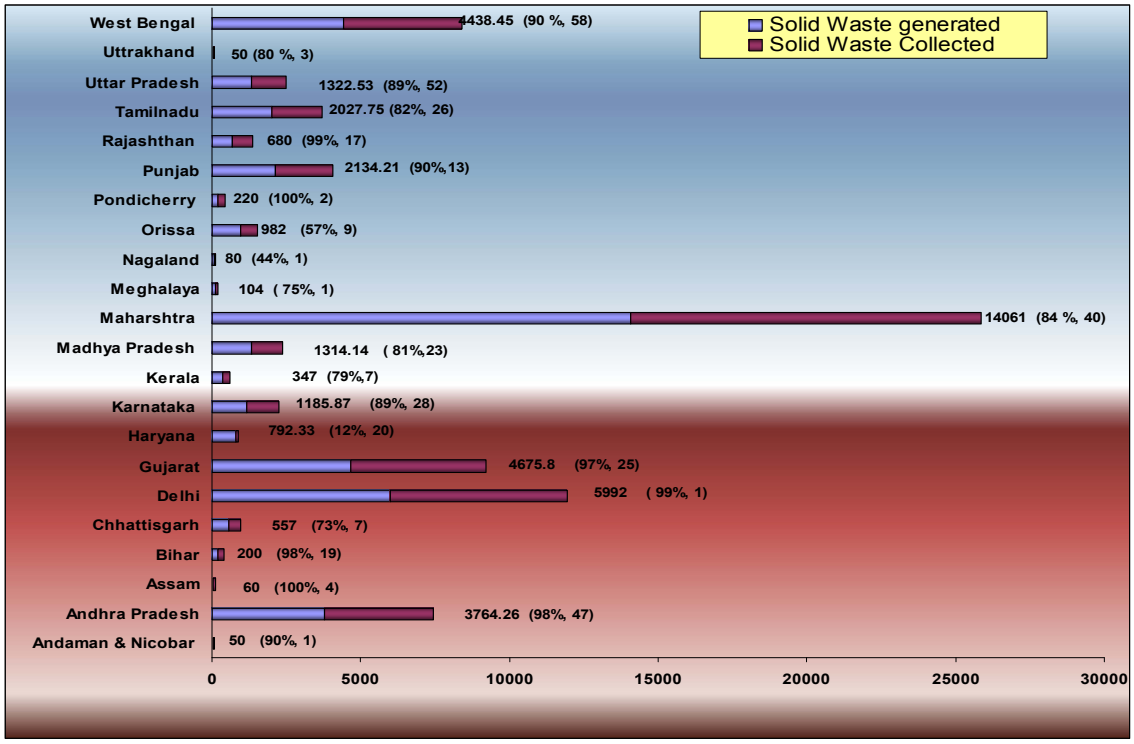


Fig. 14.3: State wise Solid Waste Generation (in MTD), Collection (in percent) and number of Class-I Cities

14.2 SEWAGE POLLUTION CONTROL

14.2.1 Status of Sewage Treatment Plants (STPs) in India

Discharge of untreated sewage in water courses both surface and ground waters is the most important water polluting source in India. Out of about 34000 million liter per day of sewage generated treatment capacity exists for only about 12000 million liter per day. Thus, there is a large gap between generation and treatment of wastewater in India. Even the treatment capacity existing is also not effectively utilised due to operation and maintenance problem. Operation and maintenance of existing sewage treatment plants and sewage pumping stations is a neglected field, nearly 39% sewage treatment plants are not conforming to the general standards prescribed under the Environmental (Protection) Rules for discharge into streams as per the CPCB's survey report. STPs are usually run by personals that do not have adequate knowledge of running the STPs and know only operation of pumps and motors. In a number of cities, the existing treatment capacity remains underutilized while large quantities of sewage is discharged without treatment to nearby water course. Auxiliary power back-up facility is required at the intermediate (IPS) and main pumping stations (MPS) of the STPs to ensure uniform flow and consistent operation.

Table 14.1: State-wise Sewage Generation and its Treatment (Year 2008)

S. No.	State/Union Territory	Sewage Generation (in MLD)	Treatment Capacity (in MLD)	Capacity Gap (in MLD)	Percent Treatment Facility
1.	Himachal Pradesh	29	35.63	-6.63	100
2.	Goa	21.5	18.17	3.33	85
3.	Maharashtra*	5882.7	4288.15	1594.55	73
4.	Delhi	3800	2330	1470	61
5.	Haryana	541	312	229	58
6.	Andhra Pradesh	1635.9	694.04	941.86	42
7.	Chandigarh	402	164.79	237.21	41
8.	Uttar Pradesh	3746.8	1238.03	2508.77	33
9.	Gujarat	2376.4	783	1593.4	33
10.	Punjab	1685	453.8	1231.2	27
11.	Tamilnadu	1348.3	334.47	1013.83	25
12.	West Bengal	2761.6	567.8	2193.8	21
13.	Chhattisgarh	356.5	69	287.5	19
14.	Uttarakhand	180.9	24.5	156.4	14
15.	Madhya Pradesh	1429.9	186.1	1243.8	13
16.	Karnataka	1887.5	231	1656.5	12
17.	Bihar	1277.9	137.5	1140.4	11
18.	Jammu & Kashmir	193.7	15	178.7	8
19.	Orissa	692.2	53	639.2	8
20.	Rajasthan	1509.6	54	1455.6	4
21.	Kerala	721.2	-	721.2	0
22.	Jharkhand	645.8	-	645.8	0

S. No.	State/Union Territory	Sewage Generation (in MLD)	Treatment Capacity (in MLD)	Capacity Gap (in MLD)	Percent Treatment Facility
23.	Assam	423.8	-	423.8	0
24.	Pondicherry	66	-	66	0
25.	Mizoram	29.6	-	29.6	0
26.	Manipur	26.7	-	26.7	0
27.	Tripura	24.4	-	24.4	0
28.	Meghalaya	24.3	-	24.3	0
29.	Nagaland	23.9	-	23.9	0
30.	Andaman & Nicobar	12.9	-	12.9	0
	Total	**33,757.00**	**11989.98**	**21767.02**	

** In Mumbai (Maharashtra) there are two marine outfalls of 3686 MLD capacity.*

14.2.2 Performance of Sewage Treatment Plants (STPs) in U.P., Haryana and Delhi under Yamuna Action Plan

Central Pollution Control Board is regularly monitoring four sewage treatment plants constructed under Yamuna Action Plan (3 STPs in Haryana State & 1 STP in Delhi) for their performance evaluation under National River Conservation Directorate project. The installed capacity of these plants varies from 10 MLD to 45 MLD. Out of these four plants, 3 are based on Up-flow Anaerobic Sludge Blanket (UASB) treatment system and one is based on physico-chemical treatment followed by aerobic treatment system. Range of various studied parameters during the year 2008 at inlet and outlet points of these STPs are presented ahead. Significant BOD reduction was observed at Sen Nursing Home STP with minimum fluctuations in minimum and maximum reduction. The performance of Gurgaon & Faridabad Zone II STPs varies greatly may be due to variation in the feeding rate. The STPs in Haryana State are always found operating under-capacity. Further, the operation and maintenance of these three plants is not satisfactory with frequent breakdown and needs augmentation.

Table 14.2: Performance of Various STPs under Yamuna Action Plan
(April, 2008 to March, 2009)

S. No.	STP		BOD, mg/l			COD, mg/l			Suspended Solid, mg/l		
			Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
1.	Faridabad Zone I STP	Inlet	77	348	152	276	894	458	88	830	369
		Outlet	21	123	58	97	250	168	21	118	57
2.	Faridabad Zone II STP	Inlet	81	219	129	233	558	380	113	374	236
		Outlet	29	203	68	139	640	220	14	80	48
3.	Gurgaon STP	Inlet	91	666	318	262	1410	806	54	976	374
		Outlet	56	1158	215	170	4080	778	32	5480	727
4.	Sen Nursing Home STP	Inlet	116	486	242	293	1016	613	43	440	212
		Outlet	02	14	8	18	58	36	BDL	36	13

S. No.	STP		Total Coliform Nos./100 ml		Faecal Coliform Nos./100 ml	
			Min.	Max.	Min.	Max.
1.	Faridabad Zone I STP	Inlet	2,00,00,000	5,60,00,00,000	28,00,000	2,70,00,000
		Outlet	26,00,000	7,20,00,000	3,10,000	90,00,000
2.	Faridabad Zone II STP	Inlet	9,50,00,000	3,10,00,00,000	47,00,000	9,30,00,000
		Outlet	21,00,000	22,00,00,000	1,70,000	1,04,00,000
3.	Gurgaon STP	Inlet	8,90,00,000	6,50,00,00,000	71,00,000	23,00,00,000
		Outlet	37,00,000	27,00,00,000	6,00,000	4,40,00,000
4.	Sen Nursing Home STP	Inlet	8,50,00,000	79,00,00,000	78,00,000	11,20,00,000
		Outlet	41,00,000	7,10,00,000	3,20,000	1,10,00,000

Besides these four STPs, one UASB based STP located at Agra was also studied during the year 2008. The installed capacity of this plant is 78 MLD. Under-capacity operation of the STP was generally observed during the study period. The performance of the plant was also found well below the desired expectations of treatment.

14.2.3 Performance of Sewage Treatment Plants (STPs) in Gujarat and Maharashtra

In Gujarat, **t**here are 12 sewage treatment plants located in Vadodara (3), Surat (6), Ahmedabad (2), Rajkot (1). In Maharashtra, there are 23 STPs located in various cities. The Central Pollution Control Board Zonal Office – Vadodara has monitored 9 STPs in Gujarat and 2 STPs in Maharashtra during the year. The monitoring results indicate that some of the STPs have been compliant to the prescribed discharge standards, while other still needs improvement.

Table 14.3: Performance of Sewage Treatment Plants in Gujarat and Maharashtra

STPs at Surat, Gujarat

Location (Inlet / Outlet)	Wastewater Quality, mg/l				
	TSS	COD	BOD	NH_3-N	Cl^-
Inlet to STP, Karanj ,Surat	199	304	145	19	181
Outlet of STP, Karanj ,Surat	18	65	30	22	121
Inlet to STP, Anjana ,Surat	562	1231	279	26	252
Outlet of STP, Anjana ,Surat	5.2	68	27	7.6	181
Inlet to STP, Bhatar ,Surat	110	167	75	29	1107
Out of STP, Bhatar ,Surat	64	91	30	12	1611
Inlet to STP, Bamroli ,Surat	299	600	216	33	534
Outlet of STP, Bamaroli, Surat	106	517	201	13	926
Inlet to STP, Singanpur ,Surat	189	668	183	22	554
Outlet of STP, Singanpur ,Surat	146	490	216	5.7	383
Inlet to STP, Bhesan ,Surat	103	274	99	31	161
Outlet of STP, Bhesan, Surat	17	110	41	2.1	362
Gujarat Pollution Control Board Prescribed effluent standard (mg/l)	100	250	30	50	600

STPs at Vadodara, Gujarat

Location (Inlet / Outlet)	Wastewater Quality, mg/l						
	TSS	TDS	COD	BOD	NH_3-N	O&G	Cl^-
Inlet to STP, Atladra	266	814	508	147	39.2	23	166
Final outlet of STP, Atladra	45	765	87	15	31.3	9.4	149
Inlet to STP, Tarsali	285	787	540	141	28.4	28	202
Final outlet of STP, Tarsali	108	724	187	23	22.8	3.3	179
Inlet to STP, Gajarawadi	255	328	464	238	23.3	18	135
Final outlet of STP,Gajarawadi	3.0	524	49	6.0	22.9	7.0	145
Gujarat Pollution Control Board Prescribed effluent standard (mg/l)	100	2100	250	30	50	10	600

STPs in Maharashtra

Location (Inlet / Outlet)	Wastewater Quality							
	pH	TSS mg/l	COD mg/l	BOD mg/l	NH3-N mg/l	TKN mg/l	TC MPN / 100 ml	FC MPN / 100 ml
Nerul STP Inlet (Navi Mumbai)	7.43	1050	484	217	--	--	$11x10^6$	$8x10^6$
Nerul STP outlet (Navi Mumbai)	7.27	38	9.7	2.9	8.5	11	200	--
Vashi STP Inlet (Navi Mumbai)	7.44	108	187	84	--	--	$17x10^6$	$11x10^6$
Vashi STP Outlet (Navi Mumbai)	7.68	584	13	1.5	8.1	12	$8x10^4$	$5x10^4$
Motagaon STP Inlet (Dombivali)	7.31	236	426	202	16	24	--	--
Motagaon STP Outlet (Dombivali)	7.19	130	274	117	17	43	--	--

14.2.4 Performance of Sewage Treatment Plants (STPs) in Rajasthan and Madhya Pradesh

STP Jalmahal Road, **Jaipur** (October 20-21, 2008)

- Designed capacity: 26 MLD.
- Treatment units: chemical dosing, primary settling, biological treatment, secondary settling, sludge settling cum centrifuging.
- The treated effluent is discharged into a nallah, which finally joins Ramgarh lake. The authorities are in the process of providing tertiary treatment unit for the treated sewage and finally propose discharge to Jalmahal Lake. The tertiary treatment plant is expected to be commissioned shortly.
- A by-pass arrangement for letting out excess effluent without treatment also exists. The sludge is also disposed in open, as the disposal options are not yet finalized by the authorities.
- The operator has maintained laboratory for day-to-day performance parameters and has maintained good house-keeping.

Table 14.4: Performance of STP Jalmahal Road, Jaipur

Sample Location	pH	TSS mg/l	Chloride mg/l	COD mg/l	BOD mg/l
Inlet of STP (Grab)	7.41	716	377	852	371
Outlet of STP (Grab)	7.45	20	349	108	29
Inlet of STP (Composite)	7.52	624	331	760	311
Outlet of STP (Composite)	7.21	16	352	936	38

- ❖ All the parameters are meeting the discharge limits. The BOD & COD values of outlet are 21 mg/l & 76 mg/l respectively.

STP Delawas, Jaipur (October 20-21, 2008)

- ❖ Designed capacity: 62.5 MLD. Another sewage treatment plant at the same premises is under construction with designed capacity of 62.5 MLD. The STP is catering to a total population of 6.0 Lakh of Jaipur South.
- ❖ Treatment units: Activated sludge process, anaerobic digester and centrifuge.
- ❖ The sewage, after treatment, is allowed to join Amanshah nallah.
- ❖ Standby power arrangements were not made and most of the time untreated sewage is discharged. The grit and other solid wastes are being dumped all over the land in the premises.
- ❖ A power generation unit from biogas was under construction. At the time of visit the biogas was being flared. Once the unit is commissioned, it will take care of all power requirements.

Table 14.5: Performance of STP Delawas, Jaipur

Sample Location	pH	TSS mg/l	Chloride mg/l	COD mg/l	BOD mg/l
Inlet of STP (Grab)	7.20	344	202	852	337
Outlet of STP (Grab)	7.54	42	187	108	40
Inlet of STP (Composite)	7.21	264	198	256	93
Outlet of STP (Composite)	7.61	32	326	84	39
After de-gritting outlet (Grab)	7.11	408	193	516	114
After de-gritting outlet (composite)	7.31	196	186	244	87

- ❖ The BOD value of outlet was 39 mg/L, exceeding the prescribed norms. Poor maintenance and the shock load provided due to absence of the DG set were the key factors for such poor BOD, COD reduction.

STP Kabitkhedi, Indore (March, 2009)

- ❖ Designed capacity: 78 MLD. During the visit only one pump of 39 MLD capacity was in operation. The plant is operated for 10 to 12 hours in a day due to insufficient flow. Uniform loading was not done to UASB reactors.
- ❖ Aerators are not operated continuously but only for 10-12 hours. Large quantity of foam was observed in the entire aeration tank.

- ❖ It was observed that sludge was not wasted regularly from the UASB reactor and gas has not being produced in the reactor.
- ❖ Two polishing ponds were in operation with a retention period of one day and one and half day for pond-I and pond-II respectively. These ponds were cleaned once in two year. Chlorine dosing system was installed at the outlet, with 900 Kg capacity chlorine dosing tank.

Table 14.6: Performance of STP, Kabitkhedi, Indore

78 MLD STP

Location	pH	TSS	TDS	COD	BOD	Chloride	PO_4	SO_4	Oil & Grease
Inlet	**7.40**	**256**	**794**	**359**	**163**	**177**	**3.25**	**42**	-
Grit Chamber O/L	7.51	336	802	383	137	185	3.26	45	-
Reactor O/L	7.50	220	788	279	80	184	1.95	36	-
Aeration tank O/L	7.58	244	770	262	60	183	1.30	32	-
Final discharge	**7.95**	**44**	**754**	**108**	**28**	**186**	**1.30**	**23**	**06**
Removal %	**---**	***83***	**---**	***70***	***83***	**---**	**---**	**----**	

12 MLD STP

Location	pH	TSS	TDS	COD	BOD	Chloride	PO_4	SO_4	Oil & Grease
Inlet	**7.39**	**460**	**944**	**725**	**172**	**240**	**3.27**	**48**	-
Grit Chamber O/L	7.39	464	916	656	151	215	3.19	52	-
Reactor O/L	7.30	212	880	698	105	212	3.25	44	-
Aeration tank O/L	7.64	88	844	193	82	223	1.95	41	-
Final discharge	**7.62**	**76**	**836**	**178**	**48**	**214**	**1.94**	**38**	**04**
Removal %	**---**	***83***	**---**	***75***	***72***	**---**	**---**	**---**	

Remark: All values except pH are in mg/l.

- ❖ Two dual fuel DG sets of 500 KVA were provided with dual fuel ratio of 60 % gas and 40% diesel. The STP can generate 56 m^3/hr gas from UASB reactor. No external power supply would be required for running the STP, if power is generated from gas produced at STP.
- ❖ Rectangular weir and on-line flow meter provided at the outlet have not been found in working condition.

14.3 INDUSTRIAL POLLUTION CONTROL

14.3.1 Performance of Common Effluent Treatment Plants (CETPs) in Gujarat and Maharashtra

There are 24 CETPs in Gujarat and 23 CETPs in Maharashtra, located in various industrial estates for the treatment of the liquid effluent generated from different industrial sectors Central Pollution Control Board West Zonal Office - Vadodara carried out performance evaluation of selected CETPs located at Vapi, Surat, Panoli, Ankleshwar in Gujarat and at Butibori, Lote-Parshuram, Jayasingpur, Taloja and Thane Belapur at Maharashtra during the year. The monitored CETPs are not complying with the prescribed norms. The CETPs located at Ankleshwar, Panoli, Vapi and FETP of Ankleshwar are being monitored regularly and their performance has not been found satisfactory. The analytical results of performance parameter are depicted below:

Table 14.7: Performance of CETP at Ankleshwar, Gujarat

Location	Monitoring Date	Parameter(s)									
		pH	TSS	TDS	BOD	COD	O&G	NH_3-N	S^{--}	Phenols	CN^{--}
Inlet to CETP	27.05.2008	1.2	748	34084	969	7486	4.5	1372	--	--	--
	29.07.2008	1.2	3284	47104	833	8010	39.0	648	--	--	1.71
	22.10.2008	1.68	2350	30934	1193	5300	--	861	8.0	14.90	0.18
	05.03.2009	1.62	1599	48828	1750	7669	--	941.2	3.8	0.36	0.15
Final Outlet	27.05.2008	7.8	380	12568	282	1672	--	422	1.7	--	0.8
	29.07.2008	7.4	363	5841	130	588	22.0	104	--	--	0.28
	22.10.2008	7.85	50	3920	67	275	2.14	154	0.5	0.72	0.28
	05.03.2009	8.21	164	7340	08	647	2.0	181	--	0.35	0.01
Gujarat Pollution Control Board Effluent Norms		**5.5-8.5**	**100**	**2100**	**30**	**100**	**10**	**50**	**0.5**	**1**	**0.2**

Remark: All values except pH are in mg/l

Table 14.8: Performance of CETP at Panoli, Gujarat

Location	Monitoring Date	Parameter(s)									
		pH	TSS	TDS	BOD	COD	O&G	NH_3-N	S^{--}	Phenol	CN^{--}
Inlet to CETP	27.05.2008	8.40	2430	24640	2154	9520	--	1844	--	--	--
	29.07.2008	7.80	1182	44696	2571	8829	54	1732	--	--	0.97
	22.10.2008	7.92	1388	46575	2108	6310	--	1264	34.3	19.33	2.12
	05.03.2009	8.53	3876	35845	2150	9382	--	1669	52.0	5.81	0.15
Final Outlet of CETP	27.05.2008	7.7	456	7068	29	611	7.0	289	BDL	0.19	0.12
	29.07.2008	7.6	160	9982	40	936	6.8	555	--	--	0.32
	22.10.2008	8.3	95	6775	167	754	8.9	594	1.8	1.75	0.71
	05.03.2009	8.0	469	13008	100	634.4	8.0	634.4	1.3	0.31	0.02
Gujarat Pollution Control Board Effluent Norms		**5.5-8.5**	**100**	**2100**	**30**	**100**	**10**	**50**	**0.5**	**1**	**0.2**

Remark: All values except pH are in mg/l

Table 14.9: Performance of FETP at Ankleshwar, Gujarat

(The combined effluent of Ankleshwar, Panoli and Jhaghadia industrial estates are treated at the final common effluent treatment plant –FETP)

Location	Monitoring Date	Parameters									
		pH	TSS	TDS	COD	BOD	NH_3-N	CN^-	Phenol	S^-	O&G
Inlet of FETP	22.04.08	7.00	411	10776	2408	488	496	1.98	6.06	11.2	19.5
	27.05.08	8.67	423	10568	2698	687	1657	--	--	--	--
	17.06.08	6.14	344	9764	2875	900	633	0.72	4.27	3.2	17
	29.07.08	6.93	532	26922	2510	438	900	1.19	--	0.96	--
	28.08.08	8.15	583	9838	2173	705	1269	0.31	9.48	3.96	17.8
	26.09.08	8.60	417	6122	2323	600	749	0.71	5.45	2.8	35

Location	Monitoring Date	Parameters									
		pH	TSS	TDS	COD	BOD	NH_3-N	CN^-	Phenol	S^-	O&G
	22.10.08	7.8	298	9546	2547	926	738	--	9.54	3.4	--
	07.11.08	8.15	281	11012	2357	840	695	2.01	5.62	4.0	30
	19.12.08	8.31	856	7488	3764	1033	32	--	10.67	--	--
	28.01.09	6.73	511	8553	4127	852	399	--	13.6	--	--
	05.03.09	7.67	747	29081	2495	733	371	0.27	7.35	3.87	60
Outlet of FETP	22.04.08	7.80	470	12457	2292	351	612	1.50	14.86	--	--
	27.05.08	8.04	1220	8060	3090	708	725	0.11	13.68	--	14
	17.06.08	8.00	256	9216	2483	475	454	0.21	9.47	37.3	12
	29.07.08	7.76	273	9629	1645	356	813	0.25	--	34.8	22.4
	28.08.08	8.31	563	9162	911	487	636	0.37	11.36	26.4	27.5
	26.09.08	8.45	246	6530	1223	338	756	0.39	8.65	17.3	14.0
	22.10.08	8.40	553	11420	2303	857	953	1.85	13.60	34.2	38.0
	07.11.08	8.37	386	11167	2613	885	708	0.91	10.19	38.1	20.0
	19.12.08	8.23	571	11780	3008	721	338	--	5.64	--	--
	28.01.09	7.97	430	9151	4158	728	643	--	19.33	65.9	47
	05.03.09	8.20	397	11853	2779	630	690	0.21	9.37	62.5	19.5
Gujarat Pollution Control Board Effluent Norms		**6.5-8.5**	**100**	**--**	**500**	**100**	**50**	**0.2**	**5**	**5**	**20**

Remark: All values except pH are in mg/l

Table 14.10: Performance of CETP at Vapi

Location	Monitoring Date	Parameters						
		pH	TSS	TDS	BOD	COD	O & G	NH_3-N
Inlet of CETP	22.04.2008	7.14	273	7730	403	2612	--	158
	17.06.2008	6.27	412	5552	719	2337	--	146
	15.09.2008	7.02	342	4709	408	1180	25.6	119
	27.11.2008	7.53	375	7475	521	1637	28.0	304
	18.02.2009	6.58	931	8708	910	5358	52.0	104
Outlet of CETP	22.04.2008	7.40	229	7960	98	996	--	160
	29.05.2008	7.45	407	7027	419	1399	23.7	236
	17.06.2008	7.10	86	5864	47	497	--	88
	15.09.2008	7.54	394	4569	64	706	24.4	135
	27.11.2008	7.66	94	8492	244	748	19.0	248
	18.02.2009	7.56	711	7298	417	1281	26.0	105
Gujarat Pollution Control Board Effluent Norms		**5.5-9.0**	**100**	**2100**	**100**	**250**	**10**	**50**

Table 14.11: Performance of other CETPs in Gujarat

CETP	Parameters									
	pH	TSS	TDS	COD	BOD	NH_3-N	S^{-2}	CN^-	Phenols	O&G
Inlet to CETP(Chemical), M/s Globe(GECL), Sachin,	8.55	232	5648	4636	1954	580	1.6	0.103	75.42	--
Final outlet of CETP(Chemical), M/s Globe(GECL), Sachin,	7.64	198	12350	532	278	20	0.38	0.044	0.18	9.0
Inlet to CETP (Textile), M/s Sachin Infra Enviro. Ltd, Sachin	6.79	254	10470	836	442	17	1.73	0.037	0.18	--
Final outlet of CETP (Textile), M/s Sachin Infra Enviro. Ltd, Sachin	7.68	156	10427	247	73	25	0.21	0.051	0.14	4.0
Inlet to CETP, M/s Palsanu	7.64	168	1801	1216	354	39	7.62	0.044	0.09	--
Final outlet of CETP, M/s Palsanu	8.06	55	781	285	140	47	0.96	0.022	0.18	26
Khadi at d/s of CETP outlet	8.14	37	484	167	77	29	--	0.073	--	--
Nandesari CETP Inlet	7.78	490	--	2632	163	129	--	--	--	159
Nandesari CETP Outlet	7.92	54	--	85	16	1.1	--	--	--	2.4

Remark: All values except pH are in mg/l

Table 14.12: Performance of other CETPs in Maharashtra

CETP		Parameters					
		pH	SS	BOD	COD	O&G	NH_3-N
Butibori, District Nagpur	Inlet	6.5	86	358	657	6.6	13
	Outlet	7.7	57	59	104	2.8	12.4
Jaysinghpur, District Kolhapur	Outlet	9.8	362	638	1203	--	4.9
Lote-Parshuram, District Ratnagiri	Inlet	7.28	1474	2814	8309	3.9	196
	Outlet	7.5	760	2700	7205	7.4	560
Taloja, Dist Thane	Inlet	3.10	195	568	1172	--	60
	Outlet	7.23	86	11	91	209	97
Navi-Mumbai	Inlet	7.24	140	401	795	---	38.7
	Outlet	6.42	46	47	220	2.3	18.5
Navi- Mumbai	Inlet	7.51	152	423	851	---	16.1
	Outlet	7.66	58	70	217	1.5	23.2
Dombivali Phase – II, Dist-Thane	Inlet	2.82	73	371	1441	--	13
	Outlet	7.89	137	11	214	4.7	16
Dombivali Phase – I, Dist-Thane	Inlet	7.02	83	523	1327	--	15
	Outlet	7.59	118	148	527	15.1	10
Ambarnath, Dist-Thane	Inlet	7.51	93	70	387	--	11
	Outlet	8.31	44	10	221	5.1	10

Remark: All values except pH are in mg/l

General observations

- Almost all monitored CETPs are non-compliant to prescribed norms.
- Most of the CETPs are having primary and secondary treatment only. Tertiary treatment is not adopted except at few CETPs like Vapi and Ankleshwar in Gujarat.
- Inlet effluent characterization indicates significant upward deviation from the inlet design norms causing sometimes shock loads.
- In most of the cases, there is heavy hydraulic shock load in monsoon season due to lack of separation of storm water and industrial waste water. This results in flooding of CETP units.
- Characterization of effluent after primary treatment indicates high BOD/COD ratio and high TDS in case of CETPs handling chemical industrial effluents. Many CETPs have started taking domestic sewage to improve amenability to biological treatment.
- Performance of many CETPs is being affected from high NH_3-N concentration in effluent received as the concerned member industrial units have not adopted any treatment to reduce the NH_3-N concentration.

14.3.2 Performance of Common Effluent Treatment Plants (CETPs) in Rajasthan and Madhya Pradesh

CETP Bhiwadi, Rajasthan (October 22-23, 2008)

- RIICO constructed a CETP with 6 MLD capacity comprising of neutralization, aeration, settling and sludge thickener to treat the effluent from the industries. The open drains reaching the CETP carry both the domestic and industrial effluents.
- At present the CETP is receiving around 9-10 MLD of wastewater comprising both domestic and industrial wastewater.
- During the visit it was observed that only neutralization was being done for effluent. Whenever the flow is more the effluent is diverted directly into nallah, which finally joins river Sabi. The treated effluent is pumped to a natural canal near Village Khushkheda, which finally joins river Sabi.
- The CETP is being managed by Bhiwadi Jal Pradushan Nivaran Anusandhan Samiti and is in the process of upgradation of CETP by constructing new units i.e, Equalization cum neutralization tank with 24-hour detention period and a clarifier. Bhiwadi Improvement Trust has proposed separate sewage treatment facilities, by the side of CETP. However, separate sewer lines are not yet planned in the area.

Table 14.13: Performance of CETP, Bhiwadi, Rajasthan

Location	pH	TSS	COD	BOD	O&G
Inlet to CETP Grab-1	6.58	136	336	112	06
Outlet of CETP Grab-1	7.21	52	208	63	BDL
Inlet to CETP Grab-II	7.21	148	428	127	--
Outlet of CETP Grab-II	7.42	70	168	55	--
Inlet to CETP Composite	6.88	586	384	107	--
Outlet of CETP Composite	7.35	40	276	68	--
Clarifier outlet Grab-I	7.22	52	216	58	--
Clarifier outlet Grab-II	7.59	66	220	85	
Final Discharge	7.41	52	388	128	

Remark: All values except pH are in mg/l

- DG sets of 182 KVA have been provided for continuous operation of CETP.
- The CETP has become member for disposal of chemical sludge at common TSDF, Udaipur. The storage facilities are not yet provided. Around 200 MT of sludge is dumped in open.

CETP – Pali, Rajasthan (10-12 December 2008)

Table 14.14: Performance of CETP, Pali, Rajasthan

CETP Unit - I

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Inlet	Composite	7.31	9552	1392	1670	486	1690	--
Aeration Tank Inlet	Composite	7.62	10102	1084	1064	288	1730	--
Final outlet	Composite	7.41	9420	404	504	172	1650	--
Inlet	Grab	7.29	8724	596	1387	361	1540	--
Final outlet	Grab	7.56	9292	304	644	203	1670	11

CETP Unit - II

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Inlet	Composite	7.20	8758	904	1008	310	1480	--
Aeration Tank Inlet	Composite	7.32	9686	820	760	176	1520	--
Final outlet	Composite	7.66	8360	276	420	112	1480	--
Inlet	Grab	7.03	9008	1140	1246	370	1510	--
Final outlet	Grab	7.61	8248	248	377	87	1470	08
Final o/l at discharge point	Grab	7.92	8502	332	465	106	1420	--

CETP Unit – III

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Inlet	Composite	8.03	4512	1056	1341	403	630	--
Aeration Tank Inlet	Composite	7.60	4824	856	1168	319	690	--
Final outlet	Composite	7.72	4116	268	474	93	562	--
Inlet	Grab	7.09	5470	756	1362	402	730	--
Final outlet	Grab	7.81	4202	340	492	110	470	14

Remark: All values except pH are in mg/l

- ❖ The total capacity of all three units is 13.6 MLD. The fourth unit is under construction.
- ❖ Very negligible quantity was bypassed from Unit I & II while 2 – 3 MLD waste water was by-passed from Unit – III during peak flow period.
- ❖ The drains connecting CETP – III also carries sewage from the city. Due to this Unit – III was overloaded.
- ❖ Poor screening and grit removal operations were observed in all the three CETPs causing the floating matters reaching the equalization tank.
- ❖ The very high overflow rate was seen from secondary clarifier of Unit – III affecting the settling. The SST was in submerged condition.
- ❖ The Sludge Drying Beds provided for Unit – I & II were submerged and overflowing.
- ❖ The CETP sludge was stored separately in the specified yard. The unscientific handling and storage was seen.

CETP – Balotra, Rajasthan (10-12 December 2008)

Table 14.15: Performance of CETP Balotra, Rajasthan

CETP Unit - I (06 MLD)

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Common inlet	Composite	7.01	34126	888	675	256	4210	--
Equalization tank	Composite	7.21	23540	636	528	115	13100	--
Primary clarifier O/L	Composite	7.36	23378	652	886	260	12900	--
Final outlet	Composite	7.21	24012	600	262	68	12870	--
Primary clarifier O/L	Grab	7.52	23686	520	1272	430	12690	--
Final outlet	Grab	7.61	23032	548	290	87	12530	08

CETP Unit - I (12 MLD)

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Aeration Tank Inlet	Composite	7.11	34342	700	1498	310	14120	--
Final outlet	Composite	7.32	22976	624	292	93	12310	--
Final outlet	Grab	7.13	22900	576	358	104	12100	12
Traeted effluent of CETP (12+6 MLD)	Grab	7.82	27504	800	1656	518	12490	--
By-pass drain	Grab	8.10	31492	1416	544	110	13210	--
Mixed effluent of Treated & untreated	Grab	7.31	30694	1408	828	167	12720	--

Remark: All values except pH are in mg/l

- ❖ Two CETP Units having treatment capacities of 6 MLD & 12 MLD were situated in the same premises.
- ❖ More than 35 MLD wastewater was reaching the CETP through the drains. Only around 18 MLD wastewater was being taken for the treatment and the remaining 50% wastewater bypassed without even entering the CETP area.
- ❖ There was no flow meter or flow control at inlet the CETP.
- ❖ The treated water drain and the drain carrying bypassed untreated wastewater joining just outside the CETP premises.

- ❖ The primary clarifier of 6 MLD unit was in submerged condition.
- ❖ A shed is provided for storage of CETP sludge. Very less quantity of sludge was stored in the shed while large quantity of sludge was dumped outside the shed in the CETP premises.

CETP – Bithuja, Rajasthan (14 December 2008)

- ❖ The total treatment capacity of CETP Bithuja is 30 MLD. The primary clarifier followed by two stabilization ponds in the series is provided for the treatment.
- ❖ Total 10 stabilization ponds are provided. More than 50% of volume was filled by the sludge in first five ponds, requiring immediately de-sludging.

Table 14.16: Performance of CETP, Bithuja, Rajasthan

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Inlet	Composite	7.11	13726	1284	720	216	1770	--
Pri. Clf. outlet	Composite	7.22	13112	425	525	103	1690	--
Final outlet	Composite	7.16	14644	---	360	87	1840	--
Inlet	Grab	7.33	13710	564	740	188	1610	--
Pri. Clf. outlet	Grab	7.42	12928	420	584	112	1490	--
After pond stabilization	Grab	7.71	14228	448	402	115	1510	--
Final outlet	Grab	7.30	16352	504	461	96	1730	05
GW		8.04	12866	388	270	----	----	--
Unit		8.36	12786	388	150	----	----	--

Remark: All values except pH are in mg/l

- ❖ Very large quantity of sludge is dumped openly in the CETP area. The yard constructed seems not sufficient to transfer all the sludge, which is openly dumped.
- ❖ Wet sludge was overflowing from the sludge drying beds and reaching the open available land near the SDBs.

CETP – Jasol, Rajasthan (14 December 2008)

- ❖ The CETP having 2.5 MLD treatment capacity is located on the bank of river.
- ❖ The industrial units on the bank of river were discharging the dyes and waste water directly to the river instated of discharging to the CETP drain.
- ❖ High overflow rate at PST and SST was observed that may not provide sufficient detention time.

Table 14.17: Performance of CETP Jasol, Rajasthan

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Inlet	Composite	8.13	23696	1132	908	182	12980	--
Aeration Tank Inlet	Composite	7.19	25064	3592	1018	108	13210	--
Final outlet	Composite	7.69	24170	692	414	104	12690	--
Inlet	Grab	8.01	27318	2036	1286	488	12410	--
Final outlet	Grab	7.91	24002	576	484	140	12390	21
Discharge water at Luni River	Grab	7.61	24560	500	575	161	12610	--

Remark: All values except pH are in mg/l

- ❖ Separate SDBs for biological and chemical sludge were provided. Very negligible quantity of sludge was stored in the . All sludge was neither quantified nor the records available with the CETP.
- ❖ All the floating materials separated from the screen chamber were dumped outside the CETP boundary in the Nallah joining the River.

CETP – Jodhpur, Rajasthan (10-12 December 2008)

- ❖ 20 MLD CETP unit was designed to commonly treat 5 MLD acidic stream and 15 MLD alkaline streams.
- ❖ Additional treatment unit with 6 MLD treatment capacity was installed to treat the acidic stream separately. Neutralisation followed by the settling was provided for the treatment. The treated acidic effluent joins the alkaline effluent before the aeration tank.
- ❖ High quantity of floating matters was seen in the equalization tank.
- ❖ The flow meter was provided at the outlet of the equalization tank was not indicating correct inlet flow.

Table 14.18: Performance of CETP Jodhpur, Rajasthan

Location	Nature	pH	TS	TSS	COD	BOD	Cl	O&G
Alkaline effluent	Composite	8.21	4422	1044	314	87	830	--
Acidic effluent	Composite	1.86	38836	928	448	56	16920	--
Primary clarifier O/L	Composite	7.32	4460	528	151	42	970	--
Secondary clarifier O/L	Composite	7.12	3484	212	98	18	630	--
Final outlet after ACF	Composite	7.30	3602	224	82	18	670	--
Alkaline effluent	Grab	7.93	4448	1200	264	114	810	--
Acidic effluent	Grab	1.31	41934	1984	912	171	17120	--
Final outlet	Grab	7.29	3792	240	90	23	980	07

Remark: All values except pH are in mg/l

- ❖ Around 10 MLD alkaline waste water was being bypassed without any treatment. The treated wastewater joins the untreated wastewater and the combined wastewater was being taken by the farmers for agricultural purpose.
- ❖ The CETP sludge being sent to TSDF, Gudli, Udaipur.

CETP, Govindpura, Bhopal (Madhya Pradesh) (16-17 March, 2009)

- ❖ The CETP is designed for 900 m^3/day wastewater with UASB followed by aeration and secondary settling. The flow during the study was 284 m^3/day. Except M/s Lilasons Breweries and M/s Bhopal Incinerator all the other units bring wastewater by tankers. Leakages were observed at certain places on the pipelines of M/s Lilasons Breweries.
- ❖ Two holding tanks were provided for removing the heavy metals from the waste water received from the electroplating industries. Due to closure of these industries the tanks were not in use.

Table 14.19: Performance of CETP Govindpura, Bhopal

Location	pH	TS	TSS	COD	BOD	Cl	Oil & Grease	DO
Equalization tank outlet	6.48	5210	2740	4671	1467	1100	--	--
Buffer tank outlet	6.64	3806	715	2668	808	1090	--	--
UASB Digester outlet	7.11	1608	95	130	42	610	--	--
Final outlet	7.47	1462	60	105	34	630	04	6.4

Remark: All values except pH are in mg/l

- The operation and maintenance cost is borne by the effluent contributing industries on the basis of BOD load.
- No proper sludge drying beds were constructed for settling of sludge from UASB reactor. The anaerobic sludge was being discharged directly into the drains along with the treated effluent.
- During the inspection gas flaring was observed. Gas flow quantification and analysis has not been done. No backup power arrangement was made to run the CETP continuously without any disturbance during MPEB power cuts.

14.3.3 Performance of CETPs in Andhra Pradesh and Tamil Nadu

CETPs in Andhra Pradesh

In Andhra Pradesh, three major Common Effluent Treatment Plants (CETP) namely (i) Pattancheru Effluent Treatment Ltd (PETL), Pattancheru (ii) Jeedimetla Effluent Treatment Ltd (JETL), Jeedimetla, Hyderabad, and (iii) Phramacity CETP Plant, Parvada, Vizag are in operation. Operational status are given below.

Patancheru Effluent Treatment Ltd (PETL-CETP), Pattancheru

This CETP was established in the year 1990, with a treatment capacity of 7500 m^3 / day. Presently, 106 members comprising mainly chemical and bulk drug industries are sending their effluent for treatment. Low TDS and low COD effluent is segregated and treated by equalization, air floatation and biological oxidation (with mechanical aeration and pure oxygen). During inspection/monitoring, Active Pharma Ingredients (API) were found in the treated effluent as well as surrounding surface water bodies. Due to non-compliance of norms, directions were issued to the CETP for further improvements.

Table 14.20: Characterisation of untreated and treated effluent of PETL-CETP

Parameters	CETP Inlet	CETP Outlet
pH	7.2	8.3
BOD for 3 days at 27° C (mg/L)	2600	510
COD (mg/L)	4940	1828
TOC (mg/L)	1654	508.8
TSS at 105° C (mg/L)	1010	62
TDS at 180° C (mg/L)	5620	4788
Fixed Dissolved Solids at 550° C (mg/L)	5472	4440
Ammonical Nitrogen as N (mg/L)	462	285.6

Parameters	CETP Inlet	CETP Outlet
Nitrate Nitrogen as N (mg/L)	58.3	38.7
TKN as N (mg/L)	553	316.4
Phosphate Phosphorus as P (mg/L)	22.1	7.5
Chloride as Cl (mg/L)	2304.3	1935.6
Sulphate as SO_4 (mg/L)	365.1	76.9
Sodium as Na (mg/L)	1537.5	1015
Potassium as K (mg/L)	395	280
Calcium as Ca (mg/L)	117.6	95.6
Oil & Grease (mg/L)	17	12.5
Phenols (mg/L)	7.7	0.7
Boron as B (mg/L)	16.8	11.9

Table 14.21: Active Pharmaceutical in influent, effluent and sludge–PETL CETP

Sample	Test Parameters (Active Pharmaceutical Ingredients)							
	Losartan	Cetrizine	Citalopram	Metoprolol	Norfloxacin	Ofloxacin	Ciprofloxacin	Enrofloxacin
Inlet	364.624	NA	50.307	2.34	99.788	50.343	5404.23	312.86
P5A	273.568	NA	50.745	2.617	114.156	51.868	7238.131	393.534
P5B	293.544	NA	56.34	2.648	104.423	49.541	6955.296	381.249
Outlet	266.45	NA	52.871	2.679	107.013	50.685	7249.841	395.312
P-S	277.622	NA	62.618	1.063	131.036	33.324	5649.576	173.954

Table 14.22: Pharmaceuticals in Surface water bodies and Ground water around PETL – CETP

Location	Test Parameters (Active Pharmaceutical Ingrediants)							
	Losartan	Cetrizine	Citalopram	Metoprolol	Norfloxacin	Ofloxacin	Ciprofloxacin	Enrofloxacin
Surface waters								
Up stream of PETL outlet	BLQ	NA	ND	BLQ	ND	ND	ND	ND
Downstream of PETL outlet	37.554	NA	20.662	0.721	12.971	6.981	995.537	63.378
Near Nakkavagu bridge	15.807	NA	ND	0.246	BLQ	BLQ	BLQ	ND
Nakkavagu at Bachigudem	26.359	NA	16.297	0.47	9.286	BLQ	328.592	21.333
Up stream of River	ND	NA	ND	ND	ND	ND	ND	ND
Downstream of River	6.649	NA	ND	BLQ	ND	ND	ND	ND
Gandhigudem Tank	1.946	NA	ND	ND	BLQ	ND	BLQ	ND

Location	Test Parameters (Active Pharmaceutical Ingrediants)							
	Losartan	Cetrizine	Citalopram	Metoprolol	Norfloxacin	Ofloxacin	Ciprofloxacin	Enrofloxacin
Kista Reddy Pet Tank	4.506	NA	ND	0.25	23.817	BLQ	BLQ	BLQ
Asani Kunta Over Flow joining with Kista reddy Pet tank	15.97	NA	ND	0.276	84.527	11.062	1284.971	17.379
Ground waters								
GW1	ND	0.026	BLQ	ND	ND	BLQ	0.082	BLQ
GW2	ND	BLQ	BLQ	ND	ND	BLQ	BLQ	BLQ
GW3	ND	0.024	BLQ	ND	ND	BLQ	BLQ	BLQ
GW4	ND	BLQ	BLQ	ND	ND	BLQ	BLQ	BLQ
GW5	ND	BLQ	BLQ	ND	ND	BLQ	0.079	BLQ
GW6	ND	BLQ	BLQ	ND	ND	BLQ	BLQ	BLQ
GW7	ND	BLQ	BLQ	ND	ND	BLQ	BLQ	BLQ
GW8	BLQ	0.029	BLQ	ND	ND	BLQ	ND	BLQ

ND = Not detected; NA = Data Not Available; BLQ =

Jeedimetla Effluent Treatment Ltd (JETL), Jeedimetla, Hyderabad

JETL CETP started its operation in the year 1987 with total member units of 65. The effluents of high TDS and low TDS are segregated and treated. The solids generated from MEE and spray drier are disposed into TSDF Site. The low TDS effluents are treated by chemical coagulation followed by biological oxidation after mixing with domestic wastewater generated from nearby township. The discharged effluents are meeting most of the parameters except Boron.

Table 14.23: Characterization of Common Effluent Treatment Plant, Jeedimetla, Hyderabad, Andhra Pradesh

Sample Collected on 17.06.08 & 18.06.08					Sample Type : Composite		
S. No	Sample Details /Parameter	Equilisation Tank Outlet	Buffer Storage Tank Outlet	Distribution Chamber Outlet	Final Outlet		Untreated Sewage
					Clarifier –I	Clarifier -II	
1.	pH	6.97	7.37	7.40	7.57	7.68	7.15
2.	Elec. Conductivity (ms/cm)	8.74	8.38	4.17	3.87	3.81	2.93
3.	TSS (mg/L)	631	152	192	38	44	170
4.	TDS (mg/L)	5887	6612	2500	2514	2438	1888
5.	BOD (mg/L)	1408	1080	355	17	14	260
6.	COD (mg/L)	3321	2687	1130	209	162	634
7.	T. Hardness as $CaCO_3$ (mg/L)	1031	–	–	–	680	–
8.	Ca. Hardness as $CaCO_3$ (mg/L)	866	–	–	–	515	–
9.	Mg.Hardness as $CaCO_3$ (mg/L)	165	–	–	–	165	–

10.	Chloride (mg/L)	768	631	691	636	649	444
11.	Sulphates (mg/L)	521	445	437	339	314	186
12.	Fluoride (mg/L)	0.55	-	-	-	1.70	-
13.	Sodium (mg/L)	1320	-	-	-	536	-
14.	Potassium (mg/L)	78	-	-	-	25	-
15.	Amm. Nitrogen (mg/L)	50.40	67.20	61.60	2.20	1.70	62.70
16.	Total Kjedahl Nitrogen (mg/L)	138.90	-	-	-	11.80	-
17.	Boron (mg/L)	3.00	-	-	-	1.20	-
18.	Oil & Grease (mg/L)	_	-	-	-	6.40	-
19.	Phenol (mg/L)	1.87	-	-	-	BDL	-
	Sample Details		MLSS	SVI	DO		
	Aeration Tank (17.06.08)		4704	74.40	1.80		
	Aeration Tank (18.06.08)		5357	70.90	1.80		

MLSS = Mother Liquor Suspended Solid; SVI = Sludge volume index; DO = Dissolved oxygen

Phrarmacity CETP, Parvada, Vishakhapatnam, Andhra Pradesh

It is located in JN Pharma city, Parvada village, Vizag district and designed to treat 3.5 MLD of low TDS effluent and 1.0 MLD of high TDS and high COD effluent. The low and high TDS effluents have been planned to be segregated at the individual industry premises itself and collected through dedicated pipes lines network connected to CETP. However, presently the effluent is collected through tankers. On an average 8 tankers are received daily. Low TDS effluents is treated in primary treatment system (oil & grease separator, air stripper, equalization tanks, flash mixing, clariflocculator) followed by biological treatment. The treated wastewater stored in guard ponds is pumped to marine outfall through pipeline. High TDS wastewater is also treated in primary treatment system (oil & grease separator, air stripper, equalization tank, flash mixer, clariflocculator) before sending to incinerator or Multiple Effect Evaporator for evaporation. Civil works for MEE were completed and machinery installation is under progress.

Total cost of the project is approximately Rs. 105 crores including Multiple Effect Evaporator and the CETP project is covered in the area of 29 acres of land. Notice was issued to CETP to stop operation of industries without getting proper consents. In-depth monitoring of the CETP is recommended after issuing consent for operation.

In-depth study of a 'Zero Liquid Discharge' CETP in Tamil Nadu

Many CETPs are in operation in many parts of country for a decade or so, the problem of pollution associated with various industrial clusters are still persisting. The pollution control concept has started shifting from treatment/disposal towards recover, reuse or recycle to achieve 'Zero Liquid Discharge' (ZLD). In Tamil Nadu, banning of polluting industries close to rivers and other water resources made 'disposal / discharge of effluent' in any aquatic system without antagonising the public a very difficult proposition. Under these circumstance, the enforcement of ZLD concept started gaining ground in recent years due to severe environmental degradation associated with industrial pollution as seen in places like Tirupur, Erode, Vaniyampadi, Ambur, Ranipet, etc. About 40 common effluent treatment plants (ETPs) are in the process of incorporating/implementing ZLD schemes. Central Pollution Control Board studied in detail one such CETP Perundurai Common

Effluent Treatment Plant (PCETP), which incorporated ZLD concept few years back to treat effluent from textile processing units.

Set-up in the year 2002 with a total capital of Rs. 27.14 crores, it is designed to treat 4050 m^3/day of segregated wastewater generated from 14 textile processing units operating in the SIPCOT Industrial Growth Centre at Perundurai. Washwater with low TDS (< 2100 mg/l) and dyebath with high TDS are segregated at the premises of individual member units itself and conveyed to the PCETP through separate conveying pipelines. The quality and quantity of effluent discharge from the member units are controlled/monitored by a customised 'Automatic PLC Based Monitoring System' installed at individual units. At PCETP, the low TDS effluent is sent to Washwater Treatment Plant (Capacity: 3600 m^3/day) and the high TDS effluent is sent to Dyebath & RO reject Treatment Plant (Capacity: 450 m^3/day). In order to assess the efficiency of the various treatment units / components of the CETP, an intensive monitoring was carried out during 24-25 Nov 2008.

Based on the analysis report and data collected during the field inspection / monitoring, the following observations are made:

- During Feb-Oct 2008, the total effluent quantity treated varied from 43291 to 49471 m^3 per month, with an average monthly flow of 410363 m^3 and average daily inflow of 1294 m^3 (washwater plant) and 204 m^3 (dyebath + RO reject plant). The average capacity utilization was 36 % (washwater treatment plant) and 45 % (dyebath + RO reject treatment plant).

- pH of washwater (7.60) was lower than dyebath effluent (9.95). Electrical conductivity was about 20 times higher (61.7 mS/cm) in dyebath than washwater (3.19 mS/cm).

- TDS was about 20 times higher in dyebath (44205 mg/l) than in washwater (2194 mg/l), indicating the necessity of bring it down to an acceptable level suitable for land discharge (Tamilnadu Pollution Control Board Standard : < 2100mg/l) or for reuse/recycle to ensure ZLD.

- COD was about 1.6 times higher in dyebath (1249 mg/l) than in washwater (757 mg/l). BOD:COD ratio was less in dyebath (0.17) when compared to washwater (0.52).

- Concentration of various metals in the dyebath varied from 0.14 to 0.29 mg/l and in washwater they are very low.

- During treatment of washwater, the organic load was reduced by 50 – 61% at primary treatment and upto 92-98% at secondary treatment system. Parameters such as TKN and ammonical nitrogen showed very little variation at primary treatment level but reduced upto 96% at secondary treatment due to utilization by microbes.
- In the Biological (secondary) treatment system, the level of MLSS, MLVSS, DO, SVI, F/M ratio was 4004 mg/l, 3394 mg/l, 3.25 mg/l, 146 ml/g and 0.02 respectively. Sludge retention time (SRT) comes to 120 days and the reason

for such high SRT could be attributed to operation of CETP with a flow which is 50% of its capacity.

- In the RO system, a reduction of upto 86% of TDS, 91% of chloride and 97% sulphate was noticed. RO permeate was having a TDS level of 204 mg/l as against the design level of < 300 mg/l. The average recovery in RO system is 90%, which is also on expected (design) level.

- Multiple Effect Evaporator concentrate was found to have BOD and COD level of 4010 mg/l and 8355 mg/l respectively, indicating that biologically resistant organic pollutants (non-biodegradable nature) are still going to the final sludge, possibly having toxic effects on the environment.

- The investment (Rs. 27.14 crores) made for the establishment of this CETP with ZLD scheme showed that the capital investment is Rs. 53,267 per m^3 of washwater effluent treatment and Rs. 1,77,024 per m^3 of dyebath + RO reject effluent treatment. Overall, the capital investment on implementation of this ZLD scheme comes to Rs. 67,018 / m^3.

- The monthly expenditure varied from Rs. 39.03 lakh to Rs. 43.68 lakh, with an average of Rs. 41.19 lakh (Fig. 14.4). Out of the total expenditure incurred, firewood accounts for 27% followed by chemicals (19%), operation / maintenance (18%), electricity (17%) and diesel (12%) (Fig. 14.5). The overall treatment cost per m^3 of effluent comes to Rs. 90/-, with an average treatment cost of Rs. 53/- per m^3 in washwater treatment plant and Rs. 327/- per m^3 in dyebath + RO reject treatment plant.

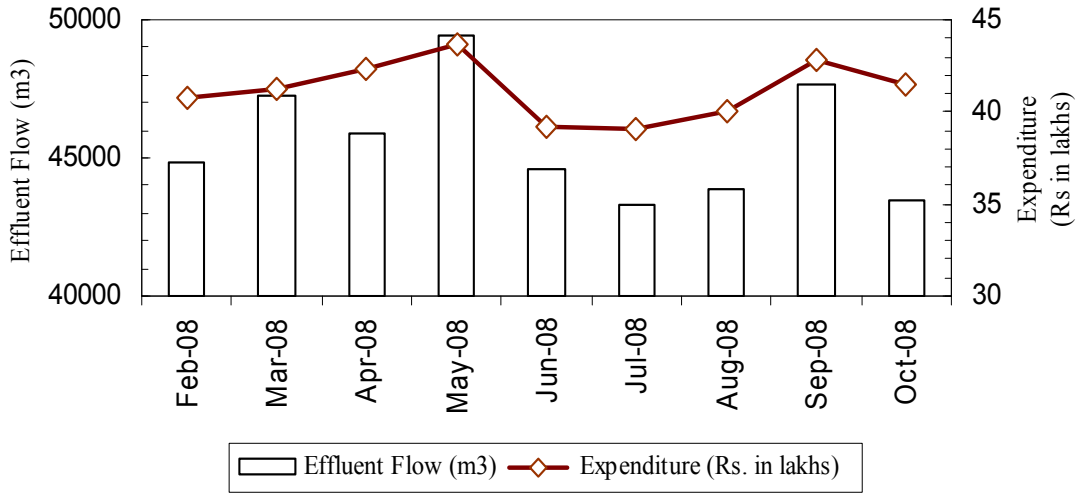


Fig. 14.4: Monthly effluent flow and expenditure incurred at PCETP, Perundurai (Tamilnadu) during February to October, 2008

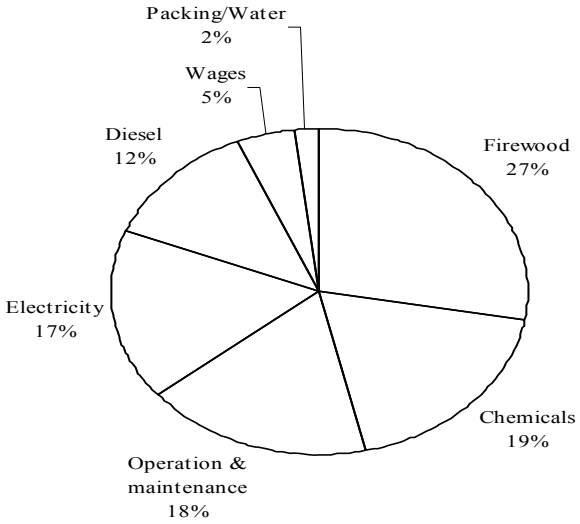


Fig. 14.5: Expenditure (%) incurred by PCETP during February to October, 2008

Based on the above results, it is concluded that the textile processing effluent can be treated and reused by segregation/treatment of wastewater based on TDS concentration. All major pollutants such as COD, BOD and TDS were effectively reduced during the treatment which enables recycle/reuse of recovered water in the manufacturing process. However, the cost of recovered water and operation of energy intensive evaporators are very high. Effort should be made to reuse / recycle the salt recovered through salt recovery plant and solar evaporation pans or a safe disposal method needs to be incorporated in the existing system.

Effluent Treatment Plant

Table 14.24: Treatment Efficiencies of various components / units of PCETP during 24-25th November 2008

Components / Units of CETP	pH	Elec. Conductivity, mS/cm	TSS, mg/l	TDS, mg/l	BOD, mg/l	COD, mg/l	Chloride, mg/l	Sulphates, mg/l	Amm. Nitrogen, mg/l	TKN, mg/l	Copper, mg/l	Lead, mg/l	Zinc, mg/l	Nickel, mg/l	Total Chromium, mg/l mg/l	Cadmium, mg/l
Dye Bath (raw effluent)	9.95	61.70	170	44205	213	1249	18989	1421	5	3.94	0.29	0.21	0.21	0.16	0.22	0.14
Wash water (raw effluent)	7.60	3.19	136	2194	397	757	800	129	17	15.94	0.06	BDL	0.09	BDL	BDL	0.01
Primary Clarifier outlet	8.10	2.95	58	1678	153	375	611	125	20	15.08	-	-	-	-	-	-
Secondary Clarifier outlet	7.50	3.06	22	1594	9	62	659	229	4	0.61	-	-	-	-	-	-
RO inlet	6.40	3.07	22	1506	< 1	55	824	300	2	2.91	-	-	-	-	-	-
RO permeate	6.20	0.29	8	204	BDL	< 5	74	10	-		0.02	BDL	0.23	0.02	BDL	BDL
RO reject	6.80	31.10	28	18176	17	429	8597	818	21	4.24	-	-	-	-	-	-
ME Evaporator inlet	10.50	90.50	382	62640	1413	4138	21923	1670	25	22.80	-	-	-	-	-	-
ME Evaporator concentrate	10.46	189.10	-	206780	4010	8355	35980	1116	37	8.86	2.23	1.11	0.95	1.40	1.88	1.19
ME Evaporator condensate	9.51	0.19	2	60	43	164	26	BDL	-	-	0.02	BDL	0.14	0.02	BDL	BDL
MLSS = 4004 mg/l, MLVSS = 3394 mg/l, SVI = 146 ml/g, MLVSS/MLSS = 0.85, DO = 3.25 mg/l, F/M ratio = 0.02																

Table 14.25: Capacity Utilization and expenditure incurred at PCETP during Feb – Oct 2008

Month / Year	Total monthly inflow (m^3 / month)			Average Daily inflow (m^3 /day)		CETP Capacity utilization (%)		Expenditure incurred (Rs.)					Cost of treatment per m^3 of wastewater (Rs.)		
	Washwater Treatment Plant	Dye-bath + R.O.Reject Treatment Plant	TOTAL	Washwater Treatment Plant	Dye-bath + R.O.Reject Treatment Plant	Washwater Treatment Plant	Dye-bath Treatment Plant	Wash Water Treatment Plant	M.E Evaporator	Salt Recovery Plant	Solar Pans	TOTAL	Washwater	Dye-bath + RO reject	Overall cost
Feb-08	37919	6902	44821	1308	238	36	53	1945970	1437113	625017	63988	4072088	51	308	91
Mar-08	40695	6554	47249	1313	211	36	47	2065942	1456564	537374	60800	4120680	51	314	87
Apr-08	40199	5728	45927	1340	191	37	42	2285356	1413813	486889	53785	4239843	57	341	92
May-08	43103	6368	49471	1390	205	39	46	2329421	1416088	554696	68264	4368469	54	320	88
Jun-08	38630	5974	44604	1288	199	36	44	2006434	1337676	508538	70703	3923351	52	321	88
Jul-08	37520	5771	43291	1210	186	34	41	1897652	1398606	542940	63867	3903065	51	347	90
Aug-08	37609	6292	43901	1213	203	34	45	1836018	1445283	650429	72486	4004216	49	345	91
Sep-08	40978	6691	47669	1366	223	38	50	2161008	1421532	627085	75412	4285037	53	317	90
Oct-08	37734	5696	43430	1217	184	34	41	2242439	1319840	527447	64707	4154433	59	336	96
Average	39376	6220	45596	1294	204	36	45	2085582	1405168	562268	66001	4119020	53	328	90

Performance of Kolkata Leather Complex CETP

The Calcutta Leather complex (CLC) has an area of about 1100 acres of which 150 acres are surface water bodies. The shifting of tanneries from their old locations to the new complex has been undertaken and about 267 units are in operation. The present wastewater generation by the operated unit is 14 -16 MLD and managed by running four modules of Common Effluent Treatment Plant. The aeration tank has retention time of 24 hrs with the aeration capacity of 8500 m^3/hour.

Table 14.26: Characteristics of Tannery Influent and Effluent of the Kolkata Leather Complex CETP

Parameters	Raw Effluent	After Primary Clarifier			After Secondary Clarifier			Final Effluent
		PC 1	PC 2	PC 3	SC 1	SC 2	SC 3	SC4
pH	7.42	7.34	7.39	7.62	6.62	7.32	7.4	7.51
TDS	8375	7773	1875	7510	8041	8039	8002	7970
TSS	985	104	71	131	30	7	742	818
COD	2424	1169	1576	1212	170	154	313	768
BOD	1446	854	725	653	56	17	64	328
Chloride	374	133	95	132	3317	3317	2984	3278
Sulfide	128	106	81	105	BDL	BDL	BDL	BDL
Cr^{+6}	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total Chromium	35	4	1.7	2	0.33	0.15	8.82	10.4
Oil & Grease	12	-	-	-	15	8	9.5	3.5

Remark: All values except pH are in mg/l

Analytical results of the monitoring of CETP from different unit operations indicate that the performance of CETP is not satisfactory.

14.4 HAZARDOUS WASTE MANAGEMENT

14.4.1 National Inventory of Hazardous Wastes Generating Industries

The Ministry of Environment & Forests, Government of India, notified the Hazardous Waste (Management & Handling) Rules on July 28, 1989 under the provisions of the Environment (Protection) Act, 1986. The Rules have been amended during the year 2000 and 2003 and modified as the Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules -2008 in 2008.

Hon'ble Supreme Court of India by its order dated 14th October, 2003 in the Writ Petition No. 657/95 has issued directions for management and handling of the hazardous waste and one of the directions was to prepare an inventory of hazardous waste by every State Pollution Control Board. Following this, Central Pollution Control Board directed the State Pollution Control Boards (SPCBs) / Pollution Control Committees (PCCs) to prepare and submit the inventory of hazardous waste

generating industries in their State / jurisdiction so that National inventory could be prepared.

Based on information provided by 27 SPCBs and 3 PCCs pertaining to the period 2007-08, the report on 'National Inventory of Hazardous Wastes Generating Industries' has been prepared and posted on Central Pollution Control Board website. The brief observations are as follows:

A: Hazardous Waste Generation Figures-

(i) There are 36,165 nos. of hazardous waste generating industries in the country, generating 62,32,507 Metric Tonnes of hazardous wastes every year. The category-wise quantity is as follows.

- Land Fillable Hazardous Wastes - 27,28,326 MTA (49.55 %)
- Incinerable Hazardous Wastes - 4,15,794 MTA (6.67 %)
- Recyclable Hazardous Wastes - 30,88,387 MTA (43.78 %)

(ii) Gujarat, Maharashtra and Andhra Pradesh are the top three Hazardous Wastes generating States. The relative contributions by these States are 28.76 %, 25.16 % and 8.93 % respectively. Chhattisgarh (4.74 %), Rajasthan (4.38 %), West Bengal (4.17 %) and Tamil Nadu (4.15 %) are major generators of HW. These seven States are together generating 80.29 % of country's Total Hazardous Wastes.

(iii) Gujarat, Maharashtra and Andhra Pradesh are generating major quantities of land disposable HW. The contributions by these States with respect to country's total land disposable HW generation are 40.58 %, 20.83 % and 7.75 % respectively. Other major contributions are from Rajasthan (6.05 %), Tamilnadu (5.79 %), West Bengal (4.42 %), Orissa (2.73 %) and Kerala (2.18 %). It is obvious that these eight States are generating more than 90 % of the country's Total Land Disposable Hazardous Wastes

(iv) Maharashtra and Gujarat together generating 62.87 % of country' total incinerable HW. Their individual contributions are 36.75 % and 26.12 % respectively. Other States generating significant quantities of incinerable HW are Andhra Pradesh (7.61 %), Rajasthan (5.54 %), Uttar Pradesh (3.78%), Punjab (3.57 %), West Bengal (3.03 %) and Tamilnadu (2.68%) respectively. These eight States are generating 89.08 % of the country's total Incinerable Hazardous Wastes.

(v) The major recyclable Hazardous Wastes generating States are Maharashtra, Gujarat, Andhra Pradesh and Chhattisgarh. Their respective contributions towards country's total recyclable Hazardous Wastes are 27.44 %, 18.68 %, 10.14 % and 9.17 % (Fig. 14.6). Other States generating significant quantities of recyclable HW are Jharkhand (6.61%), Madhya Pradesh (4.14%), West Bengal (4.10%) and Uttar Pradesh (3.80%). These eight States put together generate about 84.08 % of country's total recyclable waste.

(vi) District Bharuch of Gujarat has emerged as the highest generator of Hazardous Wastes in the country. It is generating 4,67,100 MTA of

Hazardous Wastes. Districts Ahmedabad (3,60,484 MTA) and Mumbai (3,43,129 MTA) rank at 2nd and 3rd position towards generation of Hazardous Wastes. Other districts producing major quantities of Hazardous Wastes are Kutchh (2,60,206 MTA) , Kalyan (2,52,690 MTA), Thane (2,16,344 MTA) and Jamshedpur (2,08,813 MTA).

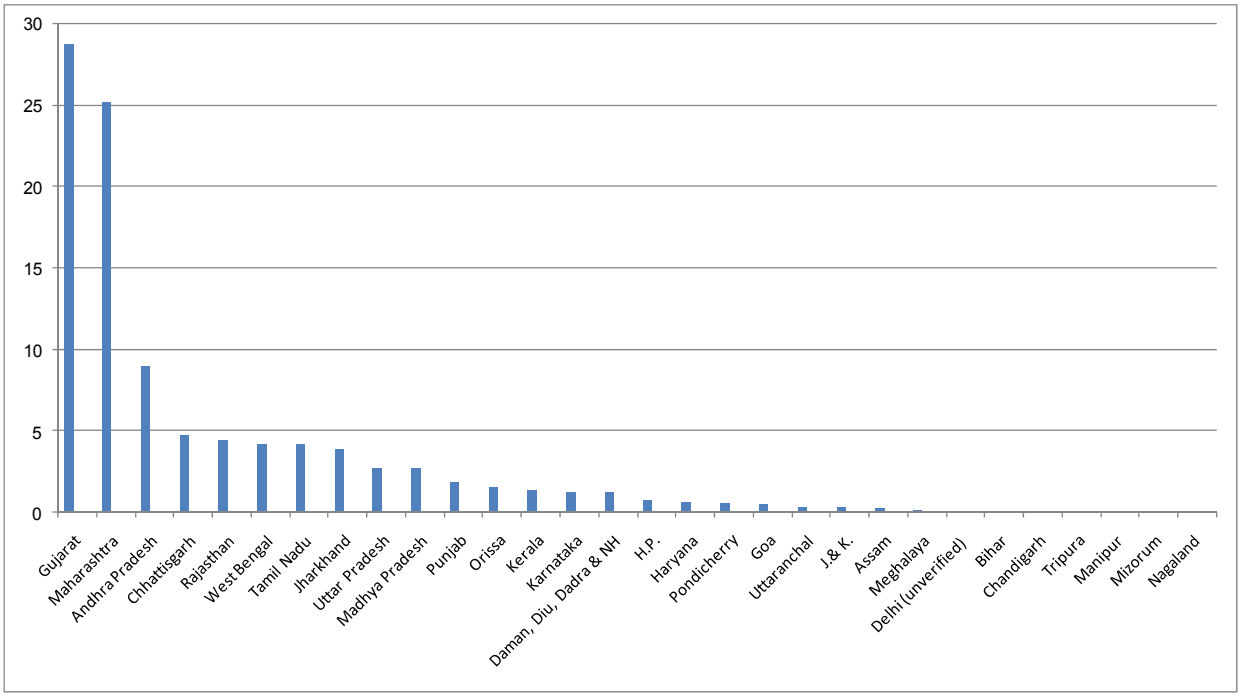
Table 14.27: State-wise Status of Hazardous Waste Generation

S. No.	State / UTs	Quantity of Hazardous waste generation (MTA)			
		Landfill able	Incinerable	Recyclable	Total
1.	Andhra Pradesh	211442	31660	313217	556319
2.	Assam	3252	-	7480	10732
3.	Bihar	3357	9	73	3439
4.	Chhattisgarh	5277	6897	283213	295387
5.	Delhi (unverified)	3338	1740	203	5281
6.	Gujarat	1107128	108622	577037	1792787
7.	Goa	10763	8271	7614	26648
8.	Haryana	30452	1429	4919	36800
9.	H.P.	35519	2248	4380	42147
10.	J.& K.	9946	141	6867	16954
11.	Jharkhand	23135	9813	204236	237184
12.	Karnataka	18366	3713	54490	76569
13.	Kerala	59591*	223	23085	82899*
14.	Madhya Pradesh	34945	5036	127909	167890
15.	Maharashtra	568135	152791	847442	1568368
16.	Manipur	--	115	137	252
17.	Meghalaya	19	697	6443	7159
18.	Mizoram	90	Nil	12	102
19.	Nagaland	61	Nil	11	72
20.	Orissa	74351	4052	18427	96830
21.	Punjab	13601	14831	89481	117913
22.	Rajasthan	165107	23025	84739	272871
23.	Tripura	0	30	237	267
24.	Tamil Nadu	157909	11145	89593	258647
25.	Uttar Pradesh	36370	15697	117227	169294
26.	Uttaranchal	17991	580	11	18582
27.	West Bengal	120598	12583	126596	259777
Union Territories					
1.	Daman, Diu, Dadra & Nagar Haveli	17219	421	56350	73990

S. No.	State / UTs	Quantity of Hazardous waste generation (MTA)			
		Landfill able	Incinerable	Recyclable	Total
2.	Pondicherry	132	25	36235	36392
3.	Chandigarh	232	--	723	955
	Total	**2728326**	**415794**	**3088387**	**6232507**

Note: * This figure of Kerala includes other wastes (8066.745 MTA) from IRE and FACT also.

Relative Percentage Contribution towards Hazardous Wastes Generation by States / Union Territories



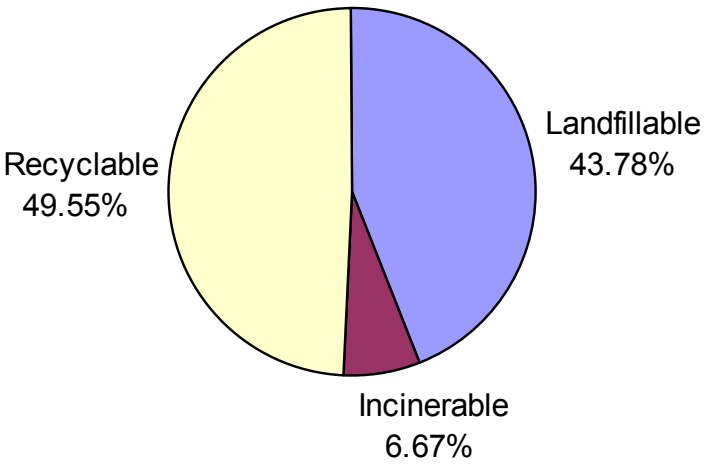


Fig. 14.6: Category wise Hazardous Waste Generation (2008) Total HW Generation - 6232507 MTA

B: Management of Hazardous Wastes in the Country

(vii) Common Treatment, Storage and Disposal Facilities (TSDF) are developed for the disposal of land disposable Hazardous Wastes at 22 different places in 10 States namely Gujarat (7 Nos.), Maharashtra (4 Nos.), Uttar Pradesh (3 Nos.), Andhra Pradesh (2 Nos.), Himachal Pradesh (1 No.), Madhya Pradesh (1 No.), Punjab (1 No.), Rajasthan (1 No.),Tamil Nadu (1 No.), and West Bengal (1 No.). Total waste handling capacities (disposal capacity) of these facilities, is 15,00,568 MTA which is much less than the present generation of 27,28,326 MTA of land-disposable Hazardous Wastes. The deficit of TSDF capacity is 12,27,758 MTA. It is obvious that additional TSDFs with waste handling capacities to the tune of 15,00,000 MTA or so must be developed to accommodate the present and future quantities of land disposable Hazardous Wastes.

(viii) Common TSDF located in Andhra Pradesh, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh are having surplus capacities to handle the present quantities of land disposable waste generated in these States while the common TSDF located in Gujarat, Maharashtra, Punjab, Rajasthan, Tamilnadu and West Bengal do not have adequate capacities to accommodate their present quantities of land disposable Hazardous Wastes.

(ix) The details of Hazardous Wastes Management facilities available in the country are as below:

- Common Incinerators - 13 Nos. in 6 States
- Individual Incinerators - 127 Nos. in 12 States
- Total incineration capacity – 3,27,705 MTA
- Present generation of Incinerable waste in the country - 4,15,794 MTA
- Deficit of Incineration capacities - 88,089 MTA

It is proposed by different States to install additional incinerators to provide additional incineration capacity of 2,56,710 MTA.

(x) Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Punjab, Pondicherry are having adequate incineration capacities (common & captive) to handle the incinerable wastes generated in the respective States. On the other hand Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, West Bengal and Daman, Diu & DNH need to augment the incineration facilities available with them to properly dispose-off the incinerable waste generated in their areas. State-wise status of existing incineration capacities vis-à-vis incinerable Hazardous Wastes generation is presented ahead.

Table 14.28: Existing TSDF Capacities vis-à-vis Hazardous Wastes Generation in India

S. No.	Name/ Location of TSDF	Capacity in MTA	Total capacity	Land Disp. HW Generation in the State MTA	Surplus Capacity / Deficit in capacity MTA
Andhra Pradesh:					
1	TSDF Dundigal	150000	350000	211442	138558 (Surplus)
2	TSDF, Vishakhapatnam	200000			
Gujarat :					
3	NEIL , Nandesari, Vadodara	21667	447401	1107128	-659727 (Deficit)
4	GEPIL, Surat	100000			
5	TSDF, Odhav, Ahmedabad	71667			
6	TSDF at Vatva, Ahmedabad	63067			
7	BEIL, Ankleshwar	120000			
8	TSDF, Vapi	48000			
9	TSDF, Alang	23000			
Himachal Pradesh:					
10	TSDF at Baddi	50000	50000	35519	14481 (Surplus)
Madhya Pradesh:					
11	MP Waste Management Limited, Pithampur	90000	90000	34945	55055 (Surplus)
Maharashtra:					
12	M/s TSDF at Taloja	120000	250000	568135	-318135 (Deficit)
13	TSDF at New Mumbai	10000			
14	TSDF at Butibori	60000			
15	TSDF at Ranjangaon	60000			
Punjab :					
16	TSDF at Nimbua, Derabassi	13000	13000	13601	-601 (Deficit)
Rajasthan:					
17	TSDF at Gudli, Udaipur	20000	20000	165107	-145107 (Deficit)
Tamilnadu:					
18	TSDF at Gummadipoondi	100000	100000	157909	-57909 (Deficit)
Uttar Pradesh :					
19	TSDF, Kumbhi, Kanpur Dehat	17500	60167	36370	23797 (Surplus)
20	TSDF at Banthar, Unnao	20667			
21	TSDF at Rooma, Kanpur	22000			
West Bengal:					
22	TSDF, Purba Shrikrishnapur, East Midnapur	120000	120000	120598	-598 (Deficit)
Grand Total		**1500568**	**1500568**	**2450754**	**-950186 (Deficit)**

Table 14.29: Status of Incineration Capacities vis-à-vis Incinerable Waste Generation

S. No.	Name of State/UT	Nos. of Common hazardous Waste Incinerators	Capacity in MTA	Nos. of Captive hazardous Waste Incinerators	Capacity of captive Incinerators in MTA	Total Capacity MTA	Incinerable Waste Generation in the State MTA	Surplus capacity
1.	Andhra Pradesh	2	18000	26	29823	47823	31660	16163 (Surplus)
3.	Gujarat	4	32872	35	128425	161297	108622	52675 (Surplus)
4.	H.P.	-----	-----	7	5082	5082	2248	2834 (Surplus)
5.	Karnataka	3	5100	7	2743	7843	3713	4130 (Surplus)
6.	Kerala	----	250	1	1500	1750	223	1527 (Surplus)
7.	Madhya Pradesh	-----	-----	7	2940	2940	5036	-2096 (Deficit)
8.	Maharashtra	2	30000	---	---	30000	152791	-122791 (Deficit)
9.	Punjab	-----	-----	17	35250	35250	14831	20419 (Surplus)
10.	Pondicherry	-----	-----	1	2700	2700	25	2675 (Surplus)
11.	Rajasthan	-----	-----	5	15500	15500	23025	-7525 (Deficit)
12.	Uttar Pradesh	1	1200	13	5340	6540	15697	-9157 (Deficit)
13.	West Bengal	1	10800	4	--	10800	12583	-1783 (Deficit)
14.	Daman, Diu, Dadra & NH	-----	-----	4	180	180	421	-241 (Deficit)
	Total	**13**	**98222**	**127**	**229483**	**327705**	**370875**	**-43170 (Deficit)**

Common Hazardous Waste Incinerator at Ankleshwar

14.4.2 Inspection of TSDFs in Andhra Pradesh

Two TSDF sites namely (i) M/s Coastal Waste Management Project (CWMP), Parvada, Vishakhapatnam and (ii) M/s. Hyderabad Waste Management Project (HWMP), Dudigal, RR District have been established in Andhra Pradesh. Both the facilities have been inspected and monitored during the year 2008.

M/s Coastal Waste Management Project (CWMP), Parvada, Vishakhapatnam

It is located in the pharma city - J.N.Pharma City (India) Ltd - at Paravada Village, 24 km west of Visakhapatnam city with a capacity of 40, 000 TPA (including incinerator of 1.5 TPH). Industries located at 5 nearby districts uses this facility and 56 industries became member of this TSDF. Important observations are as under:

- Ground water level in the area is about 1.5 m whereas Central Pollution Control Board guideline prescribe more than 3.0 m for any TSDF site. Thus the site selection is not meeting the criteria stipulated by CPCB.
- Clay lining of the land-fill site is only 600 mm as against 1500 mm prescribed in CPCB guidelines. A land-fill Cell of 0.7 acres was made operational and about 20,000 Tons of wastes already filled in the cell.
- Leachate was observed by Andhra Pradesh Pollution Control Board in the secondary leachate collection well indicating that the liner of the cell is giving way due to defects in the liner. Based on Central Pollution Control Board findings, Andhra Pradesh State Pollution Board issued direction to stop operation of the land-fill site on 26/07/2008 and a new site is under construction.
- Stabilization pits found overloaded with wastes and also incinerable wastes kept near the treatment pits. Manual handling of incinerable liquid wastes was observed during the inspection. About 400 MT of incinerable wastes found lying in the premises.

- Incinerator was operated at a load of about 17 Tons per day which is about 50% of the installed capacity. Temperature of the primary chamber (i.e. 700^{o} C) was found lower than the prescribed limit during inspection.
- In view of non-compliance of standards / norms, the TSDF facility was issued notice to follow guidelines.

M/s Hyderabad Waste Management Project, Dundigal, Rangareddy District

This is the first common facility established in South India and located in RR District 25 km away from Hyderabad. It started operation during the year 2001 with a capacity of 1,50,000 MT. The TSDF site is surrounded by industries such as pharmaceuticals, chemical, fertilizers, pesticides, dye and dye intermediates. The hazardous wastes generated from these industries mainly of ETP sludge, iron sludge, still bottom residue, process sludges/tarry residues, spent carbon, evaporators salts, incineration ash, asbestos, glass fibers spent catalyst and residues are transported to the TSDF and disposed-off. The facility for incineration was commissioned in the year 2007.

14.4.3 Fire Accident at TSDF Dundigal, Andhra Pradesh

A major fire accident occurred at M/s. Hyderabad Waste Management Project (HWMP), Dundigal (Andhra Pradesh), a facility created for Treatment, Storage & Disposal of Hazardous wastes (TSDF) on 19th January 2009. A comprehensive investigation of the accident was carried-out immediately during 20-25 January, 2009.

Fire at Hyderabad Waste Management Project Dundigal (Andhra Pradesh)

Major observations / findings are as under:

- Fire started in incinerable waste storage shed No. 1, which on the date of accident was having around 1547 MT of incinerable waste. As per records, a total of 5,78,510 MT (including 16,288 MT of incinerable waste) was stored on the site during the accident.

- As per the Facility operator, around 2.5 MT of incinerable hazardous waste received from a pharmaceutical unit on 18.01.2009 was being handled in the storage shed on 19.01.2009 around 12.55 Hrs. During handling one bag got torn-off and the contents spilled on the floor and the material caught fire immediately. The workers tried unsuccessfully to stop the fire using Dry Chemical Powder fire extinguisher and in the mean time the surrounding materials caught fire and spread rapidly within the shed. The exact reason for the fire was not established with the available information / data.
- Due to inadequate fire fighting arrangements at the TSDF site, fire tenders came from Jeedimetla, Patancheru, Dundigal Air Force Academy, BHEL and Ranga Reddy Municipality and started the fire fighting operation which took almost 9 hours to bring the major fire under control and 14 hours to control the entire fire. Minor fires, however, were erupting even after 28 hours.
- Drums containing highly flammable liquids were burning intermittently due to the action of wind and heat generated from the neighboring drums and hence buried by digging the ground near the shed-1 and covering it with the mud to completely extinguish the fire.
- Impact of fire was so heavy that many of the hazardous waste storage drums were blown off upto a height of 50 m. Distinct fire marks were noticed upto the boundaries on south-western direction (around 200 m) from the fire accident shed. Almost 80% of drums got distorted due to the heat / fire impact and 20% of drums could be retrieved.
- On the day of accident, wind was blowing predominantly from NE to SW with a speed of 2 to 3 m/s. This apparently resulted in poor dispersal of pollutants emitted from the fire accident.
- A strong protest was organized by the public from the surrounding areas on 20th January 2009 from 10.30 hrs to 13.30 hrs and had thronged the premises.
- Ambient Air Quality Monitoring including Volatile Organic Carbons (VOCs), Dioxins (including Furans) and Polycyclic Aromatic Hydrocarbons (PAHs) was carried out from 20th January onwards as per EPA approved methods.
- Fire extinguished run-off water samples for analyzing Volatile Organic Carbons (VOCs), Absorbable Organic halides (AOXs) and other general parameters, soil samples for analyzing VOCs, PCBs, Heavy metals, pH, sulphates, etc and vegetation samples (around 5 kg of biomass) to know the Dioxins settled or absorbed by the vegetation near the shed were collected.
- The 24 hourly Total Volatile organic compounds (VOC) observed in the ambient air in and around the TSDF site was in the range of 684 to 1232 µg/m^3 during 20- 21 January, 2009.
- 35 VOCs were identified in the samples. Out of these, 3 VOCs namely Carbon Tetra Chloride, Chloroform and Toluene were observed in the range of 91 to 372 µg/m^3. Further, 6 VOCs namely Benzene, Chlorobenzene, 1,2 Di Chlorobenzene, 1,3 Dichloro Propane, Ethyl Benzene and Tettra Chloro Ehene were found to be in the range of 25 to 100 µg/m^3. Another 9 VOC observed to be present in the range of 4 to 25 µg/m^3 and the remaining 17 VOCs were found < 4 µg/m^3. Presence of Chlorinated VOCs is predominant over others. The values observed are higher than the proposed standards of 15 µg/m^3 for 24 hourly average for Benzene. Presence of VOCs in all directions indicated the presence of these compounds in the drums containing incinerable wastes and the increasing in concentration observed over time period (Fig. 14.7) revealed the continuous emission of VOCs from the ruptured drums.

Table 14.30: Average VOC levels in Ambient Air after the fire at the TSDF Dundigal, Andhra Pradesh (20th to 21st January, 2009)

S. No.	VOC	South West	West	South	East	North East
1.	Benzene	28.85	23.91	33.07	8.35	14.91
2.	Bromobenzene	0.56	3.21	5.11	1.46	0.00
3.	Bromochloomethane	2.50	1.39	2.65	1.67	0.71
4.	Bromodichloromethane	6.55	6.63	4.24	4.38	6.50
5.	Bromoform	5.26	5.36	5.34	5.26	5.27
6.	Carbontetrachloride	372.63	273.82	265.12	239.51	226.93
7.	Chlorobenzene	17.90	19.10	28.41	19.59	10.50
8.	Chloroform	225.80	195.41	167.60	185.82	162.04
9.	2-Chlorotoluene	0.92	0.94	4.27	0.97	2.61
10.	4-chlorotoulene	0.00	1.21	2.93	0.00	0.00
11.	Dibromochloromethane	0.00	3.94	19.92	3.93	3.94
12.	1,2-Dibromoethane	11.82	19.84	9.62	18.94	0.00
13.	1,2- Dichlorobenzene	14.58	142.29	23.02	40.16	15.56
14.	1,3 dichlorobenzene	3.43	4.87	5.79	4.76	3.54
15.	1,4 Dichlorobenzene	7.03	12.40	9.48	9.47	0.00
16.	Dichlorobenzene	0.00	0.00	0.00	0.00	7.21
17.	1,1-Dichloroethene	5.90	0.58	2.33	3.09	4.67
18.	1,2-Dichloropropane	2.67	1.38	1.02	4.42	0.49
19.	1,3-Dichloropropane	24.79	72.56	14.26	22.95	13.31
20.	trans-1,3-Dichloropropene	0.00	0.00	2.59	0.00	2.26
21.	Ethylbenzene	29.04	29.20	22.52	16.66	34.12
22.	Napthalene	1.33	3.10	8.59	2.62	8.41
23.	Styrene	1.53	22.26	10.44	13.30	12.69
24.	1,1,1,2-Tetrachloroethane	3.02	1.15	3.04	2.20	1.07
25.	1,1,2,2-Tetrachloroethane	2.41	2.82	3.22	0.91	2.88
26.	Tetrachloroethene	8.63	21.19	44.57	9.17	18.70
27.	Toluene	151.77	306.17	125.95	141.60	91.46
28.	1,2,3 Trichlorobenzene	1.12	1.67	1.21	0.68	1.15
29.	1,2,4-Trichlorobenzene	2.13	4.93	3.23	2.27	2.48
30.	1,1,1 Trichloroethane	1.51	0.75	0.00	1.50	0.80
31.	1,1,2-Trichloroethane	4.67	5.13	4.19	3.31	4.54
32.	Trichloroethylene	1.27	2.34	1.81	0.80	3.17
33.	1,2,4 Trimethyl benzene	4.20	1.29	8.07	0.00	0.00
34.	o-Xylene	7.64	29.65	11.34	10.83	14.69
35.	p & m-Xylene	4.68	11.72	7.94	6.96	7.77
Range		0.56-372	0.58-306	1.02-265	0.68-239	0.49-227
Remark: All values are reported as $\mu g/m^3$						

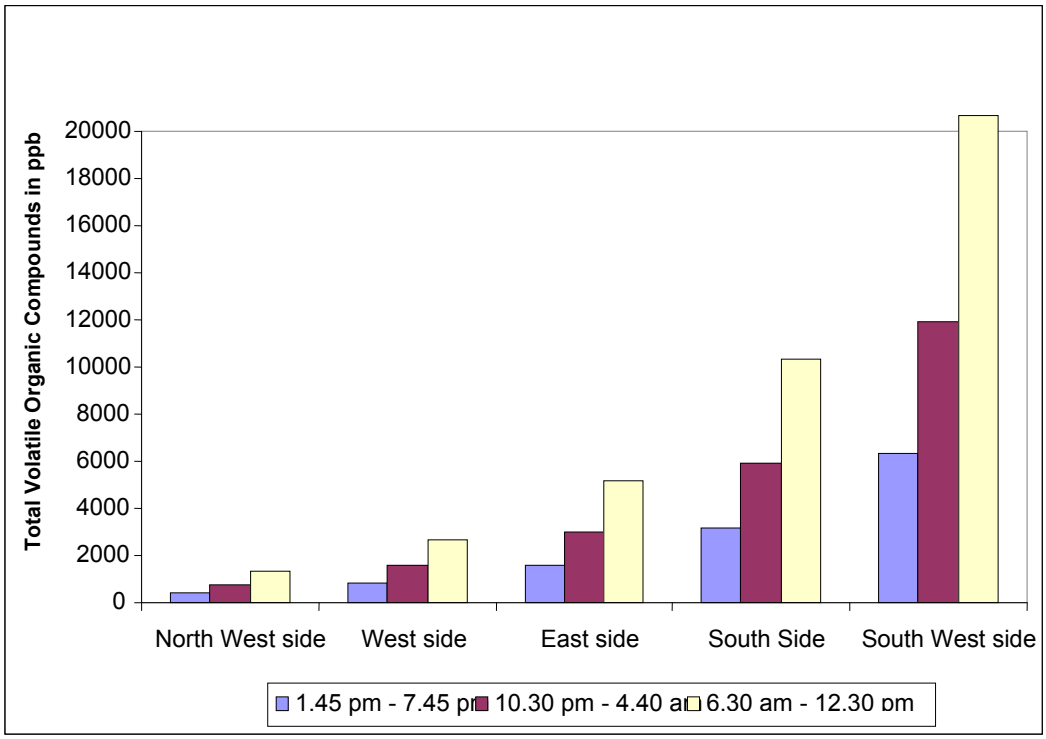


Fig. 14.7: Total VOCs present at different time intervals

- 13 PAH compounds were detected in ambient particulate matter and ranged from 0.11 to 3.72 µg/m^3. Out of these 7 PAH were more than 0.5 µg/m^3 and these in the decreasing order are: Naphthalene, Benzo (b) fluoranthene, Benzo (ghi) perylene, Pyrene, Benzo (k) fluoranthene, Benzo (a) pyrene and Phenanthene.
- 7 PAH compounds were detected in gaseous samples and varied from 0.16 to 23.63 µg/m^3. These in the decreasing order are: Phenanthrene, Naphthalene, Fluoranthene, Anthracene, Pyrene, Dibenz (ah) anthraene.
- PAH were in much higher concentrations in gaseous form as compared to particulate bound PAH (Fig. 14.8). The proposed standard for Benzo (a) pyrene is 5 ng/m^3 for 24 hrs average and the observed concentration was 740 ng/m^3.
- Dioxins in the ambient air was 0.0405 ng/l-TEQ/m^3 to 182.29 ng/l- TEQ/m^3. Exorbitantly high value of 182.29 ng/l- TEQ/m^3 was found at Station No. 4 in SW direction, which was the predominant wind direction.
- All 17 dioxins compounds (7 dioxins and 10 furans) were monitored and detected. Concentration-wise highest concentration reported were 1,2,3,4,6,7,8-HpCDF (1400 ng) and OCDF (1100 ng).
- TEQ-wise data, which indicate the carcinogenic potential indicate that 2,3,4,7,8-PeCDF has the highest value of 260 ng followed by 2,3,7,8-TCDD with a value of 68 ng. This is of serous concern, as these compounds have highest Toxicity Equivalent Factors of 0.5 and 1 respectively.

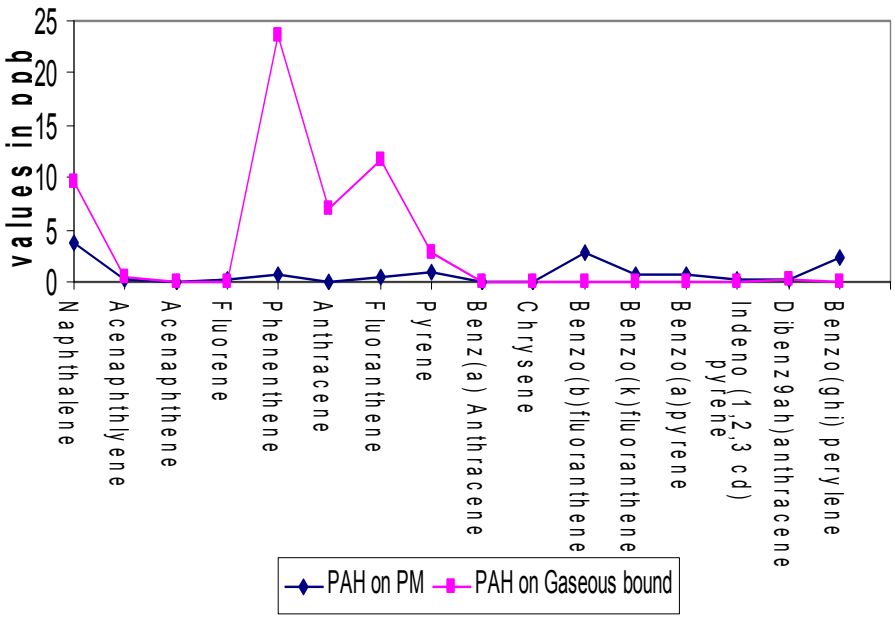


Fig. 14.8: PAH Measured on Particulate and Gaseous Matter

Table 14.31: Dioxin / Furan Concentration in Ambient Air

Dioxin / Furan	Concentration (ng)				
	West	South West	South-South West	South	East
2,3,7,8-TCDF	0.99	190(*)	2.9(*)	0.15	3.5(*)
2,3,7,8-TCDD	0.19	68(*)	0.62	0.012	0.73
1,2,3,7,8-PeCDF	0.85	140(*)	10	0.046	4.2
2,3,4,7,8-PeCDF	2.9	520(*)	45(*)	0.095	14(*)
1,2,3,7,8-PeCDD	0.35	130(*)	6.4	0.017	1.7
1,2,3,4,7,8-HxCDF	1.5	590(*)	32(*)	0.12	10
1,2,3,6,7,8-HxCDF	1	380(*)	21(*)	0.12	6.5
2,3,4,6,7,8-HxCDF	1.7	520(*)	35(*)	0.15	10
1,2,3,7,8,9-HxCDF	0.1	17(*)	1.6	0.0085	0.64
1,2,3,4,7,8-HxCDD	0.25	99(*)	6.3	0.015	1.8
1,2,3,6,7,8-HxCDD	0.4	180(*)	12	0.025	3
1,2,3,7,8,9-HxCDD	0.29	140(*)	9.2	0.02	2.7
1,2,3,4,6,7,8-HpCDF	4.1	1400(*)	110	0.81	33(*)
1,2,3,4,7,8,9-HpCDF	0.32	110(*)	9	0.1	2.3
1,2,3,4,6,7,8-HpCDD	1.7	780(*)	54(*)	0.21	14(*)
OCDF	2.8	1100(*)	70(*)	1	25
OCDD	2.2	960(*)	61(*)	0.62	17

- Though no ambient Dioxin standards prescribed in the country, the values at 5 monitoring locations were found much higher than the Japan's Annual average ambient air standard [6 x 10^{-3} ng TEQ/m^3].
- Average RSPM was found to exceed around 20 to 80 % higher than the prescribed norms of 150 microgram/cubic meter for Industrial area. The values decreased significantly with distance.

- TSPM standards were violated only once and that too exceeded by only 12% at the station kept around 100 meter distance in down wind direction on 19.01.09. Further sharp decrease in the value of TSPM was also seen over the distance like RSPM.
- Total Organic Carbon (TOC) measured in the RSPM was found to be 120 and 44 mg on 1st and 2nd day respectively. Thus the Carbon % (44% to 25%) indicated that a sizable proportion of Respirable particles are of combustion origin, which has greater influence on the human health. The Oxides of Sulphur and Nitrogen were within the norms.

Table 14.32: Ambient Air Quality at TSDF (19th to 20th January) Monitored at M/s Sri Ram Chemicals 1 km from site

Date	Duration	RSPM in mg/m^3	TSPM mg/m^3	SO_2 mg/m^3	NOx mg/m^3
19.01.09	14 hrs	270	378	14	25
20.01.09	8 hrs	83	272	7	19
20.01.09	16 hrs	206	310	7	18
	Average	**186.33**	**320**	**9.33**	**20.67**
TOC in Pm 10 on 19.01.09 = 120 mg					
TOC in PM 10 on 20.01.09 = 44 mg					

Monitored at Kekule Pharma 200 mts from site

Date	Duration	RSPM mg/m^3	TSPM mg/m^3	SO_2 mg/m^3	NOx mg/m^3
19.01.09	14hrs	446	579	58	87
20.01.09	8 hrs	93	308	8	20
20.01.09	16 hrs	289	332	7	18
	Average	**276**	**406.33**	**24.33**	**41.67**

- Dioxins in vegetation ranged from 0.008 to 0.0014 ng/l-TEQ/gram and the concentration was found increasing from the accident shed indicating dispersal of dioxin in wide spread areas.
- The analysis reports of soil samples and fire extinguisher run-off water were given below and showed that VOCs such as 1,2 Dichloro Ethane, Benzene, Carbon Tetra Chloride and Chloroform and heavy metals such as total chromium, barium and cobalt were detected in soil samples. Pesticides were not detected in the samples.

Table 14.33: Statues of Volatile Organic Carbon in Soil samples

VOCs	West side	North west side
1,2 Dichloro Ethane	194	0.44
Benzene	0.68	0.39
CarbonTetraChloriode	55.36	0.66
Chloroform	68.71	68.25

VOCs in Wastewater

VOCs	Fire extinguishing water, µg/l	Pond water µg/l
Benzene	12.22	4.85
Bromobenzene	0.63	3.23
Chloroform	1955	150
Carbon tetra Chloride	80.92	5.06
1,2 Dichloro Benzene	396	30.56
1,4 Dichloro Benzene	0.25	3.82
1,3 Dichloro Propane	187	13.79
Ethyl Benzene	7.11	0.13
Styrene	1.36	0.49
Tetrachloroethene	6.44	4.32
Toluene	909	136
O-Xylene	32.72	0.37

Table 14.34: Status of Gen parameters in Waste water

Parameters	Fire extinguished water in mg/l	Pond water in mg/l
Fluoride	8	3.7
Free Ammonia	66	23
Kjeldahl Nitrogen	801	42
Sulphide	41	11
NH_3-N	267	5.7
Chlorides	7816	468
TDS	25,900	21,925
COD	1200	643
AOX	3751	2185
TOC	360	193

- Chloroform, Carbon Tetra Chloride, 1,2 Dichlorobenzene, 1,3 Dichloropropane, Toluene, O-Xylene, Ethyl benzene, Styrene, and Tetrochloroethelene were found to be present higher in the fire extinguished water as compared to pond water. This is an indication that the extinguished water carried some amount of solvents along with them.
- The higher amount of AOX along with high TOC indicates the Chlorinated compounds are organic particle bound. This supports the higher presence of Chlorinated VOCs.
- The fire accident undoubtedly has severe impact on the environment particularly with regard to toxic pollutants.
- The incinerable waste permitted to be stored as per the Central Pollution Control Board guidelines is 50 % of the annual capacity of the incinerator. As such, the hazardous waste of around 7800 Tons stored for incineration within the TSDF facility / premises was far in excess of the permitted quantity of 4320 Tonnes.
- As per Central Pollution Control Board guidelines, at least 15 m distance between the storage sheds, fire break of at least 4 m between two blocks of stacked drums (maximum 300 tons) and minimum of 1 m clear space between two adjacent rows of drums needs to be provided. However, storage

was observed to be quite haphazard within the sheds. A large quantity of incinerable was found stored in the open without any boundaries.

- Flame proof electrical fittings are mandatory in the storage area and which has not been provided in this case.
- Flammable, Ignitable, reactive and non-compatible waste should be stored separately in the same storage shed. The drums were not found to stocked as per Flammable, Ignitable Reactive Compatibility characteristics.
- The storage area floor should be provided with secondary containment such as proper slopes as well as collection pit so as to collect wash water and leakage/spills etc. At TSDF site, The Storage sheds slope were not proper to collect the accidental spillages and no collection pits were provided to collect it back.
- The sheds has to be approachable from all the four sides without any hindrance. At TSDF site, Approach road is only available from one side.
- Central Pollution Control Board guidelines stipulate the vehicles to operate with Spark arresters and the same was not being followed.
- Proper fire fighting facilities such as fire hydrant, water, powder, foam, etc not available at the time of inspections. No automatic smoke and heat detection system provided. Proper peripheral drainage system not in place.
- Leachate management is poor and presently taken to solar evaporation pond and utilized partially in feeding in the incinerator.

The TSDF was re-inspected on 17th Feb, 2009 and the following recommendations were made:

- The mode of storage of incinerable Hazardous Waste needs to be improved as per the guidelines of Central Pollution Control Board particularly the storage capacity should not exceed more than 50% of the annual capacity, distance between drums and between the rows to be maintained, Natural slopes to be provided with in the shed so that any spillages would easily flow to the collection pits, Smoke and fire alarms being installed should be expedited.
- Entry and exit of the sheds to be kept in such a way that in case of accident one should be able to escape without encountering any hurdles. These have been taken up and needs to be completed quickly.
- Fire hydrants to be installed and activated and tested from time to time. Other fire extinguishing materials such as foam, sand also to be kept ready in case of any eventuality.
- Proper approach road to be built around the shed so that in case of any emergencies the ambulances, fire fighters should be in a position to approach with ease.
- Ambient Air quality to be monitored at least at 2 places one upwind and downwind round the year as per guide lines of NAMP of CPCB along with meteorological data.
- Occasionally Hazardous pollutants such as VOCs, Dioxins to be monitored to know their limits.
- MEE or suitable mechanism to be installed to take care of leachates. The strippers being installed may not be the perfect system.
- In view of the release of severe toxic pollutants having persistent and biomagnifying characteristics released during the accident to astronomical levels, a comprehensive Health study needs to be commissioned by the

TSDF operator immediately. The study may be taken up by a reputed institute like NIOH, Ahmedabad or IITR, Lucknow .The health checks may be regularly carried out henceforth.

- Dense green belt all along the periphery is must to ensure that any environmental threat to the nearby residential areas is minimized.
- As the fire is completely extinguished and normalcy prevailed, the drums which were buried under the trenches with mud need to be taken out and sent for proper treatment and disposed off safely. The mud used need to be tested and disposed into Landfill with or without treatment depending upon its characteristics.

14.4.3 Evaluation of Common Hazardous Waste Incinerators in West Zone

In the West Zone, which covers Gujarat, Maharashtra and UT of Daman, Diu & Dadra, Nagar Haveli, 6 CHWTSDF (with landfill, stabilization and incineration facility altogether) are established for the proper disposal of hazardous waste.

Central Pollution Control Board carried out monitoring at two facilities in the state of Gujarat viz M/s Gujarat Enviro Protection and Infrastructure Ltd (GEPIL), Surat and M/s Bharuch Enviro Infrastructure Ltd. (BEIL), Ankleshwar in the month of January 2009. The monitoring includes source emission monitoring for general parameters. The details of the incinerators are as follows:

Table 14.35: Details of Common Hazardous Waste Incinerators at Gujarat

Item(s)	M/s GEPIL, Surat	M/s BEIL, Ankleshwar
Design Capacity	-Solid Waste: 0.7 MT/Hr -Liquid Waste: 1.2 MT/Hr Total: 1.9 MT/Hr 8000 MTPA (based on 250 working Days)	-Solid Waste: 1 MT/Hr -Aqueous Waste: 0.95 KL/Hr -Liquid Waste: 0.5 KL/Hr Total: 2.5 MT/Hr (maximum) As per Authorisation: 21600 MTA
Average Capacity (During monitoring)	-Solid Waste: 0.16 MT/Hr -Liquid Waste:1.06 MT/Hr Total: 1.22 MT/Hr	-Solid Waste:0.645 MT/Hr -Semisolid Waste: 0.236 MT/Hr -Liquid waste: 0.705 MT/Hr -Aqueous Waste:0.412 MT/Hr Total: 2.00 MT/Hr
Thermal Capacity	3.8- 5 MKCal/Hr	6.5 MKCal/Hr
Average Thermal Capacity	4.9 MKCal/Hr	6.52 MKCal/Hr
Stages	Rotary Kiln, Secondary Combustion Chamber	Rotary Kiln, Secondary Combustion Chamber
Air Pollution Control System	Cyclone→Air Pre-heater→ Gas Quencher→Alkali Scrubber→ Stack (Height 30 m.)	Quencher→Lime & Carbon Injection System→Bag Filter→ Alkali Scrubber→ Mist Eliminator→ Stack (Height 45 m)

The analysis results are given in Table 14.36:

Table 14.36: Performance Monitoring of Hazardous Waste Incinerator

Parameter(s)	CHWTSDF		Gujarat Pollution Control Board Standards (mg/Nm^3)
	M/s GEPIL, Surat	M/s BEIL, Ankleshwar	
Particulate Matter	155.45	188.47	50
HCl	2.72	11.20	50
SO_2	9.54	14.32	200
NOx	3.35	270.38	400

- All values are expressed in mg/Nm^3,
- The values are corrected at 11 % O_2.

The concentration of Particulate matter at source emission monitoring at both the facilities exceeded the standards prescribed by Gujarat Pollution Control Board, whereas other monitored parameters have been found well within the standards. The Incinerator facility provided at M/s GEPIL, Surat does not have proper provision for incineration of semi solid / slurry waste such as distillation residue/tarry waste. The solid feeding mechanism is not adequate and mostly rotary kiln is used as a stationary combustion chamber. Therefore, this facility mostly (@ 87%) incinerates liquid waste.

14.4.4 Evaluation of Common Hazardous Waste Incinerators in Central Zone

TSDF, Pithampur, Dhar (M.P.)

- The total quantity (Tonne / Annum) of hazardous waste handled at the site is mentioned in Table 14.37.

Table 14.37: Hazardous waste handled at TSDF Pithampur, Dhar, M.P.

Pathway	Year			
	2006	2007	2008	2009*
Direct land fill	1959.130	11921.880	7556.071	705.795
Landfill after treatment	1396.310	4186.670	4158.262	204.882
Incinerable waste	0.000	657.968	478.352	--
TOTAL	3355.440	16766.518	12192.685	910.677

- The observations of ground water quality alongwith the data is presented in Table 14.38.

Table 14.38: Ground water quality near TSDF

Location	pH	Cond. us/S	TDS mg/l	Cl mg/l	Total Alkalinity mg/l	Na mg/l	K mg/l
GW near Transformer	7.29	467	310	28	132	22	03
GW near Bridge	8.75	422	293	40	110	15	3.6
Peizometer near Inclinator	8.19	505	419	56	172	26	3.5
GW near SLF	7.84	720	562	147	165	36	3.4
GW near weigh bridge	7.00	613	489	132	140	21	2.8
Open well near Temple	7.80	1443	832	512	186	43	4.1

a. The total dissolved solids has been gradually increasing at Piezometer No B-1(121-310), B-3(256-419),B-5(187-562) and B-7(113-489) i.e, at all the directions of site.
b. The concentration of chlorides also increased at Piezometer No B-5(70-147) and B-7(45-132), which are on either side of land fill cell.
c. The total alkalinity was seen in decreasing trend at B-1,B-2,B-5 and B-7
d. The presence of chromium was observed at piezometers B-1.B-3 and B-5, whereas in the earlier studies its presence was not detected.

- No progress has been made by the unit on the recommendations of committee under Chairmanship of Shri R. K. Garg regarding permissible storage limit as well as safety measures needed for storage of incinerable hazardous wastes by the operator of TSDF.
- The installation of incinerator is also delayed and it is expected to be commissioned for regular commercial operations from December 2009.
- The display board giving details on hazardous waste received category wise, land filled etc., was not properly displayed as per the directions of Hon'ble Supreme Court monitoring committee requirement.
- The unit has not paved all internal roads. The tree plantation especially along the boundary walls towards village Tarapur has not been taken up.
- The unit was issued direction under Section 5 of The Environment (Protection) Act, 1986 dated 16th July 2008 for non-compliance of various issues identified during inspections.

TSDF, Gudli, Udaipur (Rajasthan)

- The details of wastes received since 2005 is presented in Table 14.39.

Table 14.39: Hazardous waste handled by TSDF, Gudli, Udaipur, Rajasthan

Year	Land fill after Treatment	Direct Land fill	Incinerable waste	Total
2005	72.211	87.674	3.929	163.814
2006	3,154.618	844.596	228.990	4,228.204
2007	10,200.589	1,375.212	837.006	12,412.807
2008	11,284.664	905.157	76.949	12,209.424
2009*	1,025.140	107.899	Nil	1,133.039
Total	25,737.222	3,263.192	1,146.874	30,147.288
Disposed	25,695.094	3,259.337	Nil	28,954.431

*The data given till February, 2009.

- The unit is having authorization under Hazardous Waste (Management and Handling) Rules 2003 valid up to 31.03.2011. The consents to operate under Air & Water Act are valid up to 31.03.2011. The facility has been permitted to dispose the 8,000 TPA of Hazardous Waste in direct landfill and 10,000 TPA of Hazardous Waste in landfill after treatment.
- The incinerable waste is stored in a storage shed having 3,000 MT capacity. Total 1,146.874MT incinerable waste was stored in the yard since 2005.
- No progress has been made by the unit on the recommendations of committee under Chairmanship of Shri R.K.Garg regarding permissible storage limit as well as safety measures needed for storage of incinerable hazardous wastes.
- As directed by Central Pollution Control Board leak testing/ air pressure testing of welded HDPE liner seams in solar evaporation ponds has been tested in presence of Rajasthan State Pollution Control Board officials and no leakages were found at the tested places at a pressure of 4 Kg/ cm^2.
- The mechanical stabilization system has not been provided and the unit is mixing the waste materials in a cement concrete mixer.
- The samples collected from the six piezometers were analysed. The piezometer No 1, 2 & 6 are located on upstream side of the disposal cell while the remaining piezometers are located on downstream side.
  a) Total solids have increased in all the directions, if compared with the previous monitoring data of November 2007.
  b) pH has decreased in all the piezometers and the values are in the range of 6.50-7.24 where as earlier the values were in the range of 7.27 – 8.39.
  c) Heavy metals - Zinc and Chromium have been found in the range of 0.005 – 2.124 ppm and 0.045-0.475 ppm whereas earlier during November 2007 zinc has been found in the range of 0.03 – 0.97 ppm, while chromium was not traceable.

Table 14.40: Leachate Quality at Piezometers

Piezometer	pH	Cond	TSS	TDS	COD	Cl	TH	TA	SO_4	PO_4	Na	K
Pz. No. 1	6.82	634	02	378	01	32	468	317	39	BDL	20	2.5
Pz. No. 2	6.50	1,320	04	906	04	124	901	395	147	BDL	43	3.6
Pz. No. 3	6.54	1,300	04	902	03	132	852	419	147	BDL	40	3.6
Pz. No. 4	6.75	1,160	04	784	01	103	941	371	61	BDL	35	4.2
Pz. No. 5	7.24	835	02	554	<01	37	724	349	53	BDL	29	3.9
Pz. No. 6	6.65	1,460	04	936	04	140	734	333	66	BDL	52	6.2

All values expect pH & Cond are in mg/L. Conductivity is presented in µS.

Table 14.41: Leachate water quality for heavy metals of Piezometers

Piezometer	Cu PPM	As PPB	Zn PPM	Fe PPM	Cr PPM
Pz. No. 1	0.009	0.133	0.005	0.046	BDL
Pz. No. 2	0.025	0.273	0.122	0.181	0.195
Pz. No. 3	0.025	0.288	0.823	0.081	0.126
Pz. No. 4	0.066	0.166	1.991	0.074	0.475

Pz. No. 5	0.107	0.360	2.124	0.061	0.117
Pz. No. 6	0.010	0.451	2.003	0.001	0.045

14.4.5 Evaluation of Captive Secured Landfill Sites (SLFs) in Central Zone

Many industrial units have been permitted to develop captive SLFs in their own premises to dispose the hazardous wastes generated in the processes. It was expected that once the common hazardous wastes TSDF are established, the wastes will be sent to the common facility for disposal. The captive SLFs were mostly aimed at a temporary measure to store the waste safely. Most of the recyclers/re-processors of non-ferrous wastes such as lead, zinc etc. and waste/used oil were also permitted to have captive SLFs in their premises.

Table 14.42: Analysis report of the samples collected from the captive Secured Landfill Site in Madhya Pradesh

S. No.	Location	pH	Cond. (ms/cm)	TDS mg/l	TSS mg/l	COD mg/l
M/s Lupin Limited, Mandideep						
01	Piezometer well-I, SLF-I (old)	7.85	0.574	348.6	8.6	18.19
02	Piezometer well-I, SLF-II (new)	7.42	2.35	1924	28.4	27.60
03	Bore well No.2 water	6.88	0.460	305	12	4.28
04	Leachate collection sump for SLF-I (old)	7.51	25.7	20118.4	351.8	8971
05	Leachate collection sump for SLF-II,(new)	6.72	35.1	22879.2	360.8	11126
M/s Ranbaxy Ltd, Dewas						
01	Leachate	7.59	7.85	6436	146	299
02	Piezometer S-1 tube well D/s	7.43	3.67	3572	46	65.56
03	Piezometer r S-2 D/s	7.02	3.58	3550	138	63.80
M/s Grasim Ind Ltd. (Chemical Division), Nagda						
01	Leachate collection sump	6.70	348.5	280852	3486	1020
02	Piezometer Pardi gate P-1 U/s	7.51	0.745	2568	1152	34.32
03	Piezometer near Hydrogen bottling plant P-2U/s	7.63	0.494	736	108	8.8
04	Piezometer P-3 U/s	10.27	3.09	3032	142	29.90
05	Piezometer P-4 D/s	7.77	0.456	412	30	12.00
06	Piezometer Sai Khamat Service center, P-5	7.86	0.590	450	78	12.70
07	Piezometer new staff colony P-6	8.79	0.572	510	158	4.40

During the study, the following observations for corrective action were made:

a) Many industrial units have abandoned the captive SLFs without proper care, once the operations are stopped or the units are closed.

b) In the absence of proper guidelines, the units have designed the SLFs by providing cost effective measures. Most of the sites have been seen with damaged liner systems, and improper captive provided to the closed sites. The collection of leachate & subsequent treatment and vents for gas were absent.

c) The accumulate hazardous waste in captive SLFs should be shifted to the common hazardous waste TSDF sites for proper disposal. The transportation and treatment costs may be fixed at appropriate level for on time disposal.

Table 14.43: Heavy Metals Analysis Report in the samples collected from Captive Secured Land Fill Site in Madhya Pradesh

S. No	Location	Unit	Copper	Zinc	Chromium	Lead	Arsenic (ppb)
M/s Lupin Limited, Mandideep							
01	Piezometer well-I, SLF-I (old)	mg/l	0.012	0.13	BDL	BDL	BDL
02	Well-II SLF-I (old)	mg/l	0.332	0.21	BDL	0.14	BDL
03	Piezometer well-I, SLF-II (new)	mg/l	0.013	0.11	BDL	0.09	BDL
04	Bore well No.2 water	mg/l	0.01	0.01	BDL	BDL	BDL
05	Leachate collection sump for SLF-I (old)	mg/l	0.792	0.74	0.19	8.15	BDL
06	Leachate collection sump for SLF-II,(new)	mg/l	0.053	1.07	BDL	BDL	BDL
07	Incinerator Thimble	mg/kg	0.397	BDL	0.23	0.15	ND
08	Ash, SLF-II (new)	mg/kg	251.2	328.0	104.0	371.0	*
09	Sludge, SLF-II (new)	mg/kg	46.5	53.0	16.0	195.0	BDL
M/s Ranbaxy Limited, Dewas							
01	Leachate	mg/l	0.058	0.26	BDL	BDL	BDL
02	Piezometer S-1 tube well D/s	mg/l	0.032	0.01	BDL	BDL	BDL
03	Piezometer S-2 D/s	mg/l	0.024	BDL	BDL	BDL	BDL
04	Ash (Incinerator Dumpsite SLF)	mg/kg	23.3	34.0	15.0	231.0	BDL
M/s Grasim Ind Ltd. (Chemical Division), Nagda							
01	Leachate collection sump	mg/l	0.384	0.13	0.21	0.09	*
02	Piezometer Pardi gate P-1 U/s	mg/l	0.363	0.46	BDL	0.30	BDL
03	Piezometer near Hydrogen bottling plant P-2 U/s	mg/l	0.073	0.04	BDL	BDL	BDL
04	Piezometer P-3 U/s (Chlorine Yard)	mg/l	0.013	0.03	BDL	BDL	BDL
05	Piezometer P-4 D/s	mg/l	0.029	0.11	BDL	BDL	BDL
06	Piezometer Sai Khamat Service center, P-5	mg/l	0.013	0.03	BDL	BDL	BDL
07	Piezometer new staff colony P-6	mg/l	0.022	0.04	BDL	BDL	BDL
08	SLF Sludge	mg/kg	29.8	33.0	83.0	123.0	BDL
M/s Century Denim, Khargon							
01	Chemical Sludge	mg/kg	32.2	38.0	124.0	116.0	BDL

M/s Hukumchand Jute Mills, Amlai

S. No.	Piezometer	Unit	pH	Mercury
01	Piezometer No.4	-	7.04	BDL
02	Piezometer No.6	-	7.31	BDL
03	Piezometer No.8	-	7.14	BDL
04	Mercury Sludge at SLF (wet)	mg/kg	9.32	18.88
05	Mercury Sludge at SLF (dry)	mg/kg	9.32	26.28

Remark : BDL = Below Detectable Limit.

ND = Not Detectable.

14.4.6 Registration of Hazardous wastes Recycling Units

It is mandatory for the hazardous waste recycling units to register with Central Pollution Control Board under the provisions of Hazardous Waste (Management & Handling) Rules, 1989 as amended from time to time. Inspections carried out in 95 industrial units located in western zone for registration/renewal of registration as actual user of hazardous waste with environmentally sound management facility.

14.5 BIO-MEDICAL WASTE MANAGEMENT

14.5.1 Status of Bio-medical Waste Management in the Country

As per Rule 10 of the Bio-medical Waste (Management & Handling) Rules, 1998 and amendments made thereof (herein referred as BMW Rules), every occupier/operator shall submit an annual report to the prescribed authority in Form II by 31 January every year, to include information about the categories and quantities of bio-medical wastes handled during the preceding year. The prescribed authority shall send this information in a compiled form to Central Pollution Control Board by 31 March every year.

Central Pollution Control Board (CPCB) is regularly pursuing with the SPCBs and PCCs so as to get annual report information on bio-medical waste management in the respective State/UT. Based on the annual report information received from the SPCBs and PCCs except Arunachal Pradesh and Lakshadweep Pollution Control Committee for the year 2007-2008, salient features and details are given as follow:

i)	Total No. of healthcare facilities	: 97,662
ii)	Total No. of beds	: 12,57,695
iii)	Total No. of Common Bio-medical Waste Treatment Facilities (CBWTF)	: 170
iv)	Total No. of healthcare facilities using CBWTF	: 49,971
v)	Total No. of healthcare facilities applied for authorization	: 47,750
vi)	Total No. of healthcare facilities granted authorization	: 45,661
vii)	Quantity of bio-medical waste generated kg/day	: 5,06,745*
viii)	Quantity of bio-medical waste treated Kg/day	: 2,88,203.8
ix)	No. of incinerators	
x)	(i) With Air Pollution Control Devices	: 315
xi)	(ii) Without Air Pollution Control Devices	: 178
xii)	Total No. of Autoclave	: 2,218
xiii)	Total No. of Microwave	: 192
xiv)	Total No. of Hydroclave	: 151
xv)	Total No. of Shredder	: 3,493
xvi)	Total No. of healthcare facilities violated BMW Rules	: 1,9090
xvii)	Total No. of Show Cause Notices issued to defaulter HCF	: 1,4579

Remark: The Data Bio-medical waste generated from Arunachal Pradesh and Lakshadweep is excluded.

The CBWTF have been increasing continuously covering wider areas over the years and the number of treatment facilities has increased now from 157 in the year 2006-2007 to 165 in the year 2007-2008 and to 170 in the year 2008-2009. Over the years there is a significant improvement in implementation of these Rules. However, still

there is a large scope for improvement for compliance to the Bio-medical Waste (M & H) Rules in the Country and efforts need to be made in this regard.

14.5.2 Action Plan for Effective Management of Bio-medical Waste and implementation of Bio-medical Waste (Management & Handling) Rules, 1998

An "Interaction meet" was held at New Delhi on August 08, 2008 so as to discuss various issues associated with implementation of provisions of the Bio-medical Waste (Management & Handling) Rules, 1998 and amendments made there of (hereafter referred as BMW Rules) notified by the Ministry of Environment & Forests (MoEF), Government of India under the Environment (Protection) Act, 1986 and to come out with 'Action plan' for effective management of Bio-medical Wastes in the Country. During the interaction meet, the draft action plan prepared was circulated to all the stakeholders (SPCBs/PCCs/IMA/CBWTF operators etc) seeking their suggestions and comments so as to finalize the same.

Subsequently, the comments received from various stakeholders i.e SPCBs/PCCs/IMA/CBWTF operators etc. were considered and the final draft Action Plan was finalized and communicated to the MoEF for its approval which would need to be implemented by SPCBs/PCCs and others concerned in a time bound manner and it also contains specific amendments required in the BMW Rules as well as policy decisions to be taken with reference to the management of bio-medical waste.

14.5.3 Sub-Committee Report on Road Map for Bio-medical Waste Management in the Country

Subsequent to finalization of the draft Performance Audit Report on 'Management of Waste in India' by the Principal Director of Audit, Scientific Department, New Delhi, Ministry of Environment & Forests (MoEF), a Committee has been constituted under the Chairmanship of Additional Secretary, MoEF to evolve 'Road Map' for Management of Wastes including Bio-medical Waste Management in the Country. First meeting of the Committee was held on October 21, 2008 at MoEF in which two Working Groups were constituted i.e. one on Municipal Solid waste, Plastic waste,, Demolition and Packaging waste under the Chairmanship of Chairman, DPCC and the other on 'Bio-medical Waste, Hazardous and E-waste under the Chairmanship of Member Secretary, Central Pollution Control Board.

The Working Group / Sub-Committee constituted under the Chairmanship of Member Secretary, CPCB held its first meeting on March 09, 2009 at Central Pollution Control Board, Delhi and discussed various issues for steps to be taken for management of wastes including Bio-medical wastes in the country. A draft sub-committee report on the road map emphasizing mainly on the Bio-medical Waste Management has been prepared and sent to MoEF for further necessary action.

14.5.4 Evaluation of new proposed Plasma Pyrolysis Technology for safe disposal of Bio-medical Waste

According to the Bio-medical Waste (Management & Handling) Rules, 1998 and amendments made thereof, any occupier/operator wishing to use other state-of-the-art technologies (other than incinerator/autoclave/microwave/Hydroclave/shredder)

shall approach the Central Pollution Control Board (CPCB) to get the standards laid down to enable the prescribed authority to consider grant of authorisation.

Facilitation Centre for Industrial Plasma Technology (FCIPT), Institute of Plasma Research, Gandhi Nagar, Gujarat has submitted their proposal to Central Pollution Control Board for use of 'Plasma Technology' for treatment of bio-medical waste. As suggested by CPCB, FCIPT carried out the performance evaluation of the plasma pyrolysis and stack emission monitoring in association with M/s. Vimta Lab., Hyderabad of plasma pyrolysis system during 24th & 25th of February, 2009 at Ahmedabad for parameters such as particulate matter, HCl, NOx, CO, CO_2 and O_2 in addition to dioxins and furans. The officials of Gujarat Pollution Control Board (GPCB) and Central Pollution Control Board have also participated in the monitoring. The detailed report of the study is under preparation.

14.5.5 Follow-up of the meeting of 'Environment Pollution (Prevention and Control) Authority for the National Capital Region' Chaired by Shri Bhure Lal

In the light of the decisions taken in the Shri Bhure Lal Committee meeting, Central Pollution Control Board has prepared the checklist for monitoring and verification of compliance of the provisions by the Health Care Facilities (HCFs) as well as Common Bio-medical Waste Treatment Facilities (CBWTFs) located in the National Capital Region (NCR) by the respective State Pollution Control Board or Pollution Control Committee. Prepared check lists have been circulated to the respective SPCB/PCC in National Capital Region (NCR) for the purpose of undertaking monitoring of the HCFs and CBWTFs located in the respective State/UT in the NCR Region.

14.5.6 Evaluation of Health-care Facilities (HCFs) / Common Bio-medical Waste Treatment Facilities (CBWTFs)

Central Pollution Control Board Zonal Offices conducted performance evaluation including inspection and monitoring of eight (8) CBWTFs in the State of Assam, Andhra Pradesh, Karnataka, Kerala, Punjab and Tamilnadu under the Annual Action Plan 2008-2009. As per these inspection/monitoring reports, the general observations made with respect to non-compliance of the various provisions of the BMW Rules and Central Pollution Control Board guidelines are as below:

- Some of the CBWTFs are in operation without having valid Consents under Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981 & the Authorisation under the Bio-Medical Waste (Management and Handling) Rules, 1998 and amendments made thereof.
- Some of the incinerators installed in CBWTFs are not complying with the operating and emission standards prescribed in the Schedule V of the Bio-Medical Waste (Management and Handling) Rules;
- Effluent treatment plant for treatment of liquid wastes in many of the facilities is inefficient so as to comply with the effluent discharge stipulated under the provisions of the Bio-Medical Waste (Management and Handling) Rules;
- Records and log books are not being maintained properly by some of the CBWTFs with reference to the collection and treatment of the bio-medical

wastes as required under Rule 11 of the Bio-Medical Waste (Management and Handling) Rules;

- Many of the CBWTFs do not have proper infrastructure like waste storage rooms (both treated and untreated) or washing room or security rooms besides provision of odour control measures, firefighting equipment, green belt and generator set.
- The respective Prescribed Authorities (i.e. SPCBs) have been requested to take necessary action in this regard and ensure that the provisions of the Bio-medical Waste (Management & Handling) Rules, 1998 and CPCB guidelines are complied strictly.

Central Pollution Control Board also conducted inspection of fifty four (54) Health Care Facilities (HCFs) in the North-Eastern States, M.P, and Maharashtra so as to study the performance evaluation of the treatment equipments installed by the HCFs. Common observations made with respect to non-compliance of the various provisions of the Bio Medical Waste (Management & Hazardous) Rules and the amendments thereof by such HCFs are as follows:

- Some of the HCFs does not maintain records with reference to the category-wise generation, collection, reception, storage, transportation, treatment and disposal of bio-medical waste.
- The annual reports are not being submitted by the HCFs under Ministry of Defence to the DGAFMS (prescribed authority) as per the provisions of the Bio-medical Waste (Management & Handling) Rules, 1998 as amended.
- Some of the hospitals have provided incinerator with single chamber and some were not in compliance with the standards prescribed under Schedule V of the Bio Medical Waste (Management & Hazardous) Rules.
- Waste segregation as well as transportation in some of the HCFs were found improper and not as per provisions of the Bio Medical Waste (Management & Hazardous) Rules.
- Some of the hospitals have not provided needle and syringe destroyer, shredder etc.
- No measures were taken to treat the liquid waste generated from the HCFs by some of the HCFs and all the liquid waste being allowed to discharge through the open sewage lines without giving specific treatment.

The observations made by the Central Pollution Control Board have already been communicated to the concerned authorities (i.e. SPCB / PCC and Director General in case of HCFs falling under Ministry of Defence) highlighting these issues and requested to take necessary action to ensure that the provisions of the Biomedical Waste (Management & Handling) Rules, 1998 as amended are complied with.

14.5.7 Verification of compliance of Directions issued to a Common Bio Medical Waste Treatment Facility (CBWTF) under Section 5 of the Environment (Protection) Act, 1986 in the matter of M/s. SembRamky Environmental Management Limited, Ghaziabad

In order to verify the compliance of Directions issued to M/s. SembRamky Environment Management Pvt. Ltd., Ghaziabad, under section 5 of the Environment (Protection) Act, 1986, Central Pollution Control Board (CPCB), Delhi and Regional Office, Uttar Pradesh Pollution Control Board (UPPCB), Ghaziabad conducted

inspection and carried out monitoring of the facility. The facility was found complying with most of the directions issued under section 5 of The Environment (Protection) Act, 1986 issued to the aforesaid facility. However, the said facility is further required to carry out necessary improvements in the light of the Biomedical Waste (Management & Handling) Rules as well as the guidelines issued by Central Pollution Control Board with reference to Common Bio-medical Waste Treatment Facilities.

14.5.8 Inspection of Common Bio-medical Waste Treatment Facilities (CBMWTF) in South Zone

In South Zone, there are 42 Common Biomedical Waste Treatment Facilities (CBMWTF), with incineration capacity ranging from 100 to 300 kg/hr. Maximum number of units are in operation in Karnataka (17) followed by Tamil Nadu (11), Andhra Pradesh (11), Goa (2) and Kerala (1). During the year 2008-09, three units have been were inspected.

Table 14.44: Common Bio Medical Waste Treatment Facilities in South Zone

State	No. of CBMWTF	Range of Incineration Capacity (Kg/hr)
Andhra Pradesh	11	100-260
Karnataka	17	100-200
Kerala	1	100
Goa	2	-
Tamil Nadu	11	250-300

14.5.9 Inspection of Common Bio-medical Waste Treatment Facilities in West Zone

The Central Pollution Control Board Western Zonal Office carried out the inspections in three health care establishments located in the states of Gujarat and Maharashtra, with the objective to monitor the compliance of the provisions of the Bio-medical Waste (Management & Handling) Rules, 1998, and made specific suggestions/ recommendations for improving the performance of the facilities based on the observations & assessment studies.

After the outbreak of hepatitis, few health care units at in Taluka Modasa, Dist. Sabarkanta, Gujarat were also visited along with Gujarat Pollution Control Board officials. It was observed that the most of the victims basically belonged to rural habitat, where lack of awareness, meager financial resources of people and negligence on part of medical practitioners are the key issues.

14.5.9 Inspection of Common Bio-medical Waste Treatment Facilities in North East Zone

A number of Health Care Units (HCUs), Common Bio Medical Waste Treatment Facilities (CBMWTF) and Hospitals were visited / inspected to assess the implementation of the Bio-Medical Waste (BMW) (Management and Handling) Rules, 1998 in the Health Care Units (HCUs) and the Common Bio Medical Waste Treatment Facilities (CBMWTF) of the North Eastern States, as detailed ahead:

- Health Care Units (HCUs) : Eighty three (83)
- Common Bio Medical Waste Treatment Facilities (CBMWTF) : Three (3)
- Hospitals under the Ministry of Defence : Seven (7)

It was observed that the above-mentioned Rules were not being implemented properly. Segregation of BMW at source is not practiced in most HCUs. In most HCUs the BMW was observed being mixed with non-BMW wastes. In most of the HCUs, open burning of BMW was observed. The necessary practice of needle and syringe destruction, mutilation/ shredding, and disinfection and sterilization, as per Rule 5 of Bio Medical Waste (Management & Handling) Rules, 1998 continues to be neglected at most HCUs. Most HCUs do not have a valid Authorization under the BMW Rules, 1998. Only few HCUs are maintaining the records of Bio Medical Waste handled and submitting their Annual Reports.

14.6 PLASTIC WASTE MANAGEMENT

14.6.1 Performance Study of Polymer Coated Roads

Plastic Tar road are being laid since 2002 at different places all over Tamil Nadu. Central Pollution Control Board in association with Thiagarajan College of Engineering has undertaken performance studies at the following roads:

1. Jambulingam Street, Chennai- 2002
2. Veerabhadhra Street, Erode- 2003
3. Vandiyur road, Madurai- 2004
4. Vilachery Road, Madurai- 2005
5. Canteen road, Thiagarajar College of Engineering, Madurai- 2006
6. Bitumen road (without plastics)-2002

The studies investigate the structural adequacy of pavements and other technical requirements for providing safe and comfortable traffic operations. Surface distress is a measure or indicator of the structural and resulting functional state of a pavement section and is generally given the prime importance by highway engineers. Physical distress is identified by the type, severity and extent of various distress modes or types. The pavements constructed or overlaid with waste plastic coated aggregate was evaluated functionally by conducting:

(1) the measurement of roughness using bump integrator / merlin
(2) measurement of skid resistance using portable skid resistance tester and
(3) structural evaluation of the pavement using deflection studies using benkelman beam instrument.

Table 14.45: Performance of Polymer Coated Roads at Tamilnadu

Road	Year laid	Unevenness (mm / km) / Roughness	Skid number/ Resistance	Sand Texture Depth (mm)	Field Density	Rebound Deflection (mm)/ Benkelman Beam
Jambulingam Street	2002	2700	41	0.63	2.55	0.85
Veerabadhra Street	2003	3785	45	0.70	2.62	0.60
Vandiyur road,	2004	3005	41	0.66	2.75	0.84
Vilachery Road, MDU	2005	3891	45	0.50	2.89	0.86
Canteen Road, TCE	2006	3100	45	0.65	2.86	0.86
Plain Bitumen Road	2002	5200	76	0.83	2.33	1.55
Tolerance Value*	------	4000	<65	0.6-0.8	2.86	0.5-1

Monitoring of test roads have been carried out using structural evaluation, functional evaluation and conditional evaluation studies. Generally all the roads laid over a period from year 2002 to 2006 are performing well. The results obtained for these roads helped to conclude that these roads are performing very well in spite of their age. Under the similar conditions, most of the bitumen roads performance not as good. These roads have not developed even small cracking or pothole. The roads are distributed over different localities of Tamil Nadu exposed to various environmental conditions like temperature, rainfall, etc., yet the roads have been performing well.

14.6.2 Evaluation of Biodegradable Plastics

A field survey cum study on “Establishment and Impact of Biodegradable Plastics on Environment/Food” has been undertaken by Central Pollution Control Board in association with Central Institute of Plastics Engineering & Technology (CIPET) Chennai, an Institution under the aegis of Department of Chemicals and Petrochemicals, Government of India. During the study, more than ten units were visited by the study team and samples such as poly bags, master batches/additives were collected from various hotels, restaurants, hospitals in and Delhi.

There are 5-6 degradable plastic film manufactures or processors who convert an additive based polyolefin compound into film and then into carry bags, pouches etc. However, these products are basically evolved out of “photo or oxo degradable” concept in which first stage degradation or fragmentation depends upon UV light/ sunlight exposure and in 2nd stage they are susceptible to degrade under compostable conditions unlike biodegradable plastics.

The analytical study-cum-testing results of degradable plastics in accordance with ASTM D5338/6400 revealed that they cannot be prescribed to as biodegradable plastics as per the minimum required criteria of 60% biodegradation in 45 days.

Further, there is wide variation in degradation percent of various samples. Hence, all these degradable plastics films are in the category of “Oxo/Photo degradable type. Since most of these degradable products collected and tested under the study could not meet the minimum criteria of biodegradability, they cannot be construed as biodegradable as per ASTM D5338/ 6400. Recently, ISO 17088:2008 has been adopted by Bureau of Indian Standard (BIS) under dual number which defines the criteria for biodegradable plastics under compostable conditions.

The biodegradable products / film provided by M/s Harita NTI, M/S Earth Soul India Pvt Ltd, M/s Arrow Coated Products etc meet the criteria of biodegradable plastics as per ASTM D5338/ 6400. However, all these companies are basically licensees of their principals abroad. These companies are not manufacturing biodegradable raw material indigenously. They get the basic raw material from their principals, M/s BASF Polymers, M/s Nova Mont etc. and they convert it into end product (mostly film and injection moulded products). Hence, all these Indian Industries are the processors of biodegradable plastics by Blown Film Extrusion/ Injection Moulding. As regards to the processibility of biodegradable plastics they can be processed in a conventional Blown Film Extrusion line or Injection Moulding with little adjustment in processing parameters.

The oxo-degradable plastic bags in compost environments can take several years to biodegrade depending on the amount of sunlight and oxygen exposure. Polyethylene plastic bags that are produced with starch additives also partially degrade over time as micro-organisms digests the starch, but leave the polyethylene intact. Oxo/Photo-degradable polymers break down into small fragments over time but are not considered biodegradable since they do not meet the degradation rate or the residual-free content specified in the ASTM D6400 standards. The plastics do disintegrate but leave small plastic fragments in the compost, which violates the ASTM D6400 standards. Degradation from biological sources is called biodegradation and is more accurately defined as compostable, which specifies that not only the plastic completely biodegrades but also that it is completely consumed in 180 days while being in a proper compost environment. The term compostable is regulated by ASTM standards and is a better term to use for plastics that biodegrade than the more general term biodegradable plastic.

14.6.3 Plastics waste disposal through Plasma Pyrolysis technology

Pyrolysis is a thermal decomposition process that takes place in oxygen starved environment. Plasma, the fourth state of matter formed by removing the bound electrons from the atoms, is an electrically conducting fluid consisting of charged and neutral particles. These charged particles have high kinetic energies. When the ionized species in the plasma recombine with the striped electron, significant amount of energy in the form of ultraviolet radiations are released. The particle kinetic energy takes the form of heat and can be used for decomposing chemicals. In addition, the presence of charged and excited species renders the plasma environment highly reactive, which can catalyzes homogenous and heterogeneous chemical reactions. In plasma pyrolysis the most likely compounds that form carbonaceous matter are

methane, carbon monoxide, hydrogen and carbon dioxide and water molecules. In this context, Central Pollution Control Board has undertaken a study in collaboration with Institute of Plasma Research, Gandhinagar (Gujarat).

During the preliminary trials which have been conducted with plastics waste by feeding (i) mixed waste (1:1 cotton and plastics) and (ii) 100% polythene waste in the Plasma Pyrolysis system. Emissions in the exhaust emissions were monitored. It has been observed that with 50 % cotton and 50 % plastics, all the emissions have been found within the emissions limits prescribed by Central Pollution Control Board. However, with 100% plastics, emissions of particulate matter in the exhaust emission was higher. The experiments being continued to optimize plasma pyrolysis process to bring down the particulate matter emissions.

14.6.4 Impact of Plastics Waste on Soil and Water

Plastics waste such as carry bags, laminated pouches, toys, coloured containers, other plastics products, multilayer pouches (shampoo, gutka, biscuits pouches etc) are littered and disposed along with the municipal solid waste (MSW). These waste are often dumped in the unlined Municipal Solid Waste sites and open land. Since, the sites are not lined, the garbage mixed with plastics may contaminate soil and ground water due to pollutants in the leachate. Further, garbage containing plastics when burnt may cause air pollution problems and particularly burning of plastics may emit polluting gases.

Plastics waste such as carry bags, pouches, packaging films, toys, gift items etc. contain colours, additives and chemicals including heavy metals and other chemicals such as; stabilizers, fillers and reinforcements, coupling agents, plasticizers, lubricants and processing aids, foaming agents, flame retardants, colorants, antistats and organic peroxides. Due to indiscriminate disposal of plastics waste and to assess its impact on soil and water, Central Pollution Control Board has undertaken a study in collaboration with Indian Institute of Toxicology Research (IITR), Lucknow on effects of plastics waste disposal (colours and additives) on soil and water quality in laboratory and dumpsites.

14.6.5 Co-processing of Plastic Wastes as fuel supplement in Cement Kiln

The disposal of plastic waste is ever increasing problem and no holistic approach could be developed. The plastic carry bags, laminated pouches (including Gutka pouches) and other non–recyclable plastics are littered throughout the city and deteriorate the aesthetic view. Littered plastics spoil beauty of the city and make many important public places filthy.

Keeping in view the problems associated with the disposal of plastic waste, Central Pollution Control Board initiated a study on “Co-processing of plastic waste as supplement fuel in cement kiln” in collaboration with the Indian Centre for Plastics in the Environment, Madhya Pradesh Pollution Control Board and the ACC Ltd., Kymore Cement Works, Madhya Pradesh. A trial run was conducted for co-processing of plastic waste as fuel supplement in cement kiln of M/s ACC Ltd., Kymore Cement Works, Madhya Pradesh. Various parameters monitored in the trial burn also included heavy metals, dioxins and furans, Total Organic Carbon in the kiln stack. In the study, no adverse impact on environment was observed. The

successful trial run of plastic waste co-processing in cement kiln at ACC Ltd., Kymore , has revealed that plastic waste disposal (recyclable / non-recyclable plastic) can be solved up to a great extent. The co-processing of plastic waste in cement kiln has emerged as the best environment friendly option for its disposal.

14.7 DEVELOPMENTS IN LABORATORIES

14.7.1 Elemental Analysis of Air Filters through Energy Dispersive X-Ray Flourescence (ED-XRF) Spectrophotometer

Energy Dispersive X-Ray Fluorescence (ED-XRF) Spectrometer undertakes non-destructive elemental analysis in environmental samples. The instrument has been commissioned at Instrumentation Laboratory of Central Pollution Control Board, Delhi during January, 2007. The highly sophisticated instrument is the first of its kind in the country for non-destructive elemental analysis in Suspended Particulate Matter (SPM) fractions of PM_{10} and $PM_{2.5}$ of ambient air.

ED-XRF Spectrophotometer

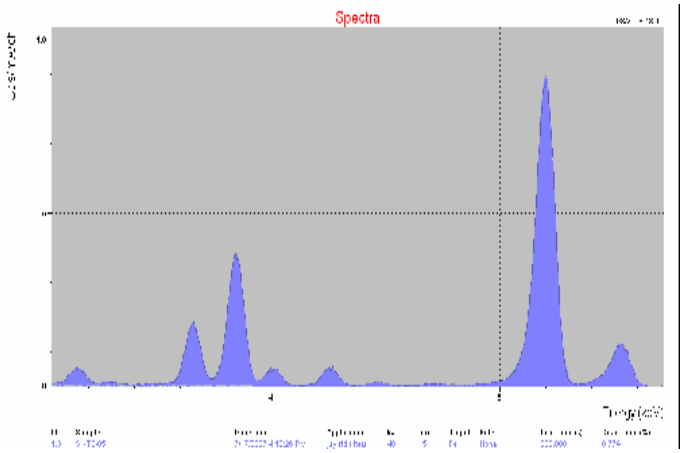


Fig. 14.9: X-Ray Spectrum with Fe Secondary Target of an Ambient Air Particulate Sample

The measurement of the elemental composition of the particulate matter is important in view of understanding the long term health effects of particulates. The particles of aerodynamic diameter of <10 and 2.5 µm (i.e. PM_{10} & $PM_{2.5}$) can be inhaled into the respiratory system, which will have adverse effects on health. The trace elemental analysis of air filter was set up according to EPA method IO-3.3. The instrument has been calibrated with 42 air filter reference standards of different elements procured from M/s Micromatter Co., USA. The instrument software features a very powerful de-convolution algorithm, which analyzes the sample spectrum and determines net intensities of element peaks, even when the peaks overlap one another. The extremely low background is a consequence of 3-dimensional optical path.

Detection limits are an important measure of an instrument`s performance. The detection limits for this application has been calculated undertaking 20 replicate measurements of a Teflon blank sample and are based on 3 sigma. The detection limits determined for 42 elements in air particulate filter samples are presented in Table 1.

Table 14.46: Elements and their detection limits (3 sigma) for particulate matter on air filters using EDXRF

S. No.	Element	Symbol	Detection limit in $\mu g/cm^2$	S. No.	Element	Symbol	Detection limit in $\mu g/cm^2$
1.	Sodium	Na	3.2599	22.	Arsenic	As	0.0012
2.	Magnesium	Mg	1.5188	23.	Selenium	Se	0.0019
3.	Aluminium	Al	0.0824	24.	Bromine	Br	0.0048
4.	Silicon	Si	0.0509	25.	Rubidium	Rb	0.0020
5.	Phosphorus	P	0.0068	26.	Strontium	Sr	0.0129
6.	Sulphur	S	0.0169	27.	Yttrium	Y	0.0080
7.	Chlorine	Cl	0.0152	28.	Molybdenum	Mo	0.0054
8.	Potassium	K	0.0048	29.	Rhodium	Rh	0.0219
9.	Calcium	Ca	0.0037	30.	Palladium	Pd	0.0227
10.	Scandium	Sc	0.0031	31.	Silver	Ag	0.0170
11.	Titanium	Ti	0.0047	32.	Cadmium	Cd	0.0258
12.	Vanadium	V	0.0014	33.	Tin	Sn	0.0223
13.	Chromium	Cr	0.0023	34.	Antimony	Sb	0.0274
14.	Manganese	Mn	0.0048	35.	Tellurium	Te	0.0297
15.	Iron	Fe	0.0061	36.	Iodine	I	0.0161
16.	Cobalt	Co	0.0018	37.	Caesium	Cs	0.0395
17.	Nickel	Ni	0.0022	38.	Barium	Ba	0.0362
18.	Copper	Cu	0.0034	39.	Lanthanum	La	0.0671
19.	Zinc	Zn	0.0045	40.	Tungsten	W	0.0514
20.	Gallium	Ga	0.0134	41.	Gold	Au	0.0173
21.	Germanium	Ge	0.0083	42.	Lead	Pb	0.0054

During the year 2008-2009, about 470 ambient air particulate filter samples (PM_{10} and $PM_{2.5}$) collected from various cities in the country under Source Apportionment project studies, have been analyzed for multi-elements using ED-XRF and results reported for finalization of reports.

14.7.2 Monitoring of Stationary Emission Sources for Assessment of Dioxins and Furans (PCDDs & PCDFs)

The National Reference Trace Organics Laboratory (NRTOL) of Central Pollution Control Board has undertaken extensive monitoring of stationary emission sources as below for assessment of levels of dioxin – furan (PCDDs & PCDFs) in emissions:

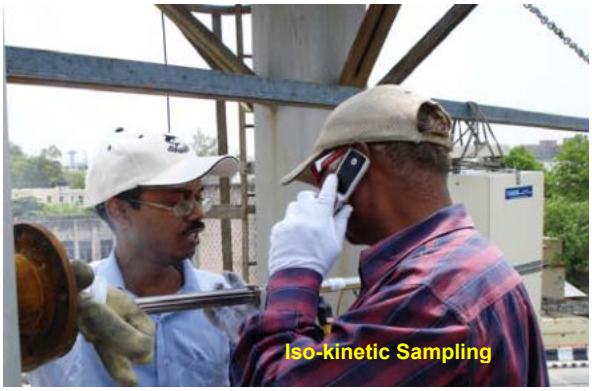
- Bio-medical Waste Incinerator, AIIMS, Delhi (May 2008 & February 2009).
- Process Waste Incinerator of Pharmaceutical Industry, Paonta Sahib, H.P. (May 2008).
- Bharuch Enviro Infrastructure Ltd., (BEIL), Ankleshwar, Gujarat (January 2009).
- Gujarat Enviro Protection Infrastructure Ltd., (GEPIL), Surat, Gujarat (January 2009)

Table: 14.47: Stationary Emission Sources Monitored at Waste Incinerators

			Waste Incinerators						
			Medical		Pharma	TSDF-G		TSDF-B	
			May '2008	Feb. '2009	May '2008	January '2009		January '2009	
						Sample -1	Sample - 2	Sample -1	Sample - 2
No	Isomer	Compound				pg I-TEQ/m3			
1	2378	T4CDD	86.416	369.263	19.971	ND	ND	8.445	11.856
2	12378	P5CDD	66.061	649.996	15.457	ND	ND	12.773	21.343
3	123478	H6CDD	3.276	40.375	0.962	0.988	0.649	1.905	3.766
4	123678	H6CDD	13.104	58.982	3.857	2.787	1.944	4.145	7.242
5	123789	H6CDD	10.036	73.503	2.964	1.492	1.022	2.916	4.886
6	1234678	H7CDD	5.977	19.746	2.509	0.703	0.409	1.700	4.789
7	12346789	O8CDD	0.540	1.423	0.301	0.206	0.141	0.523	1.819
8	2378	T4CDF	41.198	164.967	14.686	ND	ND	5.114	6.170
9	12378	P5CDF	21.447	154.688	5.346	ND	ND	2.515	3.412
10	23478	P5CDF	182.879	1725.091	52.784	ND	ND	55.974	71.091
11	123478	H6CDF	22.018	286.822	6.264	ND	ND	9.265	19.656
12	123678	H6CDF	22.981	302.161	6.790	ND	ND	10.231	19.596
13	234678	H6CDF	15.876	288.178	4.896	ND	ND	17.340	35.064
14	123789	H6CDF	3.680	117.889	1.286	ND	ND	7.590	12.993
15	1234678	H7CDF	2.430	49.888	0.980	1.006	0.609	6.201	16.215
16	1234789	H7CDF	0.426	14.602	0.155	0.230	ND	0.570	1.417
17	12346789	O8CDF	0.052	1.212	0.023	0.132	0.053	0.491	1.663
Total	**PCDDs/PCDFs**		**498.397**	**4318.784**	**139.231**	**7.543**	**4.826**	**147.699**	**242.978**

Isokinetic Stack Monitoring Kit for Dioxin / Furan Monitoring

Monitoring of Dioxin / Furan in Source Emission at various Industrial Stacks



14.7.3 Trace Metal Characterization of Solid and Hazardous Wastes using Inductively Coupled Plasma – Optical Emission Spectrophotometer (ICP-OES)

Untreated or partially treated municipal solid waste and industrial solid wastes (MSW and ISW) containing toxic trace metals are often dumped on soil at dumping sites in vicinity of urban areas. Waste and industrial solid wastes may contain various toxic and hazardous metals such as Al, As, Cd, Cr, Cu, Fe, Ni, Pb, Se, Sb, Co, V and Zn etc. The trace metals studies of solid and hazardous wastes of various industries such as electroplating, textile, tannery, refinery etc. have been the area of particular concern imposing priority research on availability, behaviour and fate of trace metals in the environment.

Various methods such as colorimeter, polargraphic, atomic absorption spectrophotometer, inductively coupled plasma etc. are adopted for detection and measurement of trace metals in environmental samples. The trace metals analysis using ICP-OES is a relatively simple, versatile and accurate technique free from interferences.

In order to assess the metallic constituents of solid and hazardous wastes trace metals detection has been undertaken by destructive analysis technique using Inductively Coupled Plasma Spectrometer. The environmental samples have been subjected to analysis various toxic and hazardous metals such as As, Cd, Cr, Cu, Fe, Ni, Pb, Se, Sb, Co, V and Zn etc. on ICP-OES and results reported.

14.7.4 Participation of CPCB Laboratories in International proficiency Testing (PT) Programme conducted by New York State Department of Health, USA

In order to ensure analytical quality, the CPCB laboratories at HQs, Zonal OfficeKolkata and Zonal Office Lucknow participated in Proficiency Testing Programme organized by New York State Dept. of Health, Wadsworth Centre, Environmental Laboratory Approval Programme, Albany New York for Proficiency Test of samples related with Potable water Chemistry, Non Potable Water Chemistry, Solid and Hazardous Waste, Potable and Non Potable Water Bacteriology.

Table 14.48: Results of Participation of CPCB HQs Laboratory in International Proficiency Testing (PT) Programme

Analyte	Result Reported by CPCB Laboratories (mg/l)	Acceptance Limit of PT Provider (mg/l)	PT Score
Non-Potable Water Chemistry			
Biochemical Oxygen Demand , mg/l	65.00	46.3-137	Satisfactory
Chemical Oxygen Demand, mg/l	115.00	114-171	Satisfactory
Solids, Total Suspended, mg/l	57.00	47.5-67.8	Satisfactory
Solids, Total, mg/l	154.00	246-322	Unsatisfactory
Hydrogen Ion (pH) , mg/l	8.10	8.18-8.58	Unsatisfactory
Alkalinity, mg/l	95.50	74.9-93.4	Unsatisfactory
Ammonia (as N) , mg/l	14.60	8.76-14.7	Satisfactory
Nitrate (as N) , mg/l	2.43	1.84-2.88	Satisfactory

Analyte	Result Reported by CPCB Laboratories (mg/l)	Acceptance Limit of PT Provider (mg/l)	PT Score
Orthophosphate (as P) , mg/l	3.38	3.25-4.68	Satisfactory
Chloride, mg/l	95.50	76.1-101	Satisfactory
Sulfate (as SO_4) , mg/l	66.90	53.1.-74.1	Satisfactory
Oil & Grease, mg/l	20.10	24.8-50.5	Unsatisfactory
Arsenic, Total, µg/l	790.00	559-778	Unsatisfactory
Cadmium, Total, µg/l	350.00	265-354	Satisfactory
Chromium, Total, µg/l	80.00	65.5-89.9	Satisfactory
Copper, Total, µg/l	570.00	505-611	Satisfactory
Iron, Total, µg/l	1170.00	990-1260	Satisfactory
Lead, Total, µg/l	2680.00	2190-2760	Satisfactory
Manganese, Total, µg/l	710.00	600-743	Satisfactory
Nickel, Total, µg/l	1540.00	1300-1600	Satisfactory
Selenium, Total, µg/l	1830.00	1250-1820	Unsatisfactory
Thallium, Total, µg/l	210.00	94.1-189	Unsatisfactory
Zinc Total, µg/l	640.00	485-651	Satisfactory
4,4'-DDD, µg/l	2.16	1.36-5.14	Satisfactory
4,4'-DDE, µg/l	3.49	3.18-9.25	Satisfactory
4,4'-DDT, µg/l	7.68	2.78-10.5	Satisfactory
Alpha-BHC, µg/l	6.61	3.48-10.8	Satisfactory
Aldrin, µg/l	4.52	2.75-13.5	Satisfactory
Beta-BHC, µg/l	3.85	1.87-6.33	Satisfactory
Delta-BHC, µg/l	5.87	2.5-9.48	Satisfactory
Dieldrin, µg/l	6.71	4.4-12.2	Satisfactory
Endosulfan I, µg/l	4.84	2.62-13.2	Satisfactory
Endosulfan II, µg/l	10.20	3.58-15.3	Satisfactory
Endosulfan sulfate, µg/l	4.48	1.61-6.38	Satisfactory
Heptachlor, µg/l	3.34	1.09-4.62	Satisfactory
Specific Conductance, µmhos/cm	676.00	613-741	Satisfactory
Chromium VI, µg/l	554.00	465-672	Satisfactory
Calcium Hardness, mg/l	228.00	200-252	Satisfactory
Calcium, Total, mg/l	91.30	80.1-101	Satisfactory
Hardness, Total, mg/l	310.00	277-356	Satisfactory
Magnesium, Total, mg/l	20.00	18.8-25.3	Satisfactory
PCB-1248, µg/l	2.9139	1.62-5.49	Satisfactory
Solids, Total Dissolved, mg/l	203.00	265-435	Unsatisfactory
Nitrite (as N) , mg/l	0.82	0.742-1.11	Satisfactory
Solid Waste Chemistry			
Antimony, Total, mg/kg	72.00	12.1-137	Satisfactory
Arsenic, Total, mg/kg	79.00	55.9-107	Satisfactory
Cadmium, Total, mg/kg	75.00	54.8-95	Satisfactory
Chromium, Total, mg/kg	93.00	64.7-122	Satisfactory
Cobalt, Total, mg/kg	92.00	75.1-127	Satisfactory
Copper, Total, mg/kg	122.00	97.4-163	Satisfactory
Iron, Total, mg/kg	25400.00	10500-34300	Satisfactory
Lead, Total, mg/kg	122.00	116-198	Satisfactory
Manganese, mg/kg mg/l	596.00	704-1090	Unsatisfactory
Mercury, Total, mg/kg	3.89	2.39-6.99	Satisfactory

Analyte	Result Reported by CPCB Laboratories (mg/l)	Acceptance Limit of PT Provider (mg/l)	PT Score
Molybdenum, Total, mg/kg	81.00	54-103	Satisfactory
Nickel, Total, mg/kg	77.60	55.5-100	Satisfactory
Selenium, Total, mg/kg	107.00	78.7-159	Satisfactory
Zinc, Total, mg/kg	180.00	110-212	Satisfactory
PCB-1254, mg/kg	0.7658	1.04-7.5	Unsatisfactory
4,4'-DDD, µg/kg	153.46	90.4-378	Satisfactory
4,4'-DDE, µg/kg	130.87	65.8-282	Satisfactory
4,4'-DDT, µg/kg	186.61	65.6-384	Satisfactory
Alpha-BHC, µg/kg	152.32	53.1-261	Satisfactory
Aldrin, µg/kg	126.96	81.3-361	Satisfactory
Beta-BHC, µg/kg	370.99	82.8-567	Satisfactory
Delta-BHC, µg/kg	455.83	108-570	Satisfactory
Dieldrin, µg/kg	261.62	112-416	Satisfactory
Endosulfan I, µg/kg	163.73	86.7-363	Satisfactory
Endosulfan sulfate, µg/kg	369.86	66-438	Satisfactory
Heptachlor, µg/kg	300.86	105-471	Satisfactory
Lindane, µg/kg	178.67	58.5-312	Satisfactory
Potable Water Chemistry			
Alkalinity mg/l	58.9	54.4-63.4	Satisfactory
Chloride mg/l	76.6	69.5-83.6	Satisfactory
Fluoride Total mg/l	5.39	4.94-6.04	Unsatisfactory
Nitrate (as N) mg/l	4.71	4.34-5.3	Satisfactory
Orthophosphate (as P) mg/l	2.18	1.89-2.47	Unsatisfactory
Sulfate (as SO4) mg/l	115	101-128	Unsatisfactory
Calcium Hardness mg/l	117	104-130	Satisfactory
Hydrogen Ion (pH)	8.44	8.34-8.74	Unsatisfactory
Cyanide Free mg/l	0.338	0.29-0.479	Satisfactory
Arsenic, Total, µg/l	16.7	11.7-21.7	Satisfactory
Cadmium, Total, µg/l	21.6	17.4-26	Satisfactory
Chromium, Total, µg/l	141	119-161	Satisfactory
Copper, Total, µg/l	736	660-806	Satisfactory
Iron, Total, µg/l	696	619-772	Satisfactory
Lead, Total, µg/l	33.3	23.4-43.4	Satisfactory
Manganese, Total µg/l	183	165-201	Unsatisfactory
Mercury, Total, µg/l	1.63	1.17-2.17	Satisfactory
Nickel, Total, µg/l	162	136-184	Unsatisfactory
Zinc, Total, µg/l	839	748-914	Satisfactory
Aldrin µg/l	1.26	0.63-1.89	Satisfactory
Dieldrin µg/l	1.34	0.86-1.82	Satisfactory
Hexachlorobenzene µg/l	1.32	0.69-1.95	Satisfactory
Heptachlor µg/l	2.53	1.67-4.39	Satisfactory
Lindane µg/l	1.71	1.03-2.73	Satisfactory
Benzo(a)pyrene µg/l	1.82	0.91-2.72	Satisfactory
Bromodichloromethane µg/l	29.8	23.1-34.7	Unsatisfactory
Bromoform µg/l	14.7	11.9-17.9	Unsatisfactory
Chloroform µg/l l	40.8	32.2-48.4	Unsatisfactory
Dibromochloromethane µg/l	43.7	34.2-51.4	Unsatisfactory

Analyte	Result Reported by CPCB Laboratories (mg/l)	Acceptance Limit of PT Provider (mg/l)	PT Score
Specific Conductance µmho/cm	894	815-997	Unsatisfactory
PCB Screen µg/l	1242	-	Satisfactory
Nitrite (as N) mg/l	1.6	1.37-1.85	Satisfactory
Solids, Total Dissolved mg/l	394	253-535	Satisfactory
Calcium, Total mg/l	50.7	45.1-56.3	Satisfactory
Potassium, Total mg/l	17	14.4-19.6	Satisfactory
Magnesium, Total mg/l	11.6	10.4-12.8	Unsatisfactory
Sodium, Total mg/l	21.3	19-23.7	Satisfactory
Organic Carbon, Total mg/l	1.47	1.13-1.81	Satisfactory
Non-Potable Water Chemistry			
Arsenic, Total µg/kg	107	74.4-140	Unsatisfactory
Cadmium, Total µg/kg	186	136-236	Satisfactory
Chromium Total µg/kg	63.3	43.1-83.5	Satisfactory
Copper, Total µg/kg	127	95.1-159	Satisfactory
Iron, Total µg/kg	18800	8080-29500	Satisfactory
Lead, Total µg/kg	74.3	50.8-97.8	Satisfactory
Manganese, Total µg/kg	623	485-761	Satisfactory
Mercury, Total µg/kg	6.11	3.13-9.09	Satisfactory
Nickel, Total µg/kg	176	130-222	Satisfactory
Zinc, Total µg/kg	164	112-216	Satisfactory
PCB-1248 µg/kg	16	4.89-27.1	Satisfactory
4,4'-DDD µg/kg	223	85-361	Satisfactory
4,4'-DDE µg/kg	326	135-517	Satisfactory
4,4'-DDT µg/kg	174	49-299	Satisfactory
Aldrin µg/kg	262	97.4-427	Satisfactory
alpha-BHC µg/kg	277	101-453	Satisfactory
beta-BHC µg/kg	342	87.8-596	Satisfactory
delta-BHC µg/kg	423	139-707	Satisfactory
Dieldrin µg/kg	382	170-594	Satisfactory
Endosulfan I µg/kg	327	133-626	Satisfactory
Endosulfan II µg/kg	242	85.2-399	Satisfactory
Endosulfan sulfate µg/kg	318	85.2-551	Satisfactory
Heptachlor µg/kg	299	109-489	Satisfactory
Lindane µg/kg	200	64.7-335	Satisfactory
Potable and Non-potable Water Bacteriology			
Sample 1 – Total Coliform	+	+	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 2 – Total Coliform	+	+	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 3 – Total Coliform	-	-	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 4 – Total Coliform	+	+	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 5 – Total Coliform	-	-	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 6 – Total Coliform	-	-	Satisfactory

Analyte	Result Reported by CPCB Laboratories (mg/l)	Acceptance Limit of PT Provider (mg/l)	PT Score
- E. Coli	-	-	Satisfactory
Sample 7 – Total Coliform	+	+	Satisfactory
- E. Coli	+	+	Satisfactory
Sample 8 – Total Coliform	+	+	Satisfactory
- E. Coli	+	+	Satisfactory
Sample 9 – Total Coliform	-	-	Satisfactory
- E. Coli	-	-	Satisfactory
Sample 10 – Total Coliform	+	+	Satisfactory
- E. Coli	+	+	Satisfactory
P W Stand Plate Count	56	44-83	Satisfactory
N W Total Coliform - MF	500	256-987	Satisfactory
N W Fecal Coliform - MF	720	457-1950	Satisfactory

14.7.5 Evaluation and Recognition of Environmental laboratories under the Environment (Protection) Act, 1986

Central Pollution Control Board in association with Ministry of Environment & Forests had developed Guidelines for Evaluation & Recognition of Environmental Laboratories under Laboratory Analytical Technical Series: LATS/9/2005-2006. The document posted at CPCB and MoEF websites (cpcb.nic.in / envfor.nic.in).

The Guidelines were circulated to all SPCBs / PCCs for inviting comments. The comments received from SPCBs/PCCs were reviewed and necessary amendments were made and the document has been finalized for adoption with some minor changes. An Expert Committee has been constituted on 28th January, 2009 at Central Pollution Control Board for recognition of environmental laboratories under the Environment (Protection) Act, 1986 comprising member of MoEF, CPCB and external experts. Meeting of Expert Committee are being held every month for review and assessment of recognition cases under The Environment (Protection) Act, 1986. The New/Renewal cases of Government and private laboratories for recognition as environmental laboratory as well as joint inspection reports are examined by the expert committee.

Central Pollution Control Board has participated in joint inspection with Ministry of Environment & Forests for the following private Environmental laboratories for consideration of their recognition under The Environment (Protection) Act, 1986.

(i) M/s Industrial testing Laboratory and Consultancy House, Patiala, Punjab.
(ii) M/s Nuchem limited, Mathura Road, Faridabad, Haryana
(iii) M/s Analytica Ecolabs Pvt. Ltd., Gwalior, M.P.
(iv) M/s Hitech Research Centre, Okhla, New Delhi
(v) M/s Unistar Environmental and Research Lab Pvt. Ltd., Vapi, Gujarat
(vi) M/s Detox Corporation Pvt. Ltd., Surat, Gujarat

14.7.6 Strengthening of State Pollution Control Boards' Laboratories

The proposals received from various State Pollution Control Boards through Ministry of Environment & Forests for financial assistance for strengthening of laboratories have been reviewed and suggestions provided to make the proposals comprehensive

to facilitate funding of the proposal by Ministry of Environment & Forests, New Delhi. The proposals from following State Pollution Control Boards have been examined and reviewed during the year:

- Kerala State Pollution Control Board
- Karnataka State Pollution Control Board
- Nagaland State Pollution Control Board
- Goa State Pollution Control Board
- Department of Science & Technology & Environment – Puducherry Pollution Control Board
- Gujarat State Pollution Control Board
- Uttar Pradesh State Pollution Control Board
- Madhya Pradesh State Pollution Control Board
- Orissa Pollution Control Board
- Mizoram State Pollution Control Board
- Sikkim State Pollution Control Board

14.7.7 Analytical Quality Control (AQC) for Central and State Pollution Control Boards' Laboratories recognized under the E.P. Act 1986

The Central Pollution Control Board (CPCB) is monitoring 1019 water quality monitoring stations under GEMS, MINARS, GAP and YAP Programmes comprising rivers, lakes, wells, and ground waters spread over 27states and 6 Union Territories through various State Pollution Control Boards (SPCB). In order to obtain reliable and accurate analytical data, CPCB is regularly conducting organized Analytical Quality Control (AQC) exercise for laboratories of SPCBs / PCCs, recognized under The Environment (Protection) Act, 1986. This exercise was started in the year 1991 with 20 laboratories and during year 2008, 155 laboratories are covered under this project. As on date 24 rounds of exercises have been conducted and performance reports communicated to the participating laboratories. There are 30 phsico-chemical parameters including heavy metals covered under this scheme. The performance of the laboratories in the 24th Exercise for physico-chemical parameters varied from 69.3% to 82.1% (Fig. 14.10).

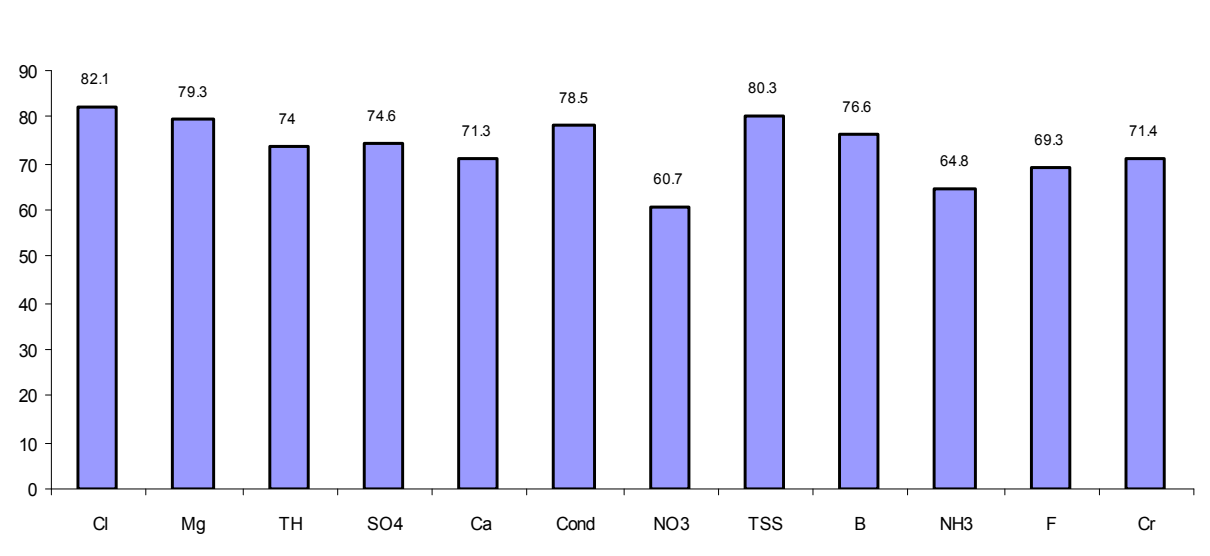


Fig. 14.10: Percentage Performance of Laboratories for different Parameters participated in 24th AQC during July, 2008

14.7.8 Standardization of Analysis of Soil & Solid Waste Samples

The Municipal Solid wastes (Management and Handling) Rules, 2000 and also the Hazardous Waste (Management and Handling) Rules, 2008 (Amendment) notified under The Environment (Protection) Act, 1986 require to carry out analysis and characterization of the solid wastes. A project has been taken up to standardize the analysis of soil (polluted) and solid waste samples with a focus on conducting AQC exercises for the laboratories of State Pollution Control Boards / Pollution Control Committees (Fig. 14.11).

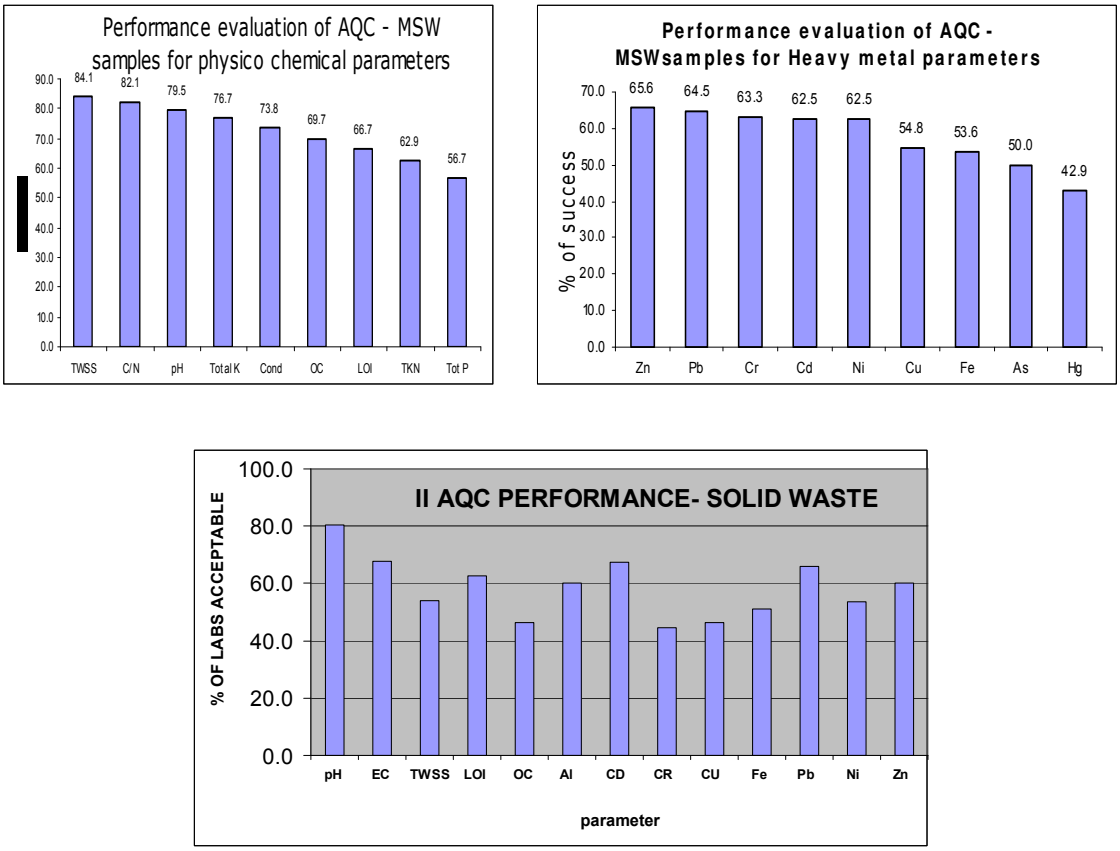


Fig. 14.11: Performance of Laboratories in AQC conducted for various Physico-chemical and Heavy metals parameters in Solid Waste

14.7.9 Laboratory Activities at Central Pollution Control Board East Zone Office

The Central Pollution Control Board Zonal Office laboratory – Kolkata is equipped with several sophisticated instruments like GC, AAS, AOX, IC etc. for the analysis of environmental parameters of water, air and soil samples under various projects. The laboratory also takes part in the AQC conducted by CPCB, MALE Authority and Environmental Laboratory Approval Program Wadsworth Center, New York State Department of Health and the success rate is more than 90% on average. The total numbers of samples collected and analyzed in the laboratory during the year 2008-2009 are presented in Table 14.49.

Table 14.49: Samples analyzed at Central Pollution Control Board Zonal Office, Kolkata Laboratory

Total number of Samples collected		Total parameters analyzed
Ambient Air	1252	16528
Stack	72	342
Waste Water	315	1921
Ground Water	196	3186
Surface Water	193	2363
Proficiency Test Sample	57	192
Sediment	35	242
Rain Water	10	110
Total	**2130**	**24884**

14.7.10 Laboratory Activities at Central Pollution Control Board West Zone Office

The Central Pollution Control Board Zonal Office Laboratory analyzed the following samples during the year:

- Water & wastewater: 322 Nos.
- Sludge: 34 Nos.
- Ambient air: 100 Stations operated
- Stack emissions: 98 stacks monitored
- Fugitive emissions: 54 stations operated
- Noise monitoring: 192 locations monitored

14.7.11 Laboratory Activities at Central Pollution Control Board South Zone Office

Environmental laboratory of Central Pollution Control Board South Zonal office – Bangalore is an Environment (Protection) Act, 1986 approved laboratory. It is strengthened with highly sophisticated instruments such as Gas Chromatograph, Ion Chromatograph, AAS, and AOX Analyzer besides the general equipments and instruments for water, air and soil analysis. For hazardous wastes analysis, it is equipped with TCLP extraction for volatiles and non-volatile components and microwave digestion system. The laboratory is preparing for accreditation as per ISO-17025 under National Accreditation Board for Laboratories. The Standard Operating Procedure (SOP) and Test Methods for analysis have been prepared. The numbers of samples analyzed at the laboratories during the year are presented ahead.

Samples analyzed in Zonal Office, Bangalore Laboratory

S. No.	Matrix	Nos.
1.	Water	360
2.	Ambient Air Quality Monitoring	159
3.	Source Emission Monitoring (Stack)	51
4.	Solid/hazardous wastes	65

14.8 NOISE POLLUTION CONTROL

A. Generator sets

1) Development of emission and noise standards for LPG/CNG generator sets have been taken up.
2) Revision of emission standards for petrol/kerosene generator sets and diesel generator sets have been taken up.

B. Noise Pollution

1) 'Requirement and Procedure for measurement of Ambient Noise level due to aircraft', has been prepared with the help of National Committee on Noise Pollution Control and published. The document is available at CPCB website.

2) The ambient noise levels in residential areas at eight locations along major roads in Delhi have been monitored since last four years.

14.9 VEHICULAR POLLUTION CONTROL

Automobile Pollution Control initiatives included marked enforcement of a variety of control measures ranging from notification of advanced Euro-IV equivalent emission norms and commensurate fuel for new vehicles to stricter exhaust emission limits for in-use vehicles, augmentation of infrastructures for alternative fuels, mass transits and other urban planning and management options. The implementation of the road map as recommended by the Auto Fuel Policy of India has been continued for implementation. The vehicular pollution control framework in the country has now shifted its focus towards integrated control and management options and has extended its domain to cover all major metro cities. Important measures pertaining to vehicular pollution control initiated during the year are as follows:

Mass Emission Standards

Mass emission standards are the primary technical policy for controlling emissions from vehicles. The Motor Vehicle Act, 1988, and the Central Motor Vehicles Rules (CMVR), 1989, are the principal instruments for regulation of motor vehicular traffic /emissions throughout the country. The implementation of various provisions of this Act rests with the state governments. The Ministry of Shipping, Road Transport and Highways (MoSRTH) acts as a nodal agency for the formulation and implementation of various provisions of the Motor Vehicle Act and CMVR.

- Mass Emission Standards - Bharat Stage IV (equivalent to Euro IV standards) have been notified for all categories of 4-wheelers to be implemented from 1st April, 2010 in 11 cities - Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad, Pune, Surat, Kanpur and Agra .

- Mass Emission Standards - Bharat Stage III (equivalent to Euro III standards) have been notified for all categories of 4-wheelers to be implemented from 1st April, 2010 in rest of the country,.

- Mass Emission Standards -Bharat Stage III have been notified for 2- & 3-wheelers to be implemented from 1st April, 2010 all over the country.

Fuel Quality Specifications

- Auto-Fuels commensurate to Euro III (whole country) and Euro IV (for 11 cities) specifications is proposed to be made available in the respective cities from 1st April, 2010.

- The Research Octane Number (RON) for premium petrol available in 11 mega cities has been boosted to 95 with lead content being reduced to 0.005 g/l and benzene content of maximum 1%. From 1st April, 2010, the content of sulphur in gasoline is proposed to be reduced to 0.005% (50 mg/kg) from existing 0.015% (150 mg/kg). However, all over the country, content of sulphur in gasoline is proposed to be 0.015% (150 mg/kg) with effect from 01.04.2010.

- For diesel the Cetane Number has been enhanced to 51 with Sulphur content proposed to be reduced further to 0.005 % (50 mg/kg) in the 11 mega cities by 1st April, 2010. The amount of sulphur in diesel is proposed to be 0.035% (350 mg/kg) all over the country
- Important fuel specification of Diesel and Gasoline as available in metro cities from 1st April, 2010 are as follows:

Table 14.50: Fuel Specifications of Diesel and Gasoline

Fuel Specifications	Requirements
DIESEL	
Cetane Number (CN), min	51
Total Sulphur, max	0.005 % (50 mg/kg)
Distillation , 95% vol. recovery at 0°C, max	360 °C
Polycyclic Aromatic Hydrocarbon (PAH), max	11 % mass
GASOLINE	
Research Octane number (RON), min	95
Reid Vapour pressure (RVP), max	60 kpa
Benzene content, max	1% Volume
Lead content (as Pb),max	0.005 g/l
Sulphur, total, max	0.005 % (50 mg/kg)
Aromatics content, max	35 % volume
Oxygen content, max	2.7 % volume

In-Use Vehicles

- The tourist transport operators shall not engage or use any vehicle for the purpose of journey, the origin and destination of which falls within the National Capital Region (NCR), unless such vehicle conforms to the mass emission standards (Bharat Stage III), notified vide GSR 58(E) dated January 30, 2009.

- MSRTH has constituted a task force to introduce auditing system in PUC centers all over the country, to look into various aspects related to procedure, implementation and suggest effective institutional mechanism for the same, in which Central Pollution Control Board is one of the members.

Alternate Fuels - Initiatives

There has been lot of developments in this front, when various organizations including the Planning Commission, Oil Companies, Auto Sectors, Central Pollution Control Board and other research agencies initiated various demonstration and feasibility studies with alternative fuels like LPG and bio-diesel (B20) in the country. Some of the developments are depicted below:

- Bio-fuels mainly Ethanol and Biodiesel (in B20 form) are the prospective options for the country. Pilot studies on ethanol and biodiesel have been completed and many are on-going.

- Efficacy of B20 biodiesel from Jatropa feedstock has been established and experiences gained through some pilot studies. Introduction of biodiesel starting with lower blends like B5, B10, etc. is a possibility now.

- In Kolkata all three wheelers have been ordered to switch over to LPG mode from September, 2005 vide notification No. 2421-WT/3M-73/2005 dated May 24, 2005.

- Besides Delhi & Mumbai, the supply of CNG as automotive fuel has been extended to the cities of Ankleshwar, Vadodra & Surat in Gujarat and Kanpur, Barally, Agra & Lucknow in Uttar Pradesh. The total CNG vehicles in the country touching over 3.54 Lakh, as per the industry estimates.

- Work is on to introduce bio-diesel in the form of B20 as an automotive fuel. Several research studies and field trials have been initiated by Organizations like –IITs, IOC, Mercedes, Railways, etc. Already "*Jatropha Carcus*" has been identified and earmarked to be the prominent source of biodiesel in the country.

- Efforts for developing and popularizing electric vehicles also gained momentum during this year. Already "Reva Motors" have commercialized a small electric/battery car. Many three-wheeler manufacturers are also contemplating electric driven OEM for Indian markets.

Other Measures

- Various traffic management options have been adopted by many cities. Governments to deal with the increasing vehicle population and to ensure smooth

traffic flow. Synchronized traffic lightings with timers, bus-only lanes, parking area demarcation, etc. are few steps initiated in many metro cities.

- Bus Rapid Transit System (BRTS) aims at segregation of traffic in various lanes, according to type of vehicles. Through BRTS it is expected that the hindrance caused to speed of fast moving vehicles by speed of slow moving vehicles will overcome and mass transit vehicles i.e. buses will move in optimal way. In Delhi, BRTS has been operationalised in first segment of a corridor during year 2008. The second segment of this corridor is under construction. It is also proposed to expand BRTS to other corridors of the city in a phased manner.

- Road-infrastructure development, management and by-passing of inter- state vehicles, parking restrictions, etc. are other measures being adopted in the cities. Cities like Delhi, Mumbai, Kolkata, Pune etc. have constructed many flyovers and multi-lane roads to ease traffic congestion.

- The Delhi metro line has been extended to various stretches of Delhi for catering more people, thereby promoting use of mass public transport system. Other cities are also exploring to start work on Metro Development and other mass transport systems.

- Interstate trucks which are not destined to Delhi are not allowed to ply within the city limits.

Vehicular Pollution Control - On-Going Studies

Action plan for Controlling Air Pollution in Polluted cities

At present Central Pollution Control Board is reviewing Action plans of seven cities out of the sixteen cities identified by the Hon'ble Supreme Court of India (Out of 16 cities 7 cities namely Agra, Varanasi, Jharia, Patna, Jodhpur, Faridabad & Pune are looked after by Central Pollution Control Board, while other 7 cities namely Lucknow, Kanpur, Sholapur, Hyderabad, Chennai, Bangalore, Ahmedabad are looked after by Environment Pollution Control Authorities and remaining two i.e. Kolkata and Mumbai are reviewed by respective High Courts).

Nation-wide Assessment of Vehicular Pollution Control Measures

For control of vehicular pollution, so far the stress has been upon the mega-cities only, however, in the recent years the tentacles of vehicular pollution have also extended to medium and small cities / towns. Thus, it is required to look upon problems of vehicular pollution at local level also to curb this menace, covering the whole country in the process. Central Pollution Control Board is attempting to assess the status of vehicular pollution in terms of problems, steps taken and those are required to be taken at various cities/towns of the country before vehicular pollution becomes a major problem at small cities and towns as well.

In view of above, a study on "Assessment of vehicular pollution problems and development of air quality management plan religious (Haridwar) and tourist (Mussoorie) places" has been taken up in collaboration with Pollution Control Research Institute (PCRI), BHEL, Haridwar.

Auditing of Auto Emission Test Centers (PUC Centers) in Delhi and Bangalore

Auditing of PUC centers in Delhi and Bangalore has been taken up during the year with the objective of knowing whether adequate testing facilities with respect to new norms have been procured by all the PUC centers and also to cross check procedure and protocols followed while vehicle testing. Further this shall also help us identify any scope for false passes, if present in the new system. The scope of the study also include checking if the testing instruments have been certified by approving agencies and further to know the status of compliance of the vehicles with PUC norms. In Bangalore a preliminary Audit was carried out at 43 centers spread over 5 zones out of 279 centers in 10 zones. Out of 267 testing centers for Petrol driven vehicles, 180 centers have upgraded their instrument to 4 gas analyzers. Remaining centers are yet to be upgraded.

Committees related to vehicular pollution control in which CPCB is a member

- Standing committee on emission legislation (SCOE) constituted by MoRTH.
- Task Force For "Introducing auditing of PUC centers" constituted by MoRTH
- Petroleum products sectioned committee constituted by BIS.
- Working group on adulteration of petroleum products constituted by Bureau of Indian Standards (BIS).
- Environmental Pollution Control Authority (EPCA) for NCR.
- The expert committee on Auto fuel Policy constituted by Ministry of Petroleum and Natural Gas.

14.10 CONSTRUCTION OF CENTRAL POLLUTION CONTROL BOARD ZONAL OFFICES BUILDINGS

- **Construction of Zonal Office - Kolkata building**: The new building was taken over by Central Pollution Control Board Zonal Office (East) during April, 2008.

- **Construction of Zonal Office - Vadodara building**: A letter of building completion has been received from Civil Construction Unit, Ministry of Environment & Forests. A Committee formed to facilitate the taking over process. The take-over of the building and shifting of office and laboratory has been scheduled for April 2009.

- **Construction of Zonal Office - Bhopal building**: The draft functional planning, as received from Bhopal office, has been scrutinized and modified. - Necessary approval has been communicated to the Bhopal office for getting plans prepared through Civil Construction Unit, Ministry of Environment & Forests / Central Public Works Department.

14.11 ECOCITY PROGRAMME

The urban areas of the country are facing problems of deterioration of environmental and socio-economic conditions. The major concerns are unplanned and haphazard development, poor sanitary and living conditions, urbanization and associated problems including slums, poor/inadequate infrastructure and pollution problems.

Environmental considerations are not being adequately incorporated into plans (Master Plans) resulting in uncoordinated and haphazard development. Weak implementation of plans and enforcement of laws, inadequate institutional competences and resource crunch are the other major concerns.

Municipalities, local bodies etc. generally do not have adequate funds to deal with the needed infrastructure facilities, as they do not have mechanisms for recovery of investments and to make the services or infrastructure provided sustainable. Public-private investments are one way of handling the sectors such as sewerage or garbage or water supply where the recoveries are to come from the households.

Pilot studies have been conducted for urban areas by the Centre for Spatial Environmental Planning created at the Central Pollution Control Board under the World Bank funded Environmental Management Capacity Building Project and supported by the GTZ-CPCB Project under the Indo-German Bilateral Programme. Using the experiences from the pilot studies conducted for urban areas, the Ecocity programme was conceptualized for improving environment and achieving sustainable development through a comprehensive urban improvement system employing practical, innovative and non-conventional solutions. The specific objectives of the programme are:

- To identify the environmental problems/hotspots in the identified towns and priority environmental improvement projects through participatory approach;

- Designing & detailing the prioritized environmental improvement projects; and creation of landmarks that shows visible environmental improvement.

The towns/cities being covered under the Ecocity Project have been selected based on the following criteria:

- Size of the town/city (less than 5 lakhs population)
- Cultural/historical/heritage/tourism importance
- Environmental Improvement Needs
- Scope for public-private partnerships and private investment
- Generators of economic momentum/urbanization
- Public participation in decision-making process
- Regional distribution of towns

Table 14.51: Steps involved in Execution of an Ecocity project:

Step	Description
Step 1	Identification of projects by the Municipalities through participatory planning process involving local people, experts, government agencies etc. and submission of Preliminary Proposals along with the details of project area, environmental improvement needs, site layout, items of work, quantity of work, estimated costs, execution mechanism, anticipated environmental improvement results etc. to Central Pollution Control Board
Step 2	Finalisation of project(s) by the Ecocity Advisory Committee and intimation of the selected project(s) to the municipality

Step	Description
Step 3	Municipalities to submit Detailed Project Reports (DPRs) along with plans, designs, specifications, cost estimates, implementation mechanism, O&M aspects upon completion etc.
Step 4	Review of DPRs by CPCB/GTZ experts (GTZ experts will provide designs if the designs provided are not upto mark)
Step 5	Issue of sanctions
Step 6	Implementation of projects by Municipalities
Step 7	Review of progress of work by SPCB and CPCB

The following towns have been covered under the programme:

- Vrindavan, Ujjain, Puri, Tirupati, Kottayam, Thanjavour
- Three towns namely Chanderi, Sawai Madhopur and Darjeeling have been taken up under this programme .

Status of Work

Tirupati

All activities related to covering of storm water drains – (D1, D2, D3 & D4) on the north, south and west side of the Govindarajaswamy temple, connecting Konneru to Narsimha Tirtha by pipeline to replenish water on permanent basis and cleaning / desilting of stagnant drains in the core area have been completed.

Ujjain

Activities related to excavation/embankments protection of Rudra Sagar fhave been completed.

Puri

Activities related to repairing/ covering/improvement of existing drains around the temple, improvement of drinking water points, improvement of public toilets near Jagannath Temple and Near Narendra tank, development of Nursery, shifting of auto garages/service station etc to Eco-automobile Park and rejuvenation of traditional water bodies- Markandeya Tank are in progress.

Kottayam

Activities related to renovation of Kacherrikadavu Boat Jetty and canal and renovation of Mundar River have been completed except two components (widening of culvert and embankment protection) of Mundar River.

Thanjavur

Memorandum of Understanding received from the Municipality/SPCB for activities related to renovation of Azhagikulam Tank, renovation of Samanthankulam Tank , renovation of Sivaganga Tank , renovation of Mothirappachavadi Tank, and further action is in progress.

Vrindavan

All activities related to improvement of Parikarma Path, comprehensive improvement along the roads connecting all major pilgrim\tourist spots in Zone-I, II and III including road surfacing, signage, parking, street lighting, public toilets, drinking water facilities etc., restoration / development of Gandhi Park", restoration of Brahmkund has to be taken up as soon as the concerned Municipality's commitment for fund is received

14.12 SPATIAL ENVIRONMENTAL PLANNING PROGRAMME

The Spatial Environmental Planning Programme aims at ensuring protection of environmental resources, while meeting developmental needs. The activities undertaken in the programme are as below:

- State Environmental Atlas
- District Environmental Atlas
- State Level Industrial Siting Guidelines
- District Wise Zoning Atlas for Siting of Industries
- District Specific Industrial Siting guidelines

During year 2008-09, seventeen State Pollution Control Boards/Executing Agencies signed the agreement for executing Spatial Environmental Planning Activities. Detailed status of activities is as below.

14.12.1 State Environmental Atlas

The State Environmental Atlas is a compilation of environment related information about a particular State and is depicted in the form of maps, texts and statistical data. It includes maps on general features (i.e. administrative boundaries, major settlements, transportation networks etc), on physical characteristics (i.e. land use, physiography, land capability etc), on surface/ground water features (i.e. drainage pattern, use, quality, flow and table etc), on environmentally sensitive zones (i.e. biological diversity, incompatible land uses etc), on major sources of pollution and also on environmental quality. The maps of the atlas are in the scale of 1:1 million or 1:2 million or as appropriate depending on upon the size of the State. State Environmental Atlas (SEA) for Andhra Pradesh has been completed. The SEAs for Orissa, Bihar, Kerala, Assam and Uttrakhand are under finalization and for Maharashtra, Gujarat, Meghalya and Punjab are under preparation

14.12.2 District Environmental Atlas

The District Environmental Atlas is a compilation of environment related information in the form of maps, texts and statistical data. It includes maps on general/physical features, surface/ground water features, environmentally sensitive zones and major source of pollution and on environmental quality. The scale of the atlas is 1:2, 50,000. District Environmental Atlases for eighty three districts are under preparation.

14.12.3 District Wise Zoning Atlas for Siting of Industries

The district-level Zoning Atlas for Siting of Industries interrelates the sensitivity of environment with the pollution potential of industries so as to identify sites with minimal environmental impacts/risks. The existing criteria for the preparation of district wise Zoning Atlas for Siting of Industries has been revised. The Zoning Atlas report will be used only for official purposes to develop district-specific industrial siting guidelines. Zoning Atlases for Siting of Industries for sixty one districts are under preparation.

14.12.4 District Specific Industrial Siting Guidelines

The district level siting guidelines, clearly bring out information on environmentally sensitive zones/areas to be avoided for location of industries or carrying of process or operations, industries or carrying of processes or operations to be restricted in the district, potential zones for siting of air and water polluting industries and industries or carrying of process or operations that may be considered for siting anywhere in the district, other than 'Environmentally sensitive zones/areas to be avoided' for priority districts. This will be an instrument for implementing the district level Zoning Atlas for Siting of Industries. These guidelines once completed are to be published after undertaking stakeholder consultations. The district level Zoning Atlas for Siting of Industries will be used to develop these guidelines. The District Level siting guidelines for sixty one districts are under preparation.

ANNEXURE-I

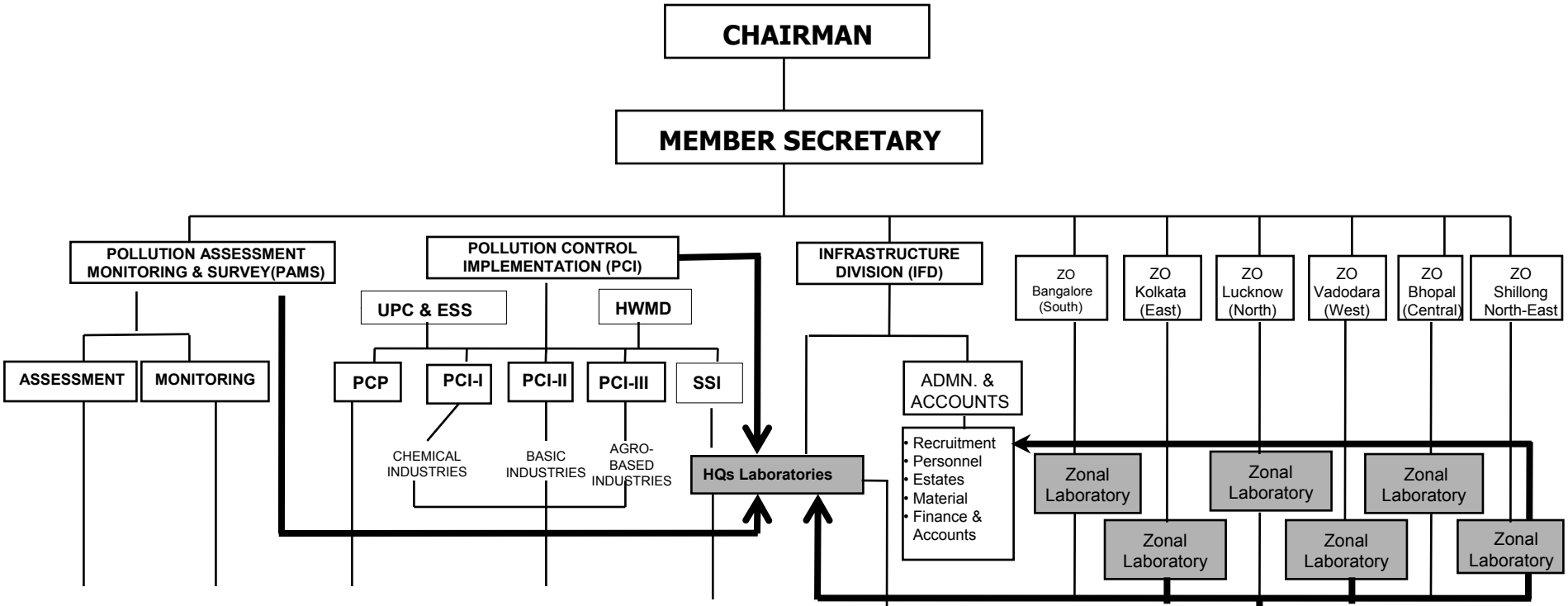
LIST OF CPCB BOARD MEMBERS

S. No.	Name	Nominated
1.	Prof. S.P. Gautam Chairman Central Pollution Control Board 'Parivesh Bhavan' East Arjun Nagar Delhi – 110 032	Chairman
2.	The Adviser (Handling Water Quality -Monitoring Works) Ministry of Environment & Forests 'Paryavaran Bhavan' C.G.O.Complex, Lodi Road New Delhi – 110 003	Member
3.	Shri Rajneesh Dube Joint Secretary Ministry of Environment & Forests 'Paryavaran Bhavan' C.G.O. Complex, Lodi Road New Delhi – 110 003	Member
4.	Smt. Ajita Bajpai Pande Joint Secretary Ministry of Mines R. No. 325 "A" Wing Shastri Bhavan New Delhi – 110 001	Member
5.	Shri E.K. Bharat Bhushan Joint Secretary & Financial Adviser Ministry of Environment & Forests 'Paryavaran Bhavan', C.G.O. Complex, Lodi Road New Delhi – 110 003	Member
6.	Prof. Mihir Deb Chairman Tripura State Pollution Control Board Vigyan Bhawan, Pt. Nehru Complex Gorkhabasti P.O. Kunjaban, Agartala (W)-799 006, Tripura	Member
7.	The Chairman, Orissa State Pollution Control Board A-118, Nilakantha Nagar, Unit VIII Bhubaneswar - 751 012, Orissa	Member
8.	Shri T.K. Reddy Mayor Municipal Corporation of Hyderabad Hyderabad - 500 038. Andhra Pradesh	Member
9.	The Chairman Kerala State Pollution Control Board Plamoodu Jn., Pattom Palace Trivandrum-695004, Kerala	Member

S. No.	Name	Nominated
10.	Shri K. Parthasarathy Advocate Madras High Court, 167, Law Chambers Association–8, Ranganathan Street Chennai– 600005 Tamil Nadu	Member
11.	Shri K. Ahmed Khan No. PH-1, Majestic Garden Apartment Behind Delhi Public School Kanakpura Road Cross Bangalore – 560 062 Karnataka	Member
12.	Shri C. Chellappan Y-73, Annanagar West, 6th Street Chennai – 600 040 Tamil Nadu	Member
13.	Shri S. Velumani Chairman and Managing Director Ennore Port Limited (A Govt. of India undertaking) P.T. Lee Chengalvarayan Maligai 23, Rajaji salai, Chennai – 600 001 Tamil Nadu	Member
14.	Shri R.K. Jain Director (Technical) National Thermal Power Corporation Ltd. NTPC Bhawan, Core – 7 SCOPE Complex Institutional Area Lodhi Road New Delhi – 110003	Member
15.	Shri C.L. Meena Chairman Gujarat Pollution Control Board 'Paryavaran Bhavan' Sector – 10 A Gandhinagar – 382 010 Gujarat	Member
16.	Shri L.N. Gupta Joint Secretary (Refineries) Ministry of Petroleum and Natural Gas Shastri Bhawan, Dr. Rajender Prasad Road New Delhi - 110 001	Member
17.	Shri J. S. Kamyotra Member Secretary Central Pollution Control Board 'Parivesh Bhavan', East Arjun Nagar Delhi – 110 032	Member Secretary

ANNEXURE II

ORGANISATION STRUCTURE OF CENTRAL POLLUTION CONTROL BOARD



* Inventory of Pollution Source
- Industries
- Municipalities
- Vehicles
- Noise
- Critically polluted problem areas
* Basin sub-basin studies
* Effects of polluting activities
* Industrial Estates
* Mining & quarrying
* Constructions
* Storage & handling of hazardous chemicals
* Application of pesticides / insecticides

* Monitoring of ambient quality
- Inland waters
- Air
- Coastal waters
- Groundwater
* Industrial emissions and effluents assessment
• Critical polluted stretches of rivers
• Epidemiological studies
• Court matter

* Perspective planning
* Project planning
* Plan Budget
* Performance audit
* Co-ordination with State Boards
* Interaction with Ministries/Govt. Departments
* Parliament Matter
• Cess Coordination
• Municipal solid waste
• Plastic wastes

* Development / updating environmental standards
* Emergency measures
* Transfer of technology
* Industrial pollution control
* Environmental auditing
* Implementation of action plan for problem areas
* Industrial pollution control under Ganga Action plan
* CREP

* Pollution Prevention and Control from Small Scale Industries :
- Textile, Dye & Dye Intermediates, Tanneries, Steel rolling mill, Induction & Are furnace, Coke oven plant, Soap & detergents, Battery, Rubber products, Automobile service station, Flour mills, Pharmaceuticals, Foundries, Brick Kilns, Hot Mix Plants, Stone Crushers, Rerolling/ Pickling Units, Electroplating, Lime Kilns, Fish & metals processing units, etc.
* Promotion of Clean Technology

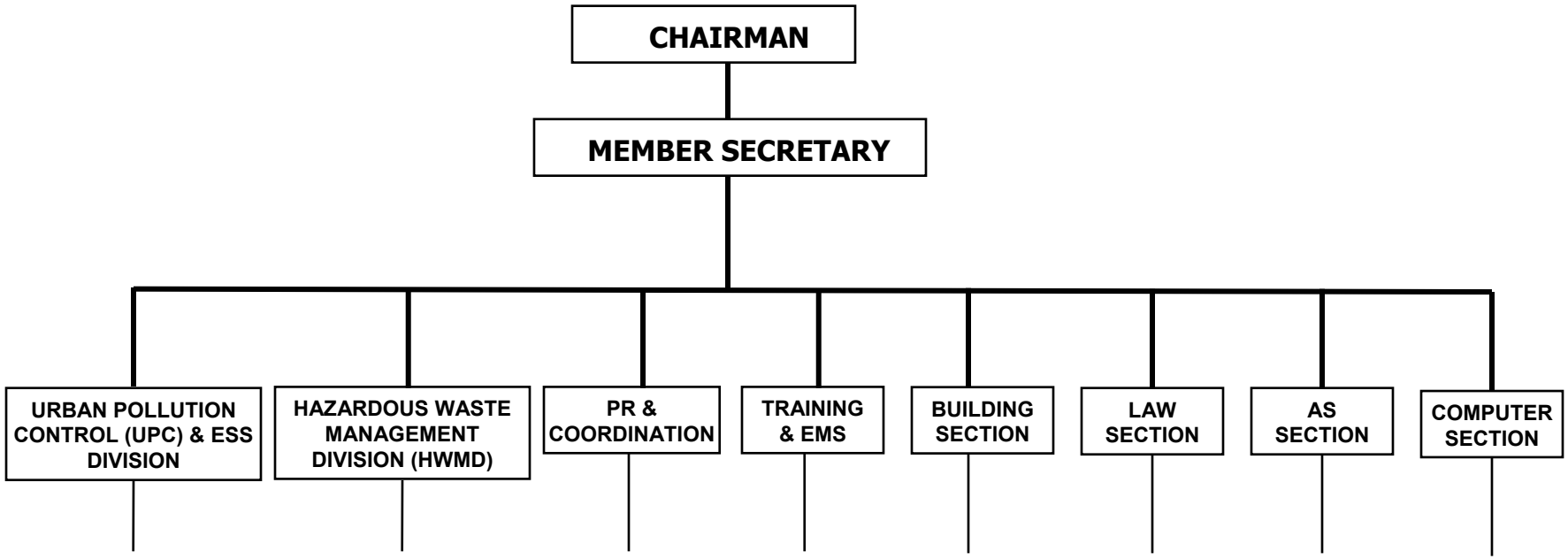
• Air & water quality monitoring
• Analytical Activities
• R & D activities
• Information services (ENVIS)
• Data Processing
• Review of ERC projects
• Project studies
• NABL Accreditation
• AQC
• PT participation

⟸ : Linkages of Laboratories with other Divisions/Sections.

PCI : Pollution Control Implementation

ZO : Zonal Office

ORGANISATION STRUCTURE OF CENTRAL POLLUTION CONTROL BOARD



ANNEXURE-III

SANCTIONED STAFF STRENGTH IN CPCB AND NUMBER OF VACANCIES IN EACH CADRE AS ON 31.03.2009

S. No.	Name of the Post	Sanctioned	Filled		Vacant	Deemed abolished/approval for revival awaited
			Regular / Deputation	Ad-hoc		
1	Director	02	01	-	01	-
2	Additional Director	08	04	-	04	-
3	Finance & Accounts Officer	01	-	01	-	-
4	Senior Scientist	09	06	-	03	-
5	Sr. Environmental Engineer	13	13	-	-	-
6	Additional Director (Law)	01	01	-	-	-
7	Sr. Administrative Officer	01	-	-	01	
8	Administrative Officer	07	02	-	05	-
9	Environmental Engineer	38	36		02	-
10	Law Officer	02	02	-	-	
11	Scientist 'C'	22	19	-	03	
12	Assistant Technical Officer	01	-	-	01	
13	Assistant Environmental Engineer	45	23	01	20	01
14	Documentation Officer	01	01	-	-	-
15	Scientist 'B'	30	30	-	-	-
16	Accounts Officer	02	02	-	-	-
17	Assistant Accounts Officer	05	05	-	-	-
18	Assistant Law Officer	02	02	-	-	-
19	Hindi Officer	01	01	-	-	-
20	Private Secretary	01	01	-	-	-
21	Senior Technical Supervisor	09	09	-	-	-
22	Section Officer	10	10	-	-	-
23	Draughting Supervisor	01	01	-	-	-
24	Deputy Librarian	01	-	-	-	01
25	Senior Scientific Assistant	35	23	-	11	01
26	Sr. Hindi Translator	01	01	-	-	-
27	Technical Supervisor	10	02	-	08	-
28	Assistant	19	16	-	03	-
29	Data Processing Assistant	04	-	01	03	-
30	Senior Draughtsman	02	02	-	-	-
31	Junior Engineer (E&M)	01	01	-	-	-

S. No.	Name of the Post	Sanctioned	Filled		Vacant	Deemed abolished/approval for revival awaited
			Regular / Deputation	Ad-hoc		
32	Junior Engineer (Civil)	01	01	-	-	-
33	Personal Assistant	01	01	-	-	-
34	Accounts Assistant	06	06	-	-	-
35	Jr. Hindi Translator	01	01	-	-	-
36	Junior Scientific Assistant	35	17	01	11	06
37	Publication Assistant	01	01	-	-	-
38	Senior Technician	12	08	03	01	-
39	Driver Special Grade	01	01	-	-	-
40	Data Entry Operator Grade-I	02	02	-	-	-
41	Driver Grade-I	07	06	-	01	-
42	Junior Technician	07	05	-	02	-
43	Senior Laboratory Assistant	32	27	-	02	03
44	Cashier	06	-	-	-	06
45	Driver Grade-II	06	04	-	02	-
46	Junior Draftsman	01	-	-	-	01
47	Stenographer	20	03	-	-	17
48	Upper Division Clerk	24	24	-	-	-
49	Data Entry Operator Grade-II	08	06	-	-	02
50	Driver (Ordinary)	08	06	02	-	-
51	Junior Laboratory Assistant	38	23	-	08	07
52	Lower Division Clerk	35	20	-	-	15
53	Plumber	01	01	-	-	-
54	Pump & Wheel Valve Operator	02	-	01	-	01
55	Senior Attendant	15	13	-	02	-
56	Field Attendant	07	07	-	-	-
57	Attendant	39	25	-	-	14
	Total	**601**	**422**	**10**	**94**	**75**

- Four post of Personal Assistant have been upgraded to Private Secretary (S. No. 33).
- Two posts of Accounts Assistant converted to Assistant. (S. No.34).
- Five post of Sr. Technician are abolished, however, filled up due to exigency of work. The proposal for revival has been sent to MoEF (S. No. 38).
- Two posts of DEO Grade -II are abolished, however due to exigency of work one post filled up on adhoc basis.

ANNEXURE-IV

POSTS CREATED BY THE CENTRAL POLLUTION CONTROL BOARD AFTER THE NOTIFICATION OF CPCB REGULATIONS, 1995 AND FOR WHICH CONCURRENCE OF GOVERNMENT IS AWAITED

S. No	Name of the post	Approved by the CPCB	Filled		Unfilled
			Regular / Deputation	Ad-hoc	
1.	Senior System Officer	01	-	-	01
2.	Assistant Law Officer	01	-	-	01
3.	Private Secretary (19 posts upgraded from Personal Assistant)	19	19	-	-
4.	Assistant	08	-	08	-
5.	Assistant Publication Officer	02	-	-	02
6.	Assistant Engineer (Bldg.) (Re-designated from JE (Bldg.)	01	-	01	-
7.	Assistant Engineer (E&M) (Re-designated from JE (E&M)	01	-	01	-
8.	Senior Hindi Officer	01	-	-	01
9.	Attendant (Safaiwala)	10	-	08	02
10.	Driver Grade II	03	-	-	03
	Total	**47**	**19**	**18**	**10**

- 05 sanctioned posts and Board created 14 posts of Personnel Assistant upgraded to Private Secretary and filled up on regular basis in view of exigency of work (S. No. 3).

- Posts converted from Accounts Assistant to Assistant & filled up on ad-hoc basis (02 posts from initial sanctioned and six created by Board after notification). (S. No.4)

- Proposed upgradation of 02 posts of Publication Assistant to Assistant Publication Officer (S. No.5).

ANNEXURE-V

CONSTITUTION OF RESEARCH ADVISORY AND MONITORING COMMITTEE (RAMC)

Composition of Research Advisory and Monitoring Committee of CPCB during 2008-2009

1.	Prof. S. P. Gautam, Chairman, Central Pollution Control Board	Chairman
2.	Sh. J. S. Kamyotra, Member Secretary, Central Pollution Control Board	Member
3.	Sh. Paritosh Tyagi, Ex-Chairman, Central Pollution Control Board	Member
4.	Prof. J. M. Dave, Retd. Prof. School of Environmental Sciences, JNU, New Delhi	Member
5.	Prof. Dilip Biswas, Ex-Chairman, Central Pollution Control Board	Member
6.	Dr. K. R. Ranganathan, Member Secretary, Loss of Ecology Authority, Chennai, Tamilnadu	Member
7.	Sh. N. K. Verma, Ex-Additional Director, Central Pollution Control Board	Member
8.	Dr. Tapan Chakrabarti, Director, Environmental Biotechnology Division, NEERI, Nagpur *- Nominee of CSIR Laboratory – NEERI*	Member
9.	Sh. S. Makhija, Executive Director, Indian Oil Corporation (R & D Centre), Faridabad *- Nominee of Indian Oil Corporation (R & D Centre), Faridabad*	Member
10.	Dr. Meenakshi Dhote, Head, Dept. of Environmental Planning *- Nominee of School of Planning and Architecture, New Delhi*	Member
11.	Dr. Virendra Misra, Scientist `F' and Head, Ecotoxicology Division *- Nominee of CSIR Laboratory – ITRC, Lucknow*	Member
12.	Dr. R. Saha, Adviser, Department of Science & Technology, New Delhi *- Nominee of Department of Science & Technology (DST), ND*	Member
13.	Sh. Ashok Bhatia, Director (RE Division) *- Nominee of Ministry of Environment & Forests, New Delhi*	Member
14.	Sh. J. K. Goel, General Manager (Env.) *- Nominee of Central Mine Planning & Design Institute (CMPDI), Ranchi*	Member
15.	Dr. B. K. Tewary, Scientist F and Coordinator/Head, Environment Management Group *- Nominee of , Central Institute of Mining and Fuel Research, Dhanbad*	Member
16.	Dr. D. K. Sharma, Medical Superintendent *- Nominee of All India Institute of Medical Sciences (AIIMS), New Delhi*	Member
17.	Dr. H. C. Joshi, Professor, Division of Environmental Sciences, IARI *- Nominee of Indian Agricultural Research Institute (IARI), New Delhi*	Member
18.	Sh. K. P. Nyati, Principal Advisor, CESD & Head, Environment Policy Division, CII, New Delhi *- Nominee of Industries (CII, New Delhi)*	Member
19.	Dr. Suneel Pandey, Fellow, TERI, New Delhi *- Nominee of The Energy and Resources Institute (TERI), New Delhi*	Member

20.	Mr. H. G. Joglekar, Senior Scientist of Chemical Engineering and Process Development Division, NCL, Pune *- Nominee of National Chemical Laboratory, Pune*	Member
21.	Dr. C. S. Sharma - Senior Scientist, CPCB, Delhi (Senior Level Scientist)	Member
22.	Dr. (Mrs.) Pratima Akolkar, Scientist `C. CPCB, Delhi (Women Scientist)	Member
23.	Dr. R. B. Lal – Scientist `B', CPCB, Delhi (Junior Level Scientist)	Member
24.	Dr. S. D. Makhijani, Director (Labs), CPCB, Delhi	Member Convener

ANNEXURE-VI

MATTER RELATED WITH ENVIRONMENTAL LABORATORIES RECOGNITION BY CENTRAL POLLUTION CONTROL BOARD UNDER THE ENVIRONMENT (PROTECTION) ACT, 1986

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

In exercise of powers conferred, Central Pollution Control Board has considered the following matter related with Environmental Laboratories Recognition in various Board Meetings during the period 1st April 2008 to 31st March 2009:

146th Board Meeting (held on 12th April, 2008)

Approval of Sampling and analysis charges for the analysis of Water, Soil, Hazardous Waste, Air and Source Emission samples at CPCB Laboratories and Notification in Govt. of India Gazette vide Notification No. S.O. Legal/42(3)/87 dated 15th June, 2008.

147th Board Meeting (held on 23rd May, 2008)

Board approved the Amendment in the name of recognized Research Centre Laboratory of Madhya Pradesh Pollution Control Board, Bhopal as Central Laboratory.

148th Board Meeting (held on 24th July, 2008)

No matter put up and considered by the Board.

149th Board Meeting (held on 23rd October, 2008)

Board approved the substitution of Government Analyst at Central Laboratory of National Fertilizer Limited, Vijaypur, Guna, M. P. due to transfer of Govt. Analysts notified earlier under Section 13 of The Environment (Protection) Act, 1986.

150th Board Meeting (held on 9th January, 2009)

No matter put up and considered by the Board.

Annexure-VII

DEPUTATION OF OFFICIALS FOR INTERNATIONAL TRAINING PROGRAMMES / WORKSHOPS / SEMINARS HELD ABROAD DURING YEAR 2008-09

S. No.	Programme	Duration & Place	Conducted by	Official's Name & Designation
1.	Annual Conference of Health Effect Institute	Apr. 25-30, 2008 USA	Health Effect Institute, USA	1. Dr. B. Sengupta, Member Secretary
2.	Visit to Bhutan for Monitoring of Industrial Emission	Apr. 22-30, 2008 Bhutan	NEC, Bhutan	2. Sh D.C. Jakhwal, Sci. 'B', HO-Delhi 3. Sh Mustaq Alam, STS, ZO-Vadodara 4. Sh M. Satheesh, SSA, HO-Delhi 5. Sh S.B. Lohat, TS, HO-Delhi
3.	G-8 Environment Ministers Meeting	May 24-26, 2008 Kobe, Japan	MoEF, Delhi	6. Dr. S.D. Makhijani, Director, HO-Delhi
4.	13th Poverty Environment Partnership Meeting	Jun. 09-11, 2008 Manila, Philippines	Asian Development Bank, Philippines	7. Sh R.K. Singh, Sci. 'C', ZO-Lucknow
5.	5th Regional Stakeholders cum-Regional Coordination Meeting under Male Declaration	Aug. 19-21, 2008 Colombo, Sri Lanka	UNEP	8. Dr. S.S. Bala, SS, ZO-Kolkata 9. Sh. R.N. Jindal, SEE, 10. Dr. Prashant Gargava, EE, HO-Delhi 11. Dr. D. Saha, Sc. 'C', Project Office-Agra
6.	Seminar on 3Rs (Reduce, Reuse and Recycle)	Oct. 06-10, 2008 Tokyo, Japan	Asian Productivity Organization (APO)	12. Dr. S.K. Nigam, Sc. 'C', HO-Delhi
7.	Workshop on "Better Air Quality (BAQ), 2008" and Meeting-cum-International Workshop on "Development of Methodology & Database for ABC Emission Inventory (IWEI)"	Nov. 10-19, 2008 Thailand, Bangkok	UNEP/AIT	13. Dr. S.K. Tyagi, Sc. 'C', HO-Delhi