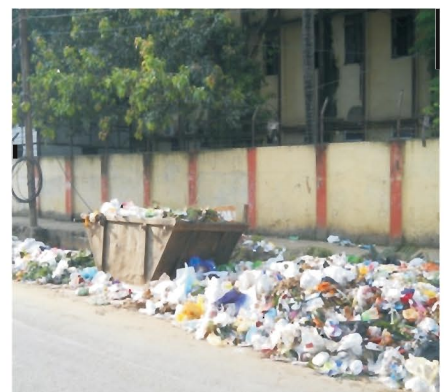




# Performance Audit of Environmental degradation in the greater Guwahati area with special emphasis on the role of the Pollution Control Board, Assam (PCBA)



**Report of the  
Comptroller and Auditor General of India  
Government of Assam  
*Report No. 3 of 2016***

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Environmental degradation in the greater  
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the role of the Pollution Control Board,  
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## Preface

1. This Report of the Comptroller and Auditor General of India for the year ended March 2015 has been prepared for submission to the Governor of Assam under Article 151 (2) of the Constitution of India for being laid before the State Legislature.
2. The Report covering the period 2010-15 contains the results of performance audit of 'Environmental Degradation in the greater Guwahati Area with special emphasis on the role of Pollution Control Board, Assam.'
3. Audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.





# **Executive Summary**



## Executive Summary

*Guwahati, the gateway to the North Eastern Region (NER) of India is the largest and fastest growing commercial and industrial centre in the Region. The pressure of the ever increasing human population and expanding commercial and industrial activities has resulted in generation of enormous municipal as well as other wastes and industrial effluents. Previous Audits which looked at the Solid Waste Management activities in the Guwahati Municipal Corporation and functioning of the Auto Emission Testing Centres implemented by the Transport Department of the Government of Assam have indicated significant risks of degradation of land, air and water in and around Guwahati city. Besides, media reports also suggested increase in the pollution levels, adversely affecting the general public. In order to examine the level of environmental degradation and the role of the Pollution Control Board, Assam (PCBA) in maintaining a balance between developmental activities and environmental conservation, a Performance Audit (PA) was conducted on the topic ‘**Environmental Degradation in the Greater Guwahati Area – with special emphasis on the role of Pollution Control Board of Assam**’.*

*The PA revealed that though the PCBA was not short of funds, it had not fulfilled its role effectively. Instead of focussing on strengthening its technical manpower for carrying out the essential inspection of industrial establishments and scientific analysis of air and water samples, the PCBA had a disproportionately large non-technical staff which resulted in huge arrears in mandatory inspections.*

**(Paragraph 2.1)**

*Use-based categorisation of water for identification of various water bodies had not been done leading to risk of using unsuitable water bodies for drinking water. Further, only 24 out of 55 Water polluting Parameters identified by the Central Pollution Control Board were being monitored by the PCBA.*

**(Paragraphs 3.1 & 3.2)**

*The Dissolved Oxygen (DO), Bio-chemical Oxygen Demand (BOD) and Total Coliform (TC) levels in the Bharalu river were far beyond the stipulated criteria indicating severe organic pollution and the river water had reached a stage where no aquatic organism can survive. Although this river had been categorised by the CPCB among the 35 most polluted river stretches in the country in terms of water quality criteria, the PCBA had failed to prepare a Report and Action Plan as directed by the CPCB.*

**(Paragraph 3.4)**

*There was no Sewage Treatment Plant in the entire state of Assam resulting in untreated sewage being discharged from various generating points to natural water bodies thereby increasing the risk of organic and bacterial contamination in the water bodies.*

**(Paragraph 3.7)**

*There was a shortfall of 68 per cent to 84 per cent in mandatory inspections of Industries conducted by the PCBA. In four out of nine industries jointly inspected along with Audit, effluent treatment plants were either not installed or not functioning resulting in discharge of untreated effluents containing oil, grease etc. into the water bodies.*

**(Paragraphs 3.8 & 4.4.2)**

*The PCBA was monitoring only three out of twelve air pollutants notified by the Central Pollution Control Board for being monitored. Besides, all air monitoring stations were located in residential areas whereas there was no station in high population/vehicular density areas or in commercial, industrial and eco-sensitive areas.*

**(Paragraphs 4.1 & 4.2)**

*Only 6 out of 35 highly polluting industries installed online Continuous Stack Emission Monitoring Systems and none of the units had installed the online effluent quality monitoring system till the deadline as mandated by CPCB expired in March 2015. The PCBA did not install necessary software and hardware for centralised data collection, analysis and corrective action.*

**(Paragraph 4.4.5)**

*Pollution Under Control certificates were issued on the verbal request of vehicle owners without physical presence of vehicles. Joint physical inspection of 9 out of 38 Pollution Testing Centres revealed that in four centres there were no testing machine/equipment while in other two centres, testing machine/equipment were available but were not in working condition even though they were issuing Pollution Under Control certificates.*

**(Paragraph 4.5.2)**

*Even after 14 years of the enactment of the Municipal Solid Waste (MSW) Rules stipulating for authorisation by the State Pollution Control Board for creating a landfill, the GMC had not obtained such approval from the PCBA for the MSW landfill at Boragaon. More importantly, the dumping site is located adjacent to the world heritage 'Deepor Beel' posing severe threat to the fragile eco-system of the Lake.*

**(Paragraph 5.2)**

836 health care establishments (HCEs) were functioning without obtaining authorisation from the PCBA in violation of Bio-Medical Waste Rules. Besides, despite lapse of more than 12 years after the scheduled date prescribed in the BMW Rules, 56 HCEs in Guwahati neither had their own waste treatment facilities nor had tie-up with other Common Bio-Medical Waste Treatment Facilities.

**(Paragraphs 6.1 & 6.2)**

Out of 243 hazardous waste generating industries, 185 industries (76 per cent) were functioning without obtaining authorisation from the PCBA. As a result, the PCBA was not in possession of information regarding the total quantity of hazardous waste generated in the State.

**(Paragraph 7.1)**

There were 15 unregistered plastic manufacturing/ recycling units, but the PCBA had not taken any action against them. As a result, in Guwahati city, plastic carry bags of less than 40 microns were being sold/used openly despite a District Administration ban on such use.

**(Paragraph 7.2)**

The sole battery dealer registered with the PCBA had sold 19.17 lakh new batteries but collected only 69 per cent of the used batteries against the requirement for collecting 90 per cent of the same, resulting in 3.94 lakh used batteries remaining unaccounted for.

**(Paragraph 7.3)**

During 2013-14, 20.046 MT of e-waste was collected by five producers/bulk consumers and transported to other States for dismantling/recycling without the knowledge of the PCBA.

**(Paragraph 7.4)**



# **Chapter I**

## **Introduction**





## Chapter I Introduction

### 1.1 Background

Under the Environment (Protection) Act, 1986, 'environment' includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, microorganisms and property.

The United Nations defined<sup>1</sup> environmental degradation as the “deterioration in environmental quality from ambient concentrations of pollutants and other activities and processes such as improper land use and natural disasters.”

While natural disasters such as earthquakes, cyclones and tsunamis have adversely impacted the environment throughout the earth's history, some of the major causes of degradation in the environment are human processes and activities such as deforestation, urbanisation, industrialisation and improper waste management. The National Environment Policy, 2006 states that the “proximate drivers of environmental degradation are population growth, inappropriate technology and consumption choices, and poverty, leading to changes in relations between people and ecosystems, and development activities such as intensive agriculture, polluting industry, and unplanned urbanisation.”

### 1.2 Rationale for selecting the topic

Guwahati is the largest and fastest growing city in the North Eastern (NE) Region of India. Home to approximately 10 lakh inhabitants, there has been a growing concern that pollution in and around the city is alarmingly high. Being the gateway to the NE Region, Guwahati has seen a constant influx of people from other NE States as well as other parts of the country in search of jobs and other means of sustenance. Commercial and industrial activities coupled with the pressure of an ever increasing human population have resulted in the generation of significant amounts of municipal waste, effluents as well as other industrial pollutants.

Guwahati falls under the Kamrup (Metro) district which comprises Guwahati Municipal Corporation (GMC) area, North Guwahati Town Committee Area, Amingaon and a few revenue villages. The area known as greater Guwahati covers an area of 955 sq. km. The southern and eastern sides of the city are surrounded by hillocks which have become major targets of illegal encroachment and rampant stone quarry mining. Further, besides having the mighty Brahmaputra running through it, Guwahati is also home to many eco-sensitive swamps, marshes and water bodies like Deepor Beel, Silpukhuri, Dighali Pukhuri, Borsola Beel, Silsako

<sup>1</sup> United Nations Statistics Division <http://unstats.un.org/>

Beel, etc. The proximity of these natural resources has made the city a sensitive area as far as conservation efforts are concerned.

As per Census 2011, the Greater Guwahati area supported 4.02 *per cent* of the state population on just 1.22 *per cent* of state land area. Population density was 1,313 persons per sq. km compared to only 398 persons per sq. km in the entire Assam and the all India population density of 368 persons per sq. Km.

In order to examine the level of environmental degradation caused by various human activities, and the role of the Pollution Control Board, Assam (PCBA) in mitigating the effects of such degradation through its regulatory and oversight functions, a Performance Audit (PA) was planned on the topic '**Environmental Degradation in the greater Guwahati Area – with special emphasis on the role of PCB, Assam**'.

### 1.3 Audit Objectives

The objectives of the performance audit were to ensure whether:

- PCBA and concerned stakeholders complied with all Acts, Rules, Government policies and instructions for prevention, control and abatement of pollution.
- Effective mechanism was in place in the Government organisations and private entities, involved in prevention, control and abatement of pollution, to ensure that adverse impact of their processes and activities on the environment was minimised.
- There was periodical analysis of the impact of environmental degradation and remedial measures to overcome it were being implemented.

### 1.4 Audit Criteria

The following were the sources of audit criteria for the performance audit:

- All related Acts, Rules like the Water (Prevention & Control of Pollution) Act, The Air (Prevention & Control of Pollution) Act, the Environment (Protection) Act, 1986, the Motor Vehicles Act, 1988 and the Central Motor Vehicles Rules, the Municipal Solid Waste (Management and Handling) Rules 2000, the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, the Plastic Waste (Management and Handling) Rules, 2011, the Batteries (Management and Handling) Rules, 2001, the e-waste (Management and Handling) Rules, 2011, the Forest (Conservation) Act, 1980, the Wild Life (Protection) Act, 1972, the National Environment Policy, 2006, the Biological Diversity Act, 2002, the Wetlands (Conservation and Management) Rules, 2010, the Guwahati Water Bodies (Preservation and Conservation) Act, 2008, the Ramsar Convention.
- Orders, instructions, guidelines, standards issued by Government, Central Pollution Control Board (CPCB), Hon'ble Courts etc.

## **1.5 Scope and Methodology of Audit**

A Performance Audit was conducted between June and September 2015 and covered the period 2010-11 to 2014-15. Records were examined at the Secretariat of the Environment and Forest Department, the offices of the PCBA and Guwahati Municipal Corporation (GMC). Information was also collected from the offices of the PHE, Jal Board, Health, Transport, Census, Agriculture, Water Resources, Ground Water Commission, Central Water Commission, Industry, Soil Conservation, Bio-diversity Board, Principal Chief Conservator of Forests and Guwahati Metropolitan Development Authority.

An entry conference was held on 24 June 2015 with the Secretary, Environment and Forest Department and Transport Department in which officers of various departments including the PCBA participated wherein the Audit Objectives, Criteria and Scope were discussed.

The Audit methodology involved collection of data through document analysis, response to audit queries, questionnaires, joint physical verifications, joint collection of samples and photographic evidence. An advertisement was also put out in local newspapers and the website of the office of the Accountant General calling for public comments on the subject. Responses to the advertisement, Study Reports of different institutions/Scholars and of various implementing agencies of the Government of Assam were also examined.

The audit findings were discussed with the Secretary, Environment and Forest Department and Transport Department in an exit conference which was held on 17 November 2015 in which officers of various departments including the PCBA also participated. Replies received from various departments have duly been incorporated at appropriate places in the Report.

## **1.6 Acknowledgement**

The cooperation extended by the Secretary, Environment and Forest department and Transport department, PCBA, GMC along with other Government departments and agencies is hereby acknowledged.

## **1.7 Audit findings**

The audit findings have been organized into seven Chapters which include the roles of the Regulatory bodies and Government Departments, Water Pollution, Air Pollution and Management of different categories of waste.



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## **Chapter II**

# **Responsibilities of different departments and agencies**

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## Chapter II

### Responsibilities of different departments and agencies

#### 2.1 Pollution Control Boards at the Centre and State

The Central Pollution Control Board is the apex advisory body of the Central Government and provides technical services to the Ministry of Environment and Forests in connection with the provisions of the Environment (Protection) Act, 1986. The PCBA, constituted in 1975, is the main agency responsible for the administration and enforcement of Acts and Rules pertaining to environment in the state of Assam. It is responsible for formulation of policies regarding environment protection and other functions including inspection of industries and hospitals, monitoring of water bodies, waste water and air quality. It is also responsible for coordination with various agencies and initiation of action as per law in respect of any other matter of non-compliance pertaining to pollution.

The PCBA consists of 17 members who are nominated by the State Government. Besides the Chairman and the Member Secretary, there are seven official members representing various State Government Departments and eight members representing corporations, local authorities and other institutions.

The PCBA functions with one Head Office at Guwahati, eight Regional Offices<sup>2</sup> and a Central Laboratory of the Pollution Control Board, Assam located at Guwahati itself. In addition there are four more Regional Laboratories established in other districts<sup>3</sup>.

The responsibility for monitoring and controlling pollution in Assam under the provisions of various Acts such as the Water (Prevention and Control of Pollution) Act, 1974 and the Water (Prevention and Control of Pollution) Assam Rules, 1977, Air (Prevention & Control of Pollution) Act, 1981, Environment (Protection) Act, 1986, is vested in the PCBA. The PCBA exercises its role mainly through conditions imposed while granting Consent for projects to be established and operated in the State. Under the Water Act, these conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Under the Air (Prevention & Control of Pollution) Act, 1981 consent of the Board is mandatory for releasing emissions to the atmosphere. Once the industry or process plant is established and the required pollution control systems are put in place, the entrepreneur is required to obtain consent to operate the unit. The consent is given for a particular period, which is mandatory to be renewed regularly. Fees are charged by the PCBA for issue of Consents and regular inspections are required to be carried out to ensure compliance by the entrepreneurs.

<sup>2</sup> Guwahati, Dibrugarh, Sibsagar, Golaghat, Tezpur, Nagaon, Bongaigaon and Silchar.

<sup>3</sup> Sivsagar, Tezpur, Silchar and Bongaigaon.



For implementing its mandate, the PCBA earns revenue comprising of Grants in aid from MoEF/CPCB, State Government, reimbursement of water cess, consent fee, authorisation fee, interest earned, etc. A summary of receipt and expenditure of PCBA during 2010-15 is shown below:

**Table: 2.1**  
**PCBA Total Receipts (in ₹crore)**

Year	Grants-in-aid from MoEF/CPCB	Grants-in-aid from State Govt.	Consent fee	Authorisation Fee	Others including interest earned	Total receipts
2010-11	1.97	0.46	17.39	0.29	3.33	23.44
2011-12	0.07	0.46	16.25	0.23	1.73	18.74
2012-13	0.99	0.20	18.52	0.69	5.52	25.92
2013-14	1.09	0.20	16.24	0.35	2.35	20.23
2014-15	0.78	0	16.06	0.57	2.07	19.48
<b>Total</b>						<b>107.81</b>

*Source: Information furnished by PCBA*

The receipts would have been more as the above amounts did not include approximately ₹48.06 lakh water cess per year as assessed by the PCBA itself which it failed to collect from 84 local bodies in Assam.

It may be mentioned that the receipts consistently exceeded the expenditure every year from 2010-11 to 2014-15. As against the total receipts of ₹107.81 crore during the period 2010-15 the PCBA spent a total of ₹ 70.60 crore during the same period as indicated below:

**Table: 2.2**  
**Expenditure on pollution control measures (₹ in crore)**

Year	Opening Balance	Total receipts	Expenditure				Unspent Balance
			Pollution Control related	Capital Expenditure	Admin related	Total	
2010-11	24.59	23.44	0.27	0.47	11.40	12.14	35.89
2011-12	35.89	18.74	0.42	0.24	10.16	10.82	43.81
2012-13	43.81	25.92	0.55	0.58	11.85	12.98	56.75
2013-14	56.75	20.23	0.65	2.59	13.27	16.51	60.47
2014-15	60.47	19.48	0.14	0.88	17.13	18.15	61.80

*Source: Information furnished by PCBA*

It is evident that although the available funds at its disposal rose from ₹ 35.89 crore at the end of 2010-11 to ₹ 61.80 crore at the end of 2014-15, the PCBA's annual expenditure ranged between a mere ₹ 10.82 crore and ₹ 18.15 crore during the same period.

For carrying out its mandate, the PCBA has strength of 88 technical and 130 non-technical staff (Details in *Appendix I*). For an organisation whose main objective is inspection of industries and hospitals, monitoring of water bodies, waste water and air quality, the number of technical staff as compared to the non-technical staff was observed to be very low. Comparatively, the Central Pollution Control Board had a technical staff of 334 and non-technical staff of 190 (as per Annual Report of CPCB for the year 2011-12). Further, the administrative expenditure ranged between 80.38 and 94.38 *per cent* during the five years under audit while the expenditure on pollution control measures did not even touch *five per cent* of the total expenditure of the PCBA during the same period.

The results of this inadequate expenditure on the part of the PCBA are brought out in the subsequent chapters.

## 2.2 State Bio-diversity Board

Biological diversity is the variability among living organisms and their habitats including diversity within species and of the ecosystems. The growing concern for environmental degradation and depletion of biological diversity world-wide led to the establishment and adoption of the Convention on Biological Diversity (CBD) in 1992. This Convention recognised the sovereign rights of the States over their biological resources. With this objective the Government of India enacted the Biological Diversity Act, in 2002. The Act provides for conservation of Biological Diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of commercial use of biological resources and associated traditional knowledge.



*Assam's Biodiversity*

The Act was to be implemented through three functional bodies, *viz.*, the National Biodiversity Authority (NBA) established in 2003 with its headquarters in Chennai (Tamil Nadu) at the National level, State Biodiversity Boards (SBBs) at State level and Biodiversity Management Committees (BMCs) at the level of local communities.

It was observed in Audit that though the GoA established the Assam State Biodiversity Board (ASBB) on 29 September 2010 albeit after a lapse of more than eight years from the enactment of Central Act, the database on biodiversity resources in the State had not been prepared by the State Biodiversity Board till March 2015. Besides:

- The Peoples Biodiversity Register (PBR) was to be prepared by all the 166 Biodiversity Management Committees (BMC)<sup>4</sup> in the State. However, as of March 2015 the PBR in respect of only six *Anchaliks* (five in Nagaon District and one in Morigaon) had been prepared.
- Biodiversity Heritage Sites in the State had not been identified and declared.
- Endangered/threatened species had not been notified by the State Government.

### 2.3 Other Departments and agencies

While the responsibility for monitoring and controlling pollution in Assam rests with the PCBA, various Departments also play a significant role in maintaining the quality of land, air and water in the State:

- The Forest Department looks after policy planning, coordination, conservation, environmental education, eco-development and restoration of degraded and vulnerable eco-systems.
- The Guwahati Municipal Corporation is responsible for management of solid waste and treatment of sewage water.
- The Jal Board (JB), Public Health Engineering Department (PHED) and GMC are responsible for providing safe drinking water.
- The Transport Department enforces the provisions of the Motor Vehicle Act, 1989 pertaining to air pollution.

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<sup>4</sup> BMC shall have seven persons nominated by the local body of whom not less than one third shall be women. The Chairperson of BMC shall be elected from amongst the members of the Committee.

# **Chapter III**

## **Water Pollution**



## Chapter III

### Water Pollution

The Water (Prevention and Control of Pollution) Act, 1974 defines pollution to mean such contamination of water or such physical, chemical or biological alteration of water by discharge of various kinds of wastes into water (whether directly or indirectly) which is harmful for the health of public, animals, plants and aquatic organism. Pollution in lakes leads to eutrophication<sup>5</sup> and ground water contamination causing loss of habitat and healthy environment. Domestic sewage, poor sanitation, industrial effluents, surface run off, etc. are the primary source of water pollution.

#### 3.1 Use based classification of surface water not made

The term ‘Water Quality’ includes ‘those physical, chemical or biological characteristics of water by which the user evaluates the acceptability of water’. In this regard the Central Pollution Control Board (CPCB) has developed a concept of ‘designated best use’. According to this concept, out of several uses a particular water body is put to, the use which demands highest quality of water is called its “designated best use” and accordingly the water body is designated. The levels of quality of water along with ‘designated best uses’ are given in the following table:

**Table No. : 3.1**  
**Use Based Classification of Surface Water**

Sl. No	Designated Best Use	Class of water
1.	Drinking water source without conventional treatment but after disinfection	A
2.	Outdoor Bathing	B
3.	Drinking water source after conventional treatment and disinfection	C
4.	Propagation of Wildlife & Fisheries	D
5.	Irrigation, Industrial Cooling, Controlled Waste disposal	E

*Source: Central Pollution Control Board (CPCB)*

It was observed in Audit that the PCBA had not classified the water bodies according to their ‘designated best use’, thereby inviting the risk of harmful effects of indiscriminate use of unsuitable water bodies for purposes of sourcing drinking water with adverse impact on health and human habitation, and on flora and fauna.

<sup>5</sup> A process where water bodies receive excess nutrients that stimulate excessive plant growth.

### 3.2 Inadequate analysis of water

Under the National Water Quality Monitoring Programme (NWQMP) the water samples were to be analysed at fixed regular frequencies on nine core parameters and 19 general parameters identified by the CPCB (List of parameters detailed in *Appendix II*) as indicated in the Table below:

**Table: 3.2**  
**Water Quality Parameters monitored by PCBA**

SI No	Categories of Parameters	Total number identified	Being monitored by PCBA
1.	Core parameters, e.g., pH, temperature, dissolved oxygen etc.	9	8
2.	General parameters e.g., turbidity, alkalinity etc.	19	16
3.	Bio-monitoring i.e., saprobity index, diversity index and P/R ratio	3	Nil
4.	Trace metals e.g., arsenic, cadmium, copper, lead, mercury, etc.	9	Nil
5.	Pesticides e.g., Alpha, Beta, Gamma, etc.	15	Nil

It was observed in Audit that out of five categories of parameters, the water samples were being analysed for only two categories by the PCBA *i.e.* eight core parameters (excluding nitrite) and 16 general parameters (excluding phenolphthalein alkalinity, total kjeldahl nitrogen<sup>6</sup> and ammonia). It was further observed that no facilities were available in the PCBA's laboratory for bio-monitoring. Due to not-analysing of some parameters, the quality of water in respect of those parameters could not be ascertained.

On being pointed out, the PCBA stated (August 2015) that all parameters were analysed as per the protocol issued by the CPCB but due to breakdown of some instruments, sometimes certain parameters were not completed. But the fact remained that PCBA were only analysing two categories out of five categories of parameters identified by CPCB.

### 3.3 Water Quality Monitoring Stations not classified

Under National Water Monitoring Programme (NWMP), the PCBA had established 101 Water Quality monitoring stations<sup>7</sup> across the State of which ten were in Guwahati (details of locations mentioned in Table 3.3 below) for monitoring both surface and ground water quality. As per the Water Quality Monitoring Protocol

<sup>6</sup> Total kjeldahl nitrogen is the sum of organic nitrogen, ammonia and ammonium in the chemical analysis of soil, water or waste water.

<sup>7</sup> Rivers : 42, Ponds : 27 and Well : 32

issued by the CPCB in 2008, initially all the monitoring stations in respect of ground water should be classified as *baseline*<sup>8</sup> stations and 20 to 25 per cent of the *baseline* stations should be classified as *trend*<sup>9</sup> or *trend-cum-surveillance* stations. For surface water, all stations should be a combination of *baseline* and *trend* stations. After sample data were collected for three years, the stations would be classified as *baseline*, *trend* or *flux*<sup>10</sup> station. The objectives of this monitoring protocol, inter-alia, included establishing base line water quality to observe the trend of water quality, surveillance for irrigation use and control/management of water pollution.

**Table: 3.3**  
**List of Monitoring Stations in Guwahati under NWMP Programme**

Sl. No.	Name of Water Bodies	Station Code	Type	Req. of Monitoring	Location of Monitoring Points
1.	Brahmaputra	1030	River	Monthly	Pandu, Guwahati
2.	Brahmaputra	2064	River	Quarterly	Chandrapur, Guwahati
3.	Brahmaputra	2069	River	Quarterly	Guwahati near Water Intake Point at Kacharighat
4.	Bharalu	1528	River	Quarterly	Near Pragjyotish College before confluence with Brahmaputra at Guwahati.
5.	Deepor beel	1529	Pond	Quarterly	Dharapur, Guwahati.
6.	Well	1541	Ground water	Half Yearly	Guwahati
7.	Well	1542	Ground water	Half Yearly	Guwahati
8.	SoubhagyaKunda	2217	Pond	Quarterly	Kamakhya
9.	Deepor Beel	2218	Pond	Quarterly	Boragaon near IASST, Guwahati
10.	Well	2252	Ground water	Half Yearly	Near MSW dumping site at Garchuk, Guwahati

It was noticed in Audit that the PCBA failed to classify the monitoring stations even after a lapse of more than seven years and all the stations were functioning as baseline monitoring stations. Hence, the Water Quality Monitoring Protocol was not being followed which deprived the PCBA the scope of observing the trend of water quality and, where necessary, making arrangements for taking corrective action in this regard.

<sup>8</sup> Monitored every two months for three years

<sup>9</sup> Monitored with an increased frequency of once every month

<sup>10</sup> Where it is considered necessary to measure the mass of any substance carried by the flow the frequency of sampling may be increased to 12-24 times per year



### 3.4 High pollution in major rivers/ponds in Guwahati

Audit obtained and analysed the test reports (2010-14) of the water samples of major rivers/ponds taken from different locations (Brahmaputra, Deepor Beel, Bharalu, Bor Sola, Saru Sola and Silsako Beel, Dighali Pukhuri and Soubhagya Kunda Pukhuri at Kamakhya Temple) by the PCBA. Analysis of the test reports of the three major water bodies of Guwahati - the Brahmaputra, Bharalu and the Deepor Beel. are shown in the following table:

Criteria for pollutants: Dissolved Oxygen - > 4 mg/ltr, Bio Chemical Oxygen Demand - < 3 mg/ltr and Total Coliform - < 5000 MPN/100 ml.

**Table: 3.4**  
**Pollutants of the three major water bodies in Guwahati**

Year	Dissolved Oxygen (DO) (mg/ltr) Criteria - > 4 mg/ltr			Bio Chemical Oxygen Demand (BOD) (mg/ltr) Criteria - <3 mg/ltr			Total Coliform (TC) (MPN/100ml) Criteria- < 5000 MPN/100ml		
	Brahmaputra Kachari ghat	Bharalu	Deepor Beel Boragaon	Brahmaputra Kachari Ghat	Bharalu	Deepor Beel Boragaon	Brahmaputra Kachari ghat	Bharalu	Deepor Beel Boragaon
2010	7.7	0.5	4.6	0.7	45	12.8	360	1583	648
2011	7	0	7.2	1.7	41.5	5.5	740	8467	878
2012	7.5	0.1	5.4	2	37.3	5	980	4875	1440
2013	7.2	0.2	5.3	1.9	47.5	11.4	7083	64875	1013
2014	8.1	0	10.3	0.9	38.5	8.35	123400	181100	16800

Source: Monitoring Reports submitted by PCBA

- **Brahmaputra River**

The water of the river Brahmaputra was not fit for drinking even after traditional treatment as Total Coliform (TC) level was far above the standard norm. Incidentally, the samples for analysis were taken from Kacharighat which is the intake point for the city's water supply.



*Bharalu outlet into the Brahmaputra*

In reply, the PCBA stated (April 2016) that the water quality in Brahmaputra has not shown any deteriorating trend and mere 1 or 2 higher values on 1-2 occasions cannot be regarded as deteriorating instead such isolated cases may be regarded as incidental. The reply is not tenable as the water quality is being monitored on a quarterly basis and TC level was

found to be 2 to 48 times above the permissible limit in four occasions (one occasion in 2013 and three occasions in 2014). Besides, as far as TC is concerned, there is a very major jump over the permissible limit during 2013 and 2014 which needs analysis and rectification.

- **Bharalu River** - The Dissolved Oxygen (DO), Bio-chemical Oxygen Demand (BOD) and TC levels were far beyond the stipulated criteria indicating severe organic pollution and the river water had reached a stage where no aquatic organism can survive. This river had been categorised by the CPCB among the 35 most polluted river stretches in the country in terms of water quality criteria. Accordingly, the CPCB had directed (May 2005) the PCBA to prepare an inventory of polluting sources, extent of pollution control requirements and an action plan to control water pollution. However, despite a lapse of ten years the PCBA had not come up with a detailed project report.
- **Deepor Beel**<sup>11</sup> - The mean value of BOD was well above the criteria during 2010-2014. High BOD values indicate severe organic pollution in the Deepor Beel. In spite of such severe organic pollution, PCBA had not formulated any Plan for addressing it. This assumes significance considering the lake is a designated Ramsar<sup>12</sup> site for which contracting Parties i.e. the various State Government Agencies had agreed to formulate and implement their planning so as to promote the conservation of the wetlands.



*Joint Team visiting city's garbage dumping ground abutting margin of Deepor Beel*

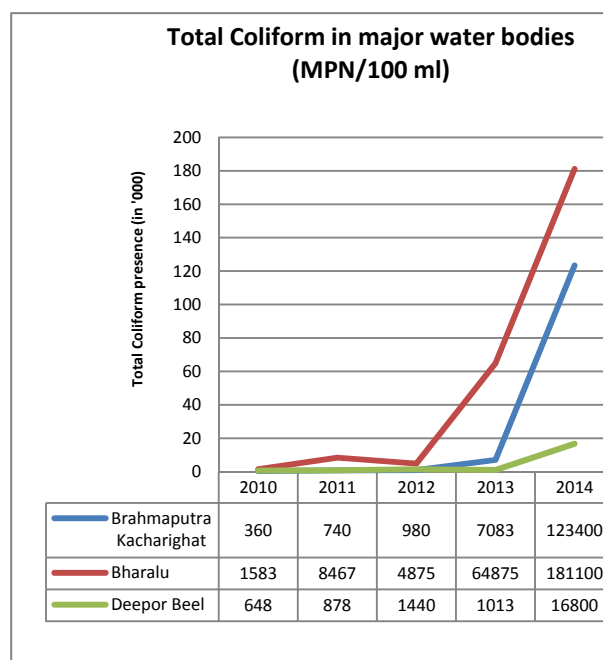
In reply, the PCBA stated (April 2016) that the BOD values remain near the criteria value. It does not establish pollution but occasional degradation. Reply also pointed out that audit team raised doubts over the water quality monitoring function of PCBA based on one monitoring report. Reply is not tenable as the PCBA's quarterly Monitoring Reports itself showed that the BOD level was well above the criteria during 2010-14 (20 numbers of monitoring reports during the period) which was also substantiated by collection of samples by Audit along with officials from the PCBA and analysed in the PCBA laboratory. Besides, PCBA did not prepare any plan for addressing the problem as advised by CPCB.

<sup>11</sup> Designated as a 'Ramsar Site' in November 2002.

<sup>12</sup> The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Besides the above three, reports of other water bodies which were analysed revealed the following:

- **Bor Sola, Saru Sola and Silsako Beel<sup>13</sup>** - Reports revealed that DO level was much lower than the prescribed standard which means that no organism can survive in these water bodies. BOD levels were also much higher than the prescribed criteria which indicated high presence of organic pollutants while TC level was around 48 times higher than the prescribed limit.



- **Dighali Pukhuri** - Mean value of DO and TC were well within the criteria. However, mean value of BOD was well above the criteria during 2010-2014 which indicated severe organic pollution.
- **Soubhagya Kunda Pukhuri at Kamakhya Temple** - Mean value of DO and TC (except in the year 2014) were well within the criteria and mean value of BOD was well above the criteria during 2010-2014. High BOD values indicate severe organic pollution in the Soubhagya Kunda Pukhuri, an important pilgrimage centre with heavy footfalls throughout the year.

In reply, the PCBA stated (April 2016) that water quality of Saubhagaya Kunda generally deteriorated after Ambubachi Mela held each year. Reply is not tenable as the readings were of the mean value of BOD (measured quarterly), which was well above the criteria during 2010-14 for all the quarters whereas the Ambubachi Mela was celebrated only in one month of the year.

It was observed in Audit that despite the alarming levels of water pollution in the rivers/water bodies in the State, the PCBA had not prepared any action plan for improving the water quality of these rivers/water bodies. It was also observed that the Government of Assam notified<sup>14</sup> Deepor Beel, Sarusala Beel, Borsola Beel, Silsako Beel and Bondajan water bodies located in Guwahati for preservation, protection, conservation, regulation and maintenance and to develop the water bodies into natural water reservoirs and convert them into eco-tourism recreation

<sup>13</sup> A joint team (consisting of officers from office of the PCBA and Audit Office) visited the site of these water bodies (as the PCBA did not have any testing stations) and collected water samples for testing at PCBA laboratory.

<sup>14</sup> Under the Guwahati Water Bodies (Preservation and Conservation) Act, 2008 and its Amendment Act 2010.

centres to suit the ecological balance and to protect the water bodies from the encroachers and further damage. However, it was observed in Audit that out of the five water bodies, the PCBA was carrying out water quality monitoring only in respect of Deepor Beel.

In July 2015 Audit officials and officers from office of the PCBA visited the city's garbage dumping ground abutting the margin of Deepor Beel for collecting water samples. Samples were tested at the PCBA laboratory and the analysis reports indicated TC level of 24,000 MPN/100 ml as against the expected level of 5,000 MPN/100 ml. The reports generated by the PCBA during the period 2010 to 2013 indicated a range of 648 MPN/100 ml to 1440 MPN/100 ml. In 2014, however, a mean of 16,800 MPN/100 ml was recorded. Incidentally, all the PCBA readings for TC during 2014 indicated astronomical levels of pollution (16,800 MPN/100 ml, 123,400 MPN/100 ml and 181,100 MPN/100 ml for Deepor Beel, Brahmaputra at Kacharighat and Bharalu respectively).

- As regards the high levels of pollution, PCBA stated (August 2015) that GMDA was the authorised agency for development of Deepor Beel. The reply was not acceptable because, as per the Water Act, PCBA was the regulatory body for abatement of water pollution and restoration of the wholesomeness of the water quality. It was observed that though PCBA had been monitoring the water quality of Deepor Beel, it failed to initiate steps for abatement of pollution levels. PCBA should have prepared action plan for abatement of pollution along with remedial measures which they had not done. Besides, they should carry out regular monitoring and also prepare action plan for preservation, protection and conservation with the co-ordination from other Govt. agencies such as GMDA, GMC, Forest Department etc. which had not been done. Further, as regards not-monitoring of other smaller water bodies, the PCBA stated (August 2015) that there was no need for regular monitoring of the ponds as they did not have water throughout the year. However, this action is also unacceptable as, besides Deepor Beel, GOA itself had in 2008 notified Sarusala Beel, Borsola Beel, Silsako Beel and Bondajan water bodies located in Guwahati for preservation, protection and conservation and as detailed above, the PCBA had the responsibility of regular monitoring to reduce pollution levels.

### 3.5 Ground Water quality

The occurrence of ground water and its availability is largely governed by the state of cementation and compaction of the geological formations, which control the pore volume and porosity, permeability, and the state of aquifer. A sizeable proportion of population (around 70 per cent in Guwahati) is dependent on ground water for drinking and other household uses. Over exploitation of ground water reserve leads to scarcity of ground water and associated deterioration of water quality.

To assess the problem of ground water deterioration in and around the Guwahati area, the PCBA carries out ground water quality monitoring under NWMP through

three monitoring stations. These stations collect the samples for testing either from open wells or tube wells. Ground water quality monitoring for the core parameters<sup>15</sup> was being carried out on half yearly basis (in April and October each year) and for the other general parameters<sup>16</sup> it was being done on yearly basis (in April).

The data (monitored by PCBA) was analysed in respect of 28 ground water samples<sup>17</sup> of the three stations based in Guwahati, for selected parameters for the period from 2010 to 2014 and observed that:

- TC count varied from 0 to 2400 MPN/100 ml which met the desired criteria except in one instance in the year 2014 at one station.
- pH<sup>18</sup> of ground water was in the range of 6.0 to 8.3 against the criteria of 6.5 to 8.5 prescribed by the CPCB. Further, pH was observed below the desired range in three instances at one station.
- BOD ranged from 0.4 to 5.0 mg/l whereas as per the criteria prescribed by the CPCB, value of BOD should be less than 3 mg/l. Incidentally, BOD was beyond the desired criteria in five instances at 3 stations.

The analysis shows that excessive extraction of ground water, if continued, would lead to scarcity as well as deterioration in the quality of ground water over a period of time and therefore, effective steps needed to be taken in this regard.

### 3.5.1 Contamination of ground water with Fluoride & Arsenic

Assam suffers from severe water shortage during the dry months of January to March leading to dependence on ground water in many areas of the State and particularly, in the areas where the public supply system is absent. This has created a new dimension<sup>19</sup> to the water problem as lowering of water level bears the risk of water coming into contact with rocks containing arsenic and fluoride which get introduced into water when the water flows through them.

- The permissible limits for human consumption of Fluoride and Arsenic in water are 1.0 mg/l and 10 µg/l respectively. Excessive fluoride content in water causes a multiplicity of ill effects for human beings such as fluorosis, osteoporosis, arthritis,

<sup>15</sup> Core parameters denotes - pH, temperature, conductivity (µmhos/cm), dissolved oxygen, biochemical oxygen demand, nitrate-N (mg/l), nitrite-N (mg/l), fecalcoliform (MPN/100 ml), total coliform (MPN/100 ml) - these are used to prima facie ascertain the water quality.

<sup>16</sup> General parameters denotes - turbidity (NTU), phenolphthalein alkalinity as CaCO<sub>3</sub>, total alkalinity as CaCO<sub>3</sub>, chlorides (mg/l), chemical oxygen demand, (mg/l), total kjeldahi-N as N (mg/l), ammonia-N as N (mg/l), hardness as CaCO<sub>3</sub> calcium as CaCO<sub>3</sub>, sulphate (mg/l), sodium (mg/l), total dissolved solids (mg/l), total fixed dissolved solids (mg/l), total suspended solid (mg/l), phosphate (mg/l), boron (mg/l), magnesium as CaCO<sub>3</sub>, potassium (mg/l) fluoride (mg/l) - these are used to ascertain the quality of water in details.

<sup>17</sup> Data for the year 2014 in respect of two water samples of one station (station no.2252) not made available to audit.

<sup>18</sup> pH (Potential of Hydrogen) is a logarithmic scale (from 1 to 14) which measure the acidity alkalinity of water soluble substance. Values below 7 indicate acidity and above 7 indicate alkalinity.

<sup>19</sup> Study Report of PCBA.

hip fractures, cancer, infertility, thyroid disorder, brain damage, Alzheimer's disease and polydipsia as evident from the Project Report on Arsenic & Fluoride in ground water carried out by the PCBA themselves. Similarly, arsenic has been recognised as a human toxin and carcinogen and is of potential public concern. Long-term overexposure to arsenic causes chronic arsenic poisoning, which can cause skin disorders (pigmentation disorders, kurtosis, skin cancer. The PCBA carried out the study of estimation of fluoride and arsenic content in ground water of 11 Districts of Assam and the results reported are given in **Appendix III**. It was observed in Audit that in Greater Guwahati area, fluoride content was more than permissible limit (1.0 mg/l) in 17 out of 122 water samples, while arsenic content was more than permissible limit (10 µg/l) in 2 out of 122 water samples. However, despite the adverse analysis report, the PCBA had not prepared any action plan for remedial measures to be taken.

In reply, the PCBA stated (April 2016) that presence of both arsenic and fluoride in ground water observed may be generated due to mineral content in underground rock/soil. It is not under the scope of the Board to improve the water quality of ground water, unless there is some visible cause of deterioration from the surface. The reply of the PCBA is not tenable as it does not indicate if any action had been taken on its own findings, since under the Water Act, the PCBA was the regulatory body responsible for abatement of water pollution and restoration of the wholesomeness of the water quality and was therefore required to prepare scientific action plan for preservation, protection and conservation.

### 3.6 Inferior quality of piped drinking water

The water supply facilities in Guwahati Metropolitan Area (GMA) are provided by three departments, viz. Guwahati Municipal Corporation (GMC), Public Health Engineering Department (PHED) and Assam Urban Water Supply and Sewerage Board (AUWSSB) now Guwahati Jal Board (GJB). Treatment Plants are located at Panbazar, operated by both GMC and PHED, along with AUWSSB operated Zoo Road treatment plant and the GMC operated treatment plant at Satpukhuri and produce about 73.90 MLD<sup>20</sup> of potable water against the demand of 132 MLD. The public water supply within Guwahati covered only about 30 per cent and mostly South Central part of the city. Even within this area due to the old degraded water treatment plants and the high water leakage rate, the provision of water to individual households was limited to 2 to 3 hours a day and consequently supply of lesser quantity of water. Hence, a sizeable population of around 70 per cent was dependant on ground water for drinking and other household uses.

Audit collected two drinking water samples each (on 6.8.15 & 10.8.15) from the Jal Board water tank at Hengrabari, PHE water tank at Panbazar and GMC water tank at Panbazar and got them tested at the PCBA laboratory. Test reports revealed that Turbidity/Nephelometric Turbidity Units (NTU) level was above the permissible

<sup>20</sup> Million Litres per day.

limit in all samples. Iron, i.e. Fe level was higher than the criteria in two samples (Jal Board at Hengarabari on 6.8.15 and PHE Tank at Panbazar on date 10.8.15) whereas Total Coliform (TC) was found (4300 MPN/100) in one sample (GMC water tank at Panbazar on 10.08.15) against the nil criteria.

In reply, the PCBA stated (April 2016) that for drinking water, there is a separate department and the PCBA has no intention to intrude into their activities. The reply is not tenable because as per the uniform drinking water quality monitoring protocol issued (February 2013) by the Ministry of Drinking Water and Sanitation, GoI, the PCBA was required to take action for abatement of pollution in drinking water sources. However, no action was found to have been taken on the matter even though as per Uniform Drinking Water Quality Monitoring Protocol, PCBA should take action for abatement of pollution in drinking water sources.

### 3.7 Absence of Sewage units

The provision of Section 24 of Water (Prevention & Control of Pollution) Act 1974 imposed restriction on use of streams or water bodies for discharge of polluting matter which should be complied by every occupier, Municipal authority etc. The State Boards under section 33 of the Water Act may make an application to court for restraining the persons who are likely to cause such pollution.

It was observed in Audit that:

- The PCBA had no data regarding drainages.
- There was not a single Sewage Treatment Plant in the entire State of Assam. Hence, untreated sewage from various generating points got directly discharged to natural water bodies, rivers, etc.
- The results of water quality tests conducted by the PCBA between 2008 and 2013 indicated that the organic and bacterial contamination due to discharge of domestic waste water in untreated form continued to be on higher side as detailed in the chart in para 3.4.



*Drainage outlet at Bharalumukh*

A joint team (consisting of officers from office of the PCBA and Audit) visited the bank of the River Brahmaputra and collected water samples from nine drainages<sup>21</sup> directly linked to the River. Water samples were tested at the Laboratory of PCBA and analysis report revealed that DO, BOD and TC level were not in conformity

<sup>21</sup> (1) Bondajan (Bonda) (2) Pragiyotish College (Shantipur) (3) Gorchuk (4) Pandu (5) Chandrapur (6) Jaipur (7) Chatrakam Devalaya (8) Sukleswar Mandir (9) Fancy Bazar

with the prescribed criteria in any of the samples. In one water sample<sup>22</sup> Zinc (Zn) level was found 13 times more than the prescribed limit *i. e.* 5.0 mg/l.

The PCBA stated (August 2015) that it is very difficult to identify the causes for deterioration of the water quality and it is true that un-treated sewage get into the rivers. The PCBA further replied (April 2016) that directions under Water Act have been issued to all Municipal Authorities to set up sewerage system for sewage collection, conveyance, treatment and its disposal. Though the PCBA had accepted the observations of audit the fact remains that under the Water Act, the Pollution Control Board had the option to approach the Courts if it apprehended that water in any river is likely to be polluted, an option which the PCBA did not resort to.

### 3.8 Untreated industry effluent released

The PCBA had categorised various industries or projects in three broad categories viz. red, orange and green in decreasing order of severity of pollution<sup>23</sup>. As per this categorisation, there were 371 red category, 557 orange category and 217 green category industries during 2014-15 under the jurisdiction of Guwahati Regional Office. Of these, only 93 (70 red category and 23 orange category) industries had Effluent Treatment Plants (ETP).



*Drainage outlet at New Guwahati Diesel Locomotive Shed*

Joint inspection (consisting of officers from office of the PCBA and Audit) of nine randomly selected red category units out of the total 93 industries revealed the following.

- In four industries<sup>24</sup>, ETPs were either not installed or not functioning/working. Thus, waste water was being discharged to public drain, surface water, etc.
- Although ETP was installed at the New Guwahati Diesel Locomotive Shed, NF Railway, Bamunimaidam, Guwahati, the unit partially discharged waste water

<sup>22</sup> Water samples from Bharalu near Pragjyotish college

<sup>23</sup> Red category means highly polluting industries, Orange category means moderately polluting industries and Green Industries means least polluting or eco friendly industries.

<sup>24</sup> M/s Seven Sisters Trade and Distilleries, Amingaon, M/s Mangalam Distillery and Bottling Industries, Changsari, M/s North East Distilleries Pvt. Ltd, Khanapara and M/s Karnak Distillery Pvt. Ltd., Panikheti.



mixed with oil, grease, etc. directly into public drain outside the boundary wall bypassing ETP. Sample of this discharge analysed in the PCBA Laboratory revealed that the following parameters were much higher than the prescribed standards:

Table No.: 3.5

Parameters	Prescribed Standards	Analysis Report	Percentage
<b>BOD (3 days at 27°C) (mg/l)</b>	250 (max)	600.0	240 %
<b>COD (mg/l)</b>	250 (max)	1304.0	522%
<b>Oil &amp; Grease (mg/l)</b>	10 (max)	51900	519000%
<b>Total Suspended Solids (mg/l)</b>	100 (max)	350.0	350%

Interestingly, the test reports held by the PCBA and shared with Audit indicated that the parameters of the effluents of the Loco shed, NF Railways were within the prescribed standards. This shows that the samples for the purpose of tests collected by the PCBA were from the effluents passing through the ETP while the effluents directly released to the water bodies bypassing the ETP were not taken into consideration. This showed that the testing process of the PCBA was flawed.

In reply, the PCBA stated (April 2016) that ETP was not functioning since long and the authority was directed on numerous occasions to efficiently operate the ETP so that the released effluents meet the permissible standards all the time. The fact remained that the PCBA had not initiated legal proceedings against the offenders for the violations as envisaged in the Water Act.

### 3.9 Recommendations

- *The PCBA should prepare a time-bound action plan for use-based classification of surface water.*
- *Monitoring of water on all the parameters identified by the CPCB should be taken up on priority in order to have a proper assessment and reliable database of the quality of water.*
- *Action should be taken timely on defaulters.*

# **Chapter IV**

## **Air Pollution**



## Chapter IV

### Air Pollution

Air Pollution occurs when the concentration of any substance which is introduced into atmosphere causes harmful effects to the environment, living and non-living things. Substances that are generally recognised as air pollutants include Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Oxide (NO<sub>2</sub>), Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), Methane and Ozone Depleting substances such as Chlorofluorocarbon (CFC).

#### 4.1 Inadequate monitoring of air pollutants

The CPCB had notified National Ambient Air Quality Standards (NAAQS) in November 2009 with 12 identified pollutants. It includes five gaseous pollutants such as Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Oxide (NO<sub>2</sub>), Ozone (O<sub>3</sub>), Carbon Monoxide (CO) and Ammonia (NH<sub>3</sub>), two dust related parameters (PM<sub>10</sub> and PM<sub>2.5</sub>), three metals (Lead, Nickel and Arsenic) and two organic pollutants (Benzene and BaP-particulate). The impact of the air pollutants on the environment is shown in *Appendix IV*.

It was observed in Audit that the PCBA was monitoring only three air pollutants - Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Dioxide (NO<sub>2</sub>) and Respirable Suspended Particulate Matter (RSPM/PM<sub>10</sub>)/Suspended Particulate Matter (SPM) regularly at all the 22 locations. It was also observed that the PCBA did not carry out any study regarding effect of air pollution on human health in Guwahati city.

On being pointed out, the PCBA stated (August 2015) that due to some technical difficulties, all prescribed parameters could not be monitored and the CPCB regularly accepted PCBA's reports on four<sup>25</sup> quality parameters. However efforts had been made to include more parameters. As regards, study on effect of air pollution on human health, the PCBA stated (August 2015) that proposal for the assistance for carrying out a study had been forwarded (23 July 2015) to the MoEF, GoI.

The PCBA's reply was not tenable as the fact remained that the PCBA could not monitor all the parameters prescribed by the CPCB even after a lapse of five years and on the basis of analysing three parameters, actual air quality could not be ascertained.

<sup>25</sup> Out of the four, one of the parameter though previously prescribed by CPCB was not included in the list of air pollutants notified by CPCB subsequently and was therefore, irrelevant but the PCBA was still monitoring the same. As per the instructions of CPCB in vogue currently, PCBA was only monitoring three parameters prescribed.

## 4.2 Unscientific location of Air Quality Monitoring Stations

The PCBA was carrying out ambient air quality monitoring under NAMP (National Air Monitoring Programme) since 1991 and till date of audit there were 22 stations in Assam; of which, six stations<sup>26</sup> were located at Guwahati. The list of the monitoring stations in Guwahati along with their type and locations is given in *Appendix V*.



*Air Monitoring station at Bamunimaidam*

It was observed in audit that:

- As per the guidelines for Ambient Air Quality Monitoring, distribution of monitoring station in a city depends on the distribution of pollution source and population in a city. More stations should be located in areas according to population density, number of industries and vehicular density. However, physical verification of the six monitoring stations at Guwahati showed that all of them were located at places relatively with lesser population and vehicular density.
- As per the guidelines, monitoring stations should be located in residential/commercial, sensitive and industrial areas and samples should be collected and tested at least on a daily basis. But all the 22 monitoring stations in Assam were set up only in residential areas.



*Air Monitoring station at Pragjyotish College, Santipur, Guwahati*

On this being pointed out, the PCBA stated (August 2015) that all the stations were set up in urban and residential areas where PCBA could assess the air quality with reference to human habitation. Besides, industries also regularly monitor ambient air quality.

<sup>26</sup> Bamunimaidan, Boragaon, Gopinath Nagar, Guwahati University, Khanapara and Santipur.

But the fact remained that setting up of monitoring stations only in residential areas ignoring sensitive and industrial areas was not in compliance with the provisions of the guidelines. Further, though industries monitor the ambient air quality, they are done on yearly basis with few exceptions being done on half yearly/quarterly basis instead of daily basis as mandated.

- As per the guidelines, the Sampler should not be located in any confined place and must be (i) more than 20 meters away from trees; (ii) more than two times the height of any obstacle; and (iii) there should be unrestricted airflow in three of four quadrants. However, it was observed that one monitoring station<sup>27</sup> was located at a distance of three/four meters (approx.) from the three-storeyed office building of the PCBA and State Public Health Laboratory. There were also trees adjacent to the monitoring station. Another monitoring station<sup>28</sup> was surrounded by buildings/trees on three sides. Placement of monitoring stations at inappropriate locations was not only against the provisions of the guidelines but was also fraught with the risk of generating inaccurate results on the air quality.

On this being pointed out, the PCBA accepted the audit observations and stated (August 2015) that in the first case the tree was under the area of state public health laboratory which was trimmed occasionally and the authority concerned shall be requested to trim it, as the rainy season was over. In respect of the second case, it stated that the site was selected long back and they were in search of an alternate location.

### 4.3 Ambient Air Quality at different Stations of Guwahati

As discussed in Para 4.2, the PCBA was monitoring ambient air quality of Guwahati under NAMP through six stations (*Appendix VI*) in respect of three presently prescribed parameters. The results of the study in respect of the six stations for the years 2010 to 2014 was analysed and the following was observed:

- The annual mean value of SO<sub>2</sub> ranged between 5.60 µg/m<sup>3</sup> and 15.20 µg/ m<sup>3</sup> which was within the prescribed limit (50.00 µg/m<sup>3</sup>).
- The annual mean values of NO<sub>2</sub> ranged between 11.80 µg/m<sup>3</sup> and 16.30 µg/ m<sup>3</sup> which was within the prescribed limit (40.00 µg/m<sup>3</sup>). However, the minimum and maximum values were 5.60 µg/m<sup>3</sup> and 45.80 µg/m<sup>3</sup> respectively.
- The annual mean values of RSPM (PM<sub>10</sub>) ranged between 41.60 µg/m<sup>3</sup> and 169.5 µg/ m<sup>3</sup>. When seen against the prescribed limit of 60.00 µg/m<sup>3</sup> RSPM values of some areas were above the standards. The minimum and maximum RSPM values observed during the said periods were 12.00 µg/m<sup>3</sup> and 478.00 µg/ m<sup>3</sup> respectively.

<sup>27</sup> Located at PCBA Office, Bamunimaidam, Guwahati

<sup>28</sup> Located at Pragiyotish College, Santipur, Guwahati

The PCBA stated (August 2015) that RSPM exhibit higher values particularly in dry season. Many factors such as vehicular movement, construction activities are primarily contributing to particulate matter (PM) which becomes higher in dry days due to dust with the wind from the hills in which earth had been cut and sandy river banks of Brahmaputra. The PCBA further stated (April 2016) that Board had taken steps to monitor more numbers of air pollutants and to study comprehensive Environment Pollution Index for some industrially cluster locations.

The fact however, remained that the PCBA was monitoring only three pollutants (SO<sub>2</sub>, NO<sub>2</sub> and RSPM/PM<sub>10</sub>) out of 12 pollutants identified by CPCB under National Ambient Air Quality Standards (NAAQS). Besides, the PCBA themselves have admitted the fact and stated that the Board had taken steps to monitor more numbers of air pollutants and to study comprehensive Environment Pollution Index for some industrial cluster locations.

#### **4.4 Industrial Emission**

As mentioned in Para 3.8, there were 1,145 industries (red category: 371, orange category: 557 and green category: 217) in the greater Guwahati area.

##### **4.4.1 Industries operating without valid Consent for Operation**

Under Section 21 of the Air Act and Section 25 of the Water Act and Rules made thereunder, the PCBA was empowered to issue consent for establishment (CFE) and consent for operation (CFO). Before expiry of CFOs granted initially, the units were required to renew their CFOs. Application for renewal of CFO was to be submitted four months before expiry of the earlier CFO. Further, as per Section 51 of the Air (Prevention and Control of Pollution) Act, every State Board should maintain a register containing particulars of the persons to whom consent has been granted under Section 21 of the said Act, the standard for emission laid down by it in relation to each such consent and such other particulars as may be prescribed.

It was noticed that 273 (23.84 *per cent*) out of 1,145 industries in the Guwahati region were operating even though the validity of their CFOs issued by the PCBA had expired and the industries had not applied for renewal of CFOs. Section 22A of the Air Act and Section 33 of the Water Act provides that where it is apprehended by a Board that emission of any air/water pollutant, in excess of the standards laid down by the State Board is likely to occur by reason of any person operating an industrial plant or otherwise, the Board may make an application to a court, not inferior to that of a Metropolitan Magistrate or a Judicial Magistrate of the first class for restraining such person from emitting such air pollutant. However, the PCBA had not initiated such action against any industry. It was also observed that contrary to the requirement, the register did not contain any information regarding the prescribed standard of emission, validity of consent etc. As such the PCBA did not monitor those industries which indicated the weak internal monitoring mechanism.

#### 4.4.2 Inadequate inspection of Industries

As per notification issued (December 1999) by the Ministry of Environment and Forest, GoI, industries should be inspected at the following frequency depending on their classification.

**Table No.: 4.1**  
**Prescribed Frequency of inspection of industries**

Sl. No.	Size of Industry	Category of Industry	Frequency of visit and effluent sampling
1.	Small Scale	Red	Once in 12 months
		Orange	Once in 3 years
		Green	Once in 3 years on random check basis
2.	Large & Medium Scale	Red	Once in 3 months
		Orange	Once in 6 months
		Green	Once in 12 months

The position of inspection of industries by PCBA in the Guwahati region is mentioned in the following table:

**Table No.: 4.2**  
**Industries Inspected in Guwahati Region**

Year	Total Nos. of Industries				Nos. of Industries Inspected (in per cent)			
	Red	Orange	Green	Total	Red	Orange	Green	Total
2010-11	312	394	142	<b>848</b>	94 (30%)	43 (11%)	31 (22%)	<b>168 (20%)</b>
2011-12	349	426	164	<b>939</b>	104 (30%)	54 (13%)	40 (24%)	<b>198 (21%)</b>
2012-13	369	466	179	<b>1014</b>	66 (18%)	49 (11%)	45 (25%)	<b>160 (16%)</b>
2013-14	378	496	193	<b>1067</b>	61 (16%)	75 (15%)	36 (19%)	<b>172 (16%)</b>
2014-15	371	557	217	<b>1145</b>	115 (31%)	149 (27%)	62 (29%)	<b>362 (32%)</b>

Source: PCBA (Note: percentage in brackets shows percentage of inspection w.r.t. total industries.)

It was observed in Audit that:

- PCBA did not have details of small, medium and large industries under each category, in the absence of which Audit could not make separate assessment of the number of inspections due, conducted and shortfall thereto in the industries.
- Even if the minimum periodicity (once in a year) of inspections is considered, there was shortfall varying from 69 per cent to 84 per cent in inspection of Red



category industries and from 68 *per cent* to 84 *per cent* in respect of all types of industries during the years 2010-15.

- PCBA was inspecting the industries only at the time of renewal of Consent for Operation (CFO).
- Due to no inspection of industries, emission level, effluent quality etc. could not be monitored.

In reply, the PCBA stated (April 2016) that due to shortage of manpower and sophisticated instruments, stack monitoring are done on yearly basis for less polluting industries. Reply is not tenable as the inspections were carried out to the extent of only 16 to 31 *per cent* during 2010-15 in respect of highly polluted industries (Red category). Besides, the PCBA is itself responsible for the shortage of manpower as they have a very small proportion of staff dedicated to anti pollution activities whereas the proportion of non-technical manpower is quite high as compared to technical manpower.

#### **4.4.3 Emission of Particulate Matter (PM) in excess of standard**

As per Section 22 of the Air (Prevention and Control of Pollution) Act no person operating any industrial plant in any air pollution control area shall discharge or cause or permit to be discharged the emission of any air pollutant in excess of the standards laid down by the State Board. Section 22A and 23 of the said Act lays down the action to be taken by the PCBA in cases of non-compliance which includes restraining any person from emitting such air pollutants in case of wilful default and taking necessary action to mitigate the emission of air pollutants in cases of accidents/unforeseen acts or events.

On scrutiny of the Stack Emission Report of various industries, it was noticed that 25 industries emitted Particulate Matter (PM) in excess of the standard laid down by the PCBA. Details are given in *Appendix VII*. However, the PCBA did not take action as envisaged under sections 22A and 23 of the Air Act against the defaulters such as restraining persons from causing air pollution, recovery of amount expended towards remedial measures from the persons concerned as arrears of land revenue, or of public demand.

#### **4.4.4 Joint physical inspection of industries**

A joint team (consisting of officers from office of the PCBA and Audit) inspected the site of 15 industries (who had taken consent from PCBA under Air Act), and the following was observed:

- Against the requirement of monitoring on a daily basis, the industries were monitoring the stack emission and the ambient air quality on yearly basis, in few cases half yearly or quarterly basis.
- In respect of two industries<sup>29</sup>, monitoring station/dust sampler was adjacent to the trees instead of the requirement of 20 metres distance, thereby restricting free movement of air.
- In one industry,<sup>30</sup> Respirable Dust Samplers were functioning during day time (6.00 am to 6.00 pm) only whereas plant was working for 24 hours.
- In four industries<sup>31</sup>, dust collector, etc. in packing section of cement was not working properly. Hence, emission of cement dust was recorded inaccurately.
- IOCL, Guwahati Refinery was meeting stack emission PM norm of 100 mg/Nm<sup>3</sup> in the mixed fuel fired furnaces. However, for gas fired furnace, the PM emission value was found to be above the limit of 10 mg/Nm<sup>3</sup>. It was stated that non-compliance was due to non-availability of space for installation of devices like ESPs in the existing units. During joint physical inspection of sites of 15 industries, irregularities were noticed which are detailed above. The PCBA, though monitoring those industries regularly, could not detect such irregularities. This indicated that there was inadequate monitoring by the PCBA resulting in failure to take action against non-compliance.



*Air Monitoring station at premises of  
M/s Purbanchal Cement*

#### **4.4.5 Continuous Stack Emission Monitoring System not installed**

To strengthen the monitoring mechanism for effective compliance through self regulatory mechanism, the CPCB directed<sup>32</sup> all the Chairmen of PCBs to issue the following directions to all the industries under the categories of highly polluting industries, Common Effluent Treatment Plants, Common hazardous Waste and Biomedical Waste Incinerators:

- a) to install online Continuous Stack Emission Monitoring Systems (CSEMS) not later than 31 March 2015
- b) to install online Effluent Quality Monitoring System (EQMS) at the outlet of effluent treatment plants not later than 31 March 2015

<sup>29</sup> IOCL, Guwahati Refinery and M/s Purbanchal Cement.

<sup>30</sup> M/s Cement Manufacturing Co. Ltd., Sonapur.

<sup>31</sup> M/s Cement Manufacturing Co. Ltd., M/s Raksha Cement, M/s River Valley Cement Corporation and M/s Vinayak Cement.

<sup>32</sup> Vide letter no. B-29016/04/06/PCI-1/5401 dated 05 February 2014

- c) to connect and upload the online emission and effluent monitoring data at PCBs/PCCs and CPCB server in a time bound manner but not later than 31 March 2015
- d) to ensure regular maintenance and operation of the online system with tamper proof mechanism having facilities for online calibration
- e) to submit bank guarantee of 25 per cent of cost of online monitoring system (emission and effluent whichever applicable) for ensuring timely installation of online monitoring systems within 90 days from the date of receipt of directions issued by PCBs/PCCs to the Industries.

Besides the above, the CPCB also directed that the PCBs shall install the necessary software and hardware in their headquarters for centralised data collection, analysis and corrective action. The action taken report along with time bound action plan for installation of online monitoring systems (emission and/or effluent) shall be submitted to the CPCB within 120 days from the date of receipt of direction.

Audit observed that:

- Out of 35 industries under the categories of highly polluting industries, only six industries<sup>33</sup> installed online CSEMS till March 2015.
- Only one industry<sup>34</sup> connected and uploaded the online emission monitoring data to CPCB server till March 2015.
- None of the units had installed the online EQMS till March 2015.
- Bank Guarantee had not been taken for ensuring timely installation of online monitoring system.
- PCBA had not installed necessary software and hardware for centralised data collection, analysis and corrective action.

On being pointed out, the PCBA stated (August 2015) that those units which had not taken initiative were called for a meeting to impress upon them for implementation of the CPCB direction.

#### 4.5 Vehicular emission

Due to increase of population, change in life style and per capita income, rapid increase of number of motor vehicles on road in Greater Guwahati area was observed over the past few years. Vehicles, one of the major contributors to air pollution, also emit greenhouse gases such as carbon dioxide which contributes to global warming and Nitrogen Oxides and Sulphur Oxides which are major contributors to acid rain<sup>35</sup>. The vehicle pollution emission centres were set up with a view to check those pollutants including harmful emissions.

<sup>33</sup> (i) M/s Topcem Cement (ii) IOCL, Guwhati Refinery (iii) Numaligarh Refinery (iv) Calcom Cement (v) IOCL, Bongaigaon Refinery (vi) Cement Manufacturing Co., Sonapur

<sup>34</sup> IOCL, Bongaigaon Refinery, Bongaigaon

<sup>35</sup> Caused by the presence of oxides of nitrogen and sulphur in the atmosphere due to the burning of fossil fuels.

### 4.5.1 Position of Motor Vehicles on road

An analysis of total motor vehicles in the Greater Guwahati area as of March 2015 as well as reports<sup>36</sup> available on the website indicated that

- Vehicle population in the Greater Guwahati area had reached 7.70 lakh (out of which 3.81 lakh vehicles were more than 10 years old) as of March 2015 compared to 3.02 lakh in March 2001, which shows a 155 *per cent* increase.
- The density of motor vehicles in Greater Guwahati area was 806 per sq. km and 61,410 vehicles per one lakh population as of March 2015 as against 316 vehicles per Sq. Km. and 28,462 vehicles per one lakh population as of March 2001 respectively.
- More than four lakh vehicles ply on Guwahati's roads, 70 *per cent* of which do not possess emission clearance certificates which has been highlighted in 'The Desert Research Institute and NASA Study Report, 2012.

### 4.5.2 Joint Physical Inspection of Vehicle Pollution Emission Testing Centres

A joint team (consisting of officials of the Transport Department and Audit) visited the site of nine Vehicle Pollution Emission Testing Centres in Guwahati. It was observed that despite deficiencies as noted below, the centres were issuing pollution under control certificates.



*Pollution testing centre at Betkuchi*

- In four centres<sup>37</sup>, there was no testing machine/equipment though they were issuing Pollution Under Control (PUC) Certificates.
- Two centres<sup>38</sup> were issuing PUC Certificates even though the testing machine/equipment was not functional.
- One centre<sup>39</sup> was not traceable at the address mentioned in their application for licence.

<sup>36</sup> Report of Desert Research Institute and NASA available in Centre for Science and Environment (CSE) website.

<sup>37</sup> (i) Puspa Auto Emission, Betkuchi (Owner-Sri Puspa Ram Kalita) (ii) Anupama Pollution Testing Centre, Lalonggaon, Lohra (Owner-Sri Debajyoti Bardoloi) (iii) Mahabir Motors, Near Udesna Cinema Hall, Dispur (Owner-Sri Raj Prasad Saikia)

<sup>38</sup> (i) Labanya Enterprise, Betkuchi, Near DTO Office (Owner- Sri Arup Pandit) (ii) Jimlee Pollution Testing Centre, Hatigaon (Owner-Sri BrojenKalita)

<sup>39</sup> Hatigaon, Bhetapara, Main Road (Owner-Sri Nazul Haque)

- In five centres<sup>40</sup>, there was no space for parking, whereas one centre<sup>41</sup> was running at the parking place of residential complex.
- In six centres<sup>42</sup>, no web-camera was installed.

In reply, the PCBA stated (April 2016) that the matter is under the purview of the MVI Act. Reply is not tenable since GoA had authorised (vide Notification dated 17 August 2009) the PCBA to check the equipment of the Private Emission Testing Stations as and when necessary.

### 4.5.3 Inadequate monitoring of Auto emission testing Stations

Mention was made in the Report of the Comptroller and Auditor General of India on Revenue Sector for the year ended March 2015, Government of Assam (Report No.3 for the year 2014-15) regarding the functioning of Auto Emission Testing Stations (AETS) in Assam during 2010-11 to 2014-15 vis-a-vis the vehicle population. It was pointed out that under Greater Guwahati area, there were 43 AETS to cater to 3.14 lakh vehicles, out of which active AETS were only 11, thereby bringing the proportion of vehicles per AETS to 28,545. The AETS functions under the direct control and monitoring of the concerned DTOs. It was observed in Audit that:

- The DTOs conduct physical verification of the AETS only at the time of commissioning and there was no system of periodic physical verification of the equipment of the AETS. This denied the Department of having a check on the efficacy of



*Mobile Testing Station*

the testing equipment and consequently there was no assurance that the PUC certificates issued by the AETS conformed to the prescribed standards.

<sup>40</sup> (i) Puspa Auto Emission, Betkuchi (Owner-Sri Puspa Ram Kalita) (ii) Labanya Enterprise, Betkuchi, Near DTO Office (Owner- Sri Arup Pandit) (iii) Anupama Pollution Testing Centre, Lalonggaon, Lokhra (Owner-Sri Debajyoti Bardoloi) (iv) Bajrangbali Auto Emission Testing Centre, Near Beltola Petrol Pump, Basistha (Owner- Sri PallabJyoti Chakraborty) (v) Mahabir Motors, Near Udesna Cinema Hall, Dispur (Owner-Sri Raj Prasad Saikia)

<sup>41</sup> Jimlee Pollution Testing Centre, Hatigaon (Owner-Sri Brojen Kalita)

<sup>42</sup> (i) Puspa Auto Emission, Betkuchi (Owner-Sri Puspa Ram Kalita) (ii) Labanya Enterprise, Betkuchi, Near DTO Office (Owner- Sri Arup Pandit) (iii) Anupama Pollution Testing Centre, Lalonggaon, Lokhra (Owner-Sri Debajyoti Bardoloi) (iv) Bajrangbali Auto Emission Testing Centre, Near Beltola Petrol Pump, Basistha (Owner- Sri PallabJyoti Chakraborty) (v) Mahabir Motors, Near Udesna Cinema Hall, Dispur (Owner-Sri Raj Prasad Saikia) (vi) Auto Emission Testing Centre, Rukminigaon (Owner-Sri BhupenBhuyan)

- There is no system of periodic verification of the renewal of licenses and proper collection of fees by the AETS.
- The DTOs or any other authority did not conduct any supervisory checks of samples of vehicles already checked by AETS for assessing the quality of checks.

A system of periodic physical verification would have enabled the DTOs to detect the AETS issuing PUC certificates without payment of fees and renewal of their licences. Further, the Govt. of Assam (Vide Notification dated 17 August 2009) authorised the officers of the PCBA to check the equipment of Private Emission Testing Stations as and when necessary. Since the AETS were private parties, inspection by PCBA at regular intervals could have enhanced the quality of checks by AETS. However, no inspections were ever done by PCBA.

#### **4.6 High Benzene Level near the Petrol/Diesel Retail Station**

Benzene is a sweet-smelling, light yellow liquid at room temperature, volatile organic compound containing six carbon and hydrogen atoms, but evaporates very quickly into the air. It hangs closer to the ground than air giving people no choice but to breathe in benzene vapour wherever the levels are high. As per the World Health Organisation, breathing in high doses of benzene can affect the central nervous system which can lead to drowsiness, dizziness, headaches and convulsions. It can stop bone marrow from producing enough red blood cells, leading to anaemia. High exposure to benzene can also upset heart beat rhythms besides damaging the immune system by causing the loss of white blood cells<sup>43</sup>.

Benzene mainly emanates from evaporation in petrol stations, vehicle exhausts and industrial emissions. Escape of Benzene is controlled by a device called a Vapour Recovery System which sucks back the fumes that escapes from a pipe when fuel is being pumped into a vehicle or an outlet. The permissible level of Benzene is 5  $\mu\text{g}/\text{m}^3$  as allowed by the National Ambient Air Quality Standards (NAAQS) set by the CPCB.

On test check of records of PCBA, it was noticed that:

- Though the activities involving storage, transfer and processing of petroleum products fall under 'Red' category of industries, no retail petrol/diesel stations applied for Consent to Establishment or Consent for Operation to the PCBA.
- PCBA never carried out any testing of benzene level near the retail petrol/diesel stations.
- None of the retail petrol/diesel stations had installed any Vapour Recovery System.

<sup>43</sup> Study conducted by World Health Organisation and CPCB.

A joint team (consisting of officers from office of the PCBA and Audit) along with the analyst of the Private Laboratory<sup>44</sup>, authorised by the PCBA, visited the site of 10 retail petrol/diesel stations<sup>45</sup> and collected the air samples for testing of Benzene level. The testing apparatus used for testing benzene level had maximum scale of 25 µg/m<sup>3</sup>. However, the levels of benzene prevalent in the samples were much higher than the maximum of 25 ug/m<sup>3</sup> in the scale against the permissible limit of 5 µg/m prescribed by NAAQS. Hence, the actual level of benzene in the air could not be ascertained in audit.

In reply, the PCBA stated (April 2016) that first two points<sup>46</sup> had been noted.

#### 4.7 Recommendations

- *The PCBA should establish adequate air quality monitoring stations especially in eco-sensitive and commercial areas and monitor all parameters as prescribed.*
- *Functioning of vehicular pollution emission testing centres should be reviewed and strengthened in co-ordination with the Transport Department. The testing centres should be regularly monitored and strict action initiated against agencies issuing inaccurate PUC Certificates.*

<sup>44</sup> Green Tech Environmental Engineer & Consultants, Bhetapara, Guwahati

<sup>45</sup> M/s ChandmalSawargi& Co., Chandmari, M/s Goswami Service Station, Silpukhuri, ChandmalSawargi& Co., Paltan Bazar, M/s Prabhat Oil Station, Santipur, NRL Energy Station (Mohini), Adabari, M/s Saraight Service Centre, Adabari, M/s Das Service Station, Kalapahar, M/s Bungrung Service station, Kahilipara, M/s Kiran Service Station, Wireless, Beltola and NRL Petrol Pump, Joya Nagar.

<sup>46</sup> Bullet numbers 1 & 2 pre-page.

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# **Chapter V**

## **Municipal Solid Waste (MSW)**

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## Chapter V

### Municipal Solid Waste (MSW)

MSW Rules provides that every municipal authority shall be responsible for implementation of provisions of these Rules and for any infrastructure, development for collection, storage, segregate, transportation, processing and disposal of MSW, GMC is the implementing agency in Guwahati city.

Guwahati Municipal Corporation (GMC) was responsible for management of solid waste generated in Guwahati city. Municipal Solid Waste (Management and Handling) Rules 2000 envisaged mandatory setting up of infrastructure facility and servicing of Solid Waste Management (SWM) by 31 December 2003. The Pollution Control Board, Assam (PCBA) was responsible for monitoring the implementation of provisions of MSW Rules.

The PCBA was responsible for monitoring of implementing these Rules such as compliance of standards regarding groundwater, ambient air, leachate quality and the compost quality including incineration standards as prescribed. The PCBA shall issue the authorisation to Municipal authority or an operator (on receipt of application) stipulating compliance criteria and standards as specified including such other conditions as may be necessary. Further the Municipal Authority shall furnish copy of annual report to the PCBA on or before 30<sup>th</sup> June every year. The PCBA shall prepare and submit to CPCB an annual report with regard to the implementation of MSW Rules by 15<sup>th</sup> September every year.

#### 5.1 Previous Audit Findings

Mention about Solid Waste Management in Guwahati was made in Para 1.3 of Report of the Comptroller and Auditor General of India (Civil) for the year 2010-11 (Performance Audit of Public Private Partnership in Solid Waste Management in Guwahati). The Performance Audit covered the period upto March 2011 and brought out the following major audit findings:

- The land provided for setting up of the SWM project did not comply fully with applicable parameters stipulated by Central Public Health and Environmental Engineering Organisation (CPHEEO).
- The SWM partner, Guwahati Waste Management Corporation Private Limited (GWMCP) failed to take appropriate measures against pollution of air, water and land.
- The Boragaon, Guwahati landfill site shares a common boundary with a national wetland, which has a linkage with 'Deepor Beel' a Ramsar site water body and pollution through seepage endangered the fish and migratory birds in the wetland. The future of SWM project was in jeopardy as the site was in close vicinity of a national wetland and was in violation of Wetland Rules, 2010.

On the basis of the audit findings, the following recommendations were made:

- Proper assessment of generation and characteristic of MSW should be made before proceeding towards implementation of the project.
- Waste processing should be made mandatory by the developer and it should be impressed upon the developer to improve the existing dumpsites to make them more sanitary and aesthetic.
- In view of the alarming possibility of contamination of surface water, groundwater and soil for setting up the project site in wetland in violation of MSW rules 2000 and Wetland Rules 2010, the State Government should consider remedial measures urgently.
- The PCBA should draw up comprehensive schedules for sustained monitoring of compost plants, landfill sites and other installations.

Verification of MSW management during the course of this performance audit revealed that a number of deficiencies were continuing despite being pointed out in 2011. These are mentioned in the succeeding paragraphs.

## 5.2 Quantity of MSW generated, collected, treated & disposed off

The quantity of MSW generated in Guwahati had been consistently rising over the years owing to rapid population growth, mass migration of population, floating population, increase in economic activities in the city and change in people's lifestyle.

A wide gap between the total quantity of MSW generated/collected, segregated, treated and disposed off during 2011-15<sup>47</sup> in Guwahati was noticed in Audit, as shown in the following Table:

**Table No.: 5.1**  
**Status of disposal of MSW in Guwahati**

Year	Quantity of MSW generated/collected (MT)	Quantity of MSW segregated (MT)	Quantity of MSW treated/processed (MT)	Quantity of MSW disposed through landfills (MT)	Quantity of MSW dumped (MT)	Total expenditure incurred for management of MSW (₹ in crore)
2011-12	1,26,000	50,400	36,000	0	39,600	7.10
2012-13	1,49,760	59,904	36,000	0	53,856	7.42
2013-14	1,55,880	62,352	36,000	0	57,528	7.50
2014-15	1,80,000	72,000	36,000	0	72,000	7.83
Total	<b>6,11,640</b>	<b>2,44,656 (40%)</b>	<b>1,44,000 (24%)</b>	<b>0</b>	<b>2,22,984 (36%)</b>	<b>29.85</b>

*Source: Information furnished by GMC*

<sup>47</sup> As period upto March 2011 has been covered in earlier PA, this data is restricted from 2011 onwards.

It was further observed in Audit that:

- As per Rule 4 (2) of the MSW Rules, the municipal authority or an operator of a facility shall make an application for grant of authorisation by the PCBA for setting up waste processing and disposal facility including landfills in order to comply with the implementation schedule. Even after passage of more than 14 years since the Rules were made, Guwahati Municipal Corporation (GMC) had not obtained authorisation from the PCBA.
- Only 40 per cent of the total MSW was segregated into biodegradable and non-biodegradable wastes and only 24 per cent of the total MSW was treated/processed.
- Final disposal of MSW needed to be done through landfills, but no such disposal was done during 2011-15.
- During 2011-15, a total of 2,22,984 MT untreated MSW had been dumped in the open dumpsites/yards increasing the risk of environmental degradation and health hazards.
- Despite incurring a total expenditure of ₹29.85 crore during 2011-15, GMC had not complied with MSW Rules.
- As per MSW Rules, the PCBA was responsible for monitoring of compliance but did not take any action in this regard.



*Untreated MSW dumped at Boragaon*

In reply, the PCBA stated (April 2016) that the matter had been brought before GoA and also communicated to the Municipal Bodies. The fact remained that the matter was never discussed in any of the 12 Board Meetings of PCBA that were held between 2010 and 2015 although Secretary, Urban Development Department was a member of the Board.

### 5.3 Unhygienic collection and storage of MSW

As per Schedule II of MSW Rules, littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. Municipal authorities were responsible for prohibiting littering and facilitating compliance with MSW Rules in such a manner that it does not create unhygienic and insanitary conditions.



*Mixed MSW littering around bins near Wireless, Guwahati*

Storage facilities shall be created and established by taking into account quantities of waste generated in a given area and the population densities. It shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly. Storage facilities or bins shall have 'easy to operate' design for handling, transfer and transportation of waste.

Bins for storage of bio-degradable wastes, recyclable waste and other wastes shall be painted in green, white and black colours respectively.

It was noticed in Audit that:

- Facilities for house to house collection of MSW were available only in some parts of the city. With available tricycles (500 nos.) and auto tippers (62), a maximum of 2.12 lakh households could be covered out of 2.50 lakh total households in the City.
- Single coloured (black) bins were placed on road side instead of three coloured bins *i.e.* green, white and black. Hence, all types of wastes *i.e.* bio-degradable wastes, recyclable waste and other wastes were mixed.
- Size and nos. of bins were placed without considering the quantities of wastes generated in an area and the population density. This resulted in littering after bins became full thus creating unhygienic and insanitary conditions around the site.
- The available Dumper Bins, Compactors, etc, had a total waste holding capacity of 207.3 tonnes whereas the estimated quantity of waste generation was 506 tonnes per day. Hence, numbers of Bins, compactors were not sufficient and these were also not being cleared regularly resulting in unhygienic and filthy conditions near the collection points.



*Mixed MSW littering around bins near Gitanagar, Guwahati*



*Overflowing MSW littering out bins near Biruhari*

In reply, the PCBA stated (April 2016) that correspondence with the Municipal authority was in progress regarding segregation of biodegradable, recyclable and inert part of MSW.

## 5.4 Transportation of MSW

As per Schedule II of MSW Rules, vehicles used for transportation of wastes shall be covered. Wastes should not be visible to public or exposed to open environment in order to prevent scattering. The storage facilities set up by the municipal authorities shall be attended daily for clearing of wastes. The bins or containers wherever placed shall be cleared before they start overflowing. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided. It was observed in Audit that

- 200 dumper bins of 3.5 m<sup>3</sup> capacity each were placed at the road sides of the city and 23 dumper placers were engaged to transport the bins. Considering the waste holding capacity of 200 dumper bins (*i.e.* 200 ton), at least 25 dumper placers were required for transporting.
- MSW was being transported in uncovered vehicles.

## 5.5 Partial treatment of MSW

As per MSW Rules, the municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimise burden of landfill. The biodegradable wastes shall be processed by composting, vermin-composting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule IV of MSW Rules. Mixed waste shall follow the route of recycling. Incineration with or without energy recovery can also be used for processing wastes in specific cases.

It was observed in Audit that

- 1,44,000 MT MSW was treated during 2011-15, which was only 24 *per cent* of total actual quantity *i.e.* 6,11,640 MT MSW generated/collected during those periods.
- GMC installed (February 2011) Compost Plant with a capacity of 50 tonnes per day (TPD) at Boragaon dumping site for treatment of MSW and



*Compost plant at Boragaon*



*Packed Compost lying in the plant at Boragaon*

a meagre quantity of five TPD of manure was being produced. However, the compost produced was never tested by the PCBA and hence its quality could not be ascertained by audit.

- Recycling of the waste was not carried out and
- No incinerator had been installed.

## 5.6 Leachate at MSW Dumping Site

As per Schedule III of MSW Rules, diversion of storm water drains was necessary to minimize leachate<sup>48</sup> generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy condition. Steps should be taken for prevention of run-off from landfill area entering any stream, river, lake or pond. Provision for management of leachate collection and treatment shall be made. The treated leachate should meet the standards specified in Schedule IV of the Rules.

Audit observed that

- Leachate Treatment Plant was commissioned in February 2011 but was not operational till date of audit (August 2015)
- Test Analysis Report<sup>49</sup> of 20 samples of Leachate at MSW Dumping Site at Boragaon for the period from 2009 to 2015 revealed the following:



*Untreated Leachate pumped out at Boragaon*

**Table No.: 5.2**

Parameters	Standards prescribed for inland surface water (Schedule IV)	Observation	Remarks
pH	5.5-9.0	4.2-5.9	It met the desired criteria only on six occasions
Chemical Oxygen Demand (COD) (mg/l) Max	250	5482-15288	COD did not meet the desired criteria on any occasion.
Bio-Chemical Oxygen Demand (BOD) (mg/l) Max	30	1600-6912	BOD did not meet the desired criteria on any occasion.
Total Dissolved	2100	920-2822	TDS met the desired criteria

<sup>48</sup> Leachate means liquid that seeps through solid wastes or other medium and has extracts of dissolved or suspended material from it.

<sup>49</sup> Conducted by the PCBA annually.

<b>Solids (TDS) (mg/l) Max</b>			on eight occasions.
<b>Total suspended solids (TSS) (mg/l) Max</b>	100	86-5444	TSS met the desired criteria on only one occasion.
<b>Phenolic (mg/l) Max</b>	1.0	0.36-1.86	It met the desired criteria on nine occasions.
<b>Lead (as Pb) (mg/l) Max</b>	0.1	0.09-2.15	Lead level was above the criteria on ten occasions.

No follow-up had been done by the Municipal Authority regarding potential threats and adverse reports. As per section 15 of the Environment (Protection) Act, 1986, whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure. PCBA however, had not taken any action in this regard.

### 5.7 Monitoring of Air Quality at MSW Dumping Site

As per Schedule III of MSW Rules, installation of landfill gas control system including gas collection system should be made at landfill site to minimize odour generation, prevent off-site migration of gases and protect vegetation planted on the rehabilitated landfill surface.

The ambient air quality monitoring shall also be carried out by the concerned authority at regular intervals based on the population of cities such as six times in a year for cities having population more than 50 lakh, four times in a year for cities having population between 10 to 50 lakh and two times in a year for cities having population below 10 lakh.

It was observed in Audit that:

- Landfill Gas Control System and Gas Collection System were not installed.
- Against the requirement of four tests per year<sup>50</sup>, neither the GMC nor PCBA carried out any monitoring of the ambient air quality at the dumping site, except once in 2012 when it was conducted by a Private Lab<sup>51</sup>.

### 5.8 Ground Water Quality at MSW Dumping Site

As per Schedule III of MSW Rules, before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept on record for future reference. The ground water quality within 50 meters of the periphery of landfill site shall also be periodically monitored to ensure that the ground water was

<sup>50</sup> Population of Guwahati being about twelve lakh.

<sup>51</sup> M/s Vision Labs, Hyderabad



not contaminated beyond acceptable limit. Such monitoring should be carried out to cover different seasons in a year *i. e.* summer, monsoon and post monsoon period.

Audit observed that

- Base Line Data of ground water quality was not made available by GMC to audit. It was stated that the Data was available with the Guwahati Waste Management Corporation Private Limited.
- The PCBA was monitoring the ground water quality at the dumping site at Boragaon. The values of DO level during the years from 2011 to 2014 were found less than the criteria which was corroborated by the findings of the physical verification of the water quality of Deepor Beel carried out by Audit as mentioned in Para 3.4.

## **5.9 Recommendations**

- *The PCBA should ensure that GMC obtains proper authorisation from them for management of MSW.*
- *Awareness Campaigns should be initiated by the PCBA in schools and media to ensure that the general public is sensitised regarding scientific disposal of domestic waste.*

# **Chapter VI**

## **Bio Medical Waste (BMW)**



## Chapter VI

### Bio Medical Waste (BMW)

According to the Bio-medical Waste (Management and Handling) Rules, 1998, Bio-Medical Waste (BMW) means any waste which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto.

Bio-Medical waste would, thus, include waste generated by Hospitals, other Health Care Establishments (HCEs), Veterinary Institutions and consists of discarded drugs, sharp waste, microbiological and biotechnological waste, human anatomical waste, animal wastes, etc.

#### 6.1 HCEs functioning without obtaining authorisation

As per Rule 8 of the BMW Rules, every HCE treating 1,000 or more patients in a month, has to obtain authorisation from the PCBA for generating, collecting, receiving, storing, treating, disposing or handling of biomedical waste. Accordingly, the Government of Assam fixed (November 2003) the authorisation fee under BMW Rules ranging between ₹ 40,000 and ₹ 2 lakh per HCE depending upon the number of beds/volume of BMW generation.

As per Annual Report submitted to CPCB by PCBA, the position of authorisation obtained by HCEs in Assam are shown in the following Table:

**Table No.: 6.1**  
**Number of HCEs requiring authorisation and obtained**

Year	No. of HCEs requiring authorisation	No. of HCEs which obtained authorisation	No. of HCEs functioning without authorisation
2010-11	1,007	114	893
2011-12	1,007	160	847
2012-13	1,011	294	717
2013-14	1,014	295	719
2014-15	1,014	178	836

*Source: Annual Report of PCBA submitted to CPCB*

Thus, 836 HCEs (82.44 per cent) were functioning without authorisation from PCBA in violation of BMW Rules, which, besides being in clear violation of the Rules also deprived the Exchequer of at least ₹ 3.34 crore<sup>52</sup> as fees not realised from the defaulters.

In reply, the PCBA stated (August 2015) that action had been taken in the form of issue of notices and directions to HCEs. The PCBA further stated (April 2016) that most of the HCEs that had not applied for authorisation are Government Primary

<sup>52</sup> Worked out on basis of minimum authorisation fee of ₹ 40,000 per HCE

Health Centres (PHCs) including dispensaries and clinics. However, PCBA assured that action had been initiated for detailed inventorisation of these units after which pending dues will be recovered.

## 6.2 HCEs functioning without BMW treatment facilities

Rule 5 (2) of the BMW Rules stipulate that every occupier shall set up, in accordance with the time-schedule in Schedule VI, requisite BMW treatment facilities like incinerator, autoclave, microwave system for the treatment of waste or ensure requisite treatment of waste by having a tie up with common BMW treatment facilities. Details are shown in the following table:

**Table No.: 6.2**  
**Time schedule for Waste Treatment Facilities**

<b>A</b>	<b>Hospitals and nursing homes in towns with population of 30 lakhs and above</b>	<b>By 30<sup>th</sup> June 2000 or earlier</b>
<b>B</b>	Hospitals and nursing homes in towns with population of below 30 lakhs	
	With 500 beds and above	By 30 <sup>th</sup> June 2000 or earlier
	With 200 beds and above but less than 500 bed	By 31 <sup>st</sup> December 2000 or earlier
	With 50 beds and above but less than 200 beds	By 31 <sup>st</sup> December 2001 or earlier
	With less than 50 beds	By 31 <sup>st</sup> December 2002 or earlier
<b>C</b>	All other institutions generating bio-medical waste not included in A and B above	By 31 <sup>st</sup> December 2002 or earlier

*Source: BMW Rules*

It was observed in Audit that:

- Despite mandatory provisions in the BMW Rules and lapse of more than 12 years, since 01 January 2003, 56 HCEs out of 183 HCEs in Guwahati neither had their own waste treatment facilities nor tied up with other Common Bio-Medical Waste Treatment Facilities. As per section 15 of the Environment (Protection) Act, 1986, whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which



*BMW laying in the open space in District Civil Hospital, Sonapur*

may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure. The PCBA also had not taken any punitive action as per the Environment (Protection) Act for non-compliance with BMW Rules. This was despite the fact that 98.14 MT BMW was generated by 56 hospitals during the period of the Performance Audit.

- No discussion was held in any of the 12 PCBA Board Meetings between 2010 and 2015 regarding non-compliance with BMW rules by HCEs.
- The PCBA had also not carried out any study on impact of untreated BMW on health.

On being pointed out, the PCBA stated (August 2015) that the HCEs were under Government Sector and generate very little amount of BMW. However, the matter had been communicated to the Director of Health Services, Guwahati for immediate necessary action. The fact remained that as per BMW Rules all HCEs (either Govt. or private, big or small) shall set up BMW treatment facilities or ensure requisite treatment of waste by having a tie-up with common BMW treatment facilities.

### 6.3 Monitoring of Veterinary Institutions

As per Rule 7 (1) of the BMW Rules, the PCBA was the prescribed authority for enforcement of the provisions of BMW Rules in respect of all HCEs including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories and blood banks.

Audit observed that PCBA did not have any information regarding the veterinary institutions and was not monitoring compliance with BMW Rules.

On being pointed out, the PCBA stated (August 2015) that the veterinary dispensaries were very tiny units and have no OT, etc. due to which these units do not come under purview of authorisation. However, detailed inventory of the units shall be carried out shortly.

The fact remained that the PCBA did not have any detailed inventory of the units and consequently, monitoring was not done. It is therefore, evident that their contention was not substantiated.

### 6.4 Monitoring of PCBA under BMW Rules

As per Rule 7 (1) of the BMW Rules, PCBA was the designated authority for enforcement of the provisions of the said Rules and for monitoring of compliance, thereof.

As per the information furnished by PCBA, number of occupiers<sup>53</sup> vis-a-vis checked is given in the following table.

<sup>53</sup> Any Institution generating bio-medical waste

**Table: No. : 6.3**  
**Occupiers in Guwahati vis-a-vis, Checked**

Year	No. of authorised occupiers	Nos. of occupiers Checked/inspected	Percentage
2010-11	97	2	2
2011-12	100	8	8
2012-13	105	6	6
2013-14	115	6	5
2014-15	123	11	9

This shows that PCBA carried out physical inspection of authorised occupiers of BMW varying from 2 per cent to 9 per cent only. This reflects poor monitoring by the PCBA despite the PCBA being the only prescribed authority for enforcement of the BMW Rules.

### 6.5 Quantity of BMW generated, treated and disposed off

Rule 5 of BMW Rules lays down the methodology and standards for treatment and disposal of bio-medical wastes such as incineration, deep burial, autoclaving, microwaving, disinfection, etc. for various categories of wastes *i. e.* human anatomical waste, animal waste, micro-biology and bio-technology waste.

The year wise position of BMW generated, treated and disposed off in Guwahati is given in the following table:

**Table No.: 6.4**

#### Quantity of BMW generated, treated and disposed off in Guwahati

Year	Estimated BMW generated (MT)	BMW collected & treated (MT)	BMW disposed of without treatment (MT)
2010-11	185.68	167.39	18.29
2011-12	210.51	191.81	18.70
2012-13	218.96	199.83	19.13
2013-14	234.43	213.61	20.82
2014-15	239.21	217.96	21.25
Total	<b>1,088.79</b>	<b>990.60 (91%)</b>	<b>98.19 (9%)</b>

*Source: Information furnished by PCBA*

It was noticed in Audit that though 98.19 MT or nine per cent BMW was disposed off without treatment in violation of BMW Rules, the PCBA had not taken any punitive action against the violators as stipulated under the Environment

(Protection) Act, section 15 of which provides that whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure.. Further, due to non-maintenance of records at the Common BMW treatment facility as discussed below, the veracity of statistics on collection and treatment of BMW could not be ascertained and verified in audit.

## 6.6 Common Bio Medical Waste Treatment Facilities

Fresh Air Waste Management Services Pvt. Ltd. situated at Panikhaiti, Guwahati, was the only Common Bio-Medical Waste Treatment Facility (CBWTF) in Assam. It provided services/facilities to 150 HCEs of Kamrup, Nalbari and Nagaon Districts. It had incinerator with auto loading, autoclave, shredder, sharp pit, Effluent Treatment Plant, chemical treatment bath, etc.

## 6.7 Segregation, packaging, transportation and storage of BMW at CBWTF

Schedules II, III & IV of Rule 6 of BMW Rules provide that bio-medical waste shall be segregated at the point of generation and kept in yellow, red, blue and black containers/bags prior to its storage, transportation, treatment and disposal.

The containers shall be labelled as Bio-hazards and carry/display Cytotoxic hazard symbol with the name of waste category, waste class, sender's name & address, contact no., receiver's name & address, contact no., etc.

Joint physical inspection (by the officials of Audit and the PCBA) revealed that:

- un-segregated BMW was collected and transported to CBWTF site. Un-segregated waste was dumped in an enclosure near the incineration unit.
- the containers/bags were not labelled as Bio-hazards and did not carry/display Cytotoxic hazard symbol.
- labels (regarding category of BMW, Sender's name & address, date, etc.) on containers/bags were not pasted.
- the log books of vehicles transporting BMW were not maintained at the CBWTF site.
- stock register regarding quantity of BMW receipt, treated and disposed was not being maintained at the site.



*Unsegregated BMW lying in the CBWTF*



It is therefore, evident that the Common Bio-medical Waste Treatment Facility was not complying with the BMW Rules properly and the PCBA was not monitoring compliance with the same on a regular basis.

## 6.8 Treatment of BMW at CBWTF

Rule 5 of BMW Rules provides that bio-medical waste shall be treated and disposed off in accordance with the provisions of Schedule I and in compliance with the standards prescribed in Schedule V.

During joint physical inspection with the officers of PCBA it was noticed that:

- the temperature at the Primary Chamber of incinerator was displayed as around  $747^{\circ}\text{C}$  against minimum requirement of  $800 \pm 50^{\circ}\text{C}$ ;
- the Secondary chamber of incinerator displayed only around  $170^{\circ}\text{C}$  against the requirement of  $1050 \pm 50^{\circ}\text{C}$ ;
- due to non-maintenance of proper temperature at the chamber there was possibility that the BMW may not be treated properly.

On query, it was stated by the operator of the facility that the display panel or the thermo-couple were not working properly.

Thus, faulty equipment deprived the operators the means of ensuring that the incinerator burns at prescribed temperature. It was further observed that log books for Incinerator and Autoclave were not being maintained at the site. Though PCBA should have done regular inspections, they had not conducted any inspection. Hence, treatment of actual quantity of BMW per day could not be ascertained.

## 6.9 Handling of BMW at CBWTF

Bio-Medical Waste includes variety of hazardous chemical agents which may cause acute poisoning, chemical accidents, damage to the respiratory system, chronic diseases, etc. The operator/worker may also suffer cuts and pricks from sharp tools, glass, etc. For their safety they should use Personal Protective Equipment (PPE) namely safety boots and goggles, chemical resistant clothing, gas masks, etc.

Joint physical inspection (August 2015) along with the officers of PCBA revealed that the workers at the unit were handling unused/expired medicines without PPEs thus exposing them to the risk of serious infections.



*Incinerator at CBWTF*



*Workers working without PPEs*

## 6.10 Physical Inspection of Health Care Establishments (HCEs)

Joint physical inspection (September 2015) along with the officer of PCBA in respect of 10 HCEs in Guwahati Region revealed that:

- As per Rule 6(3) of the BMW Rules, no untreated BMW should be kept stored beyond a period of 48 hours. It was observed in Audit that seven HCEs<sup>54</sup> were tied up with the CBWTF<sup>55</sup> for treatment of BMW and one HCE<sup>56</sup> was sending the BMW to another HCE<sup>57</sup> (being administered office) from where it was being sent to CBWTF. However, the BMW were not collected by the CBWTF centre on daily basis (weekly basis in respect of one HCE<sup>58</sup> and an interval of three to four days in respect of three HCEs<sup>59</sup>).
- the bags, through which BMW were sent to CBWTF centre, were not labelled as per Schedule III (Bio-hazards and Cytotoxic hazard symbol) & Schedule IV (name of waste category, waste class, sender's name & address, contact no., receiver's name & address, contact no.).
- in one HCE<sup>60</sup>, incinerator was installed (June 2014) which was not made operational. The entire BMW was kept in temporary pit, which was not as per the scientific method prescribed in BMW Rules. In another HCE<sup>61</sup>, incinerator was not operated on regular basis and the operator stated that the incinerator was started only when about 10 kg BMW accumulated in the Laboratory.
- as per Rule 6 of the BMW Rules, BMW shall not be mixed with other waste. BMW shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. It was seen in one HCE<sup>62</sup> that



*BMW mixed with MSW lying openly outside boundary of MMCH, Pan Bazar*



*ETP at MMCH, Pan Bazar*

<sup>54</sup> (i) Guwahati Medical College & Hospital (GMCH), Bhangagarh (ii) International Hospital, Christian Basti (iii) Maternity and Child Welfare Hospital, Dhirenpara (iv) Marwari Maternity Hospital, Athgaon (v) Arya Hospital, Rehabari, A. M. Road (vi) Hayat Hospital, Udalbakra (vii) Dispur Polyclinic and Nursing Home, Ganeshguri

<sup>55</sup> Fresh Air, Panikhaiti

<sup>56</sup> Mahendra Mohan Choudhury Hospital (MMCH), Pan Bazar

<sup>57</sup> Guwahati Medical College & Hospital (GMCH), Bhangagarh

<sup>58</sup> Maternity and Child Welfare Hospital, Dhirenpara

<sup>59</sup> (i) Arya Hospital (ii) Hayat Hospital (iii) Dispur Polyclinic and Nursing Home

<sup>60</sup> District Hospital, Sonapur

<sup>61</sup> Dr. B. Barua Cancer Institute, Gopinath Nagar, Birubari

<sup>62</sup> Mahendra Mohan Choudhury Hospital (MMCH), Pan Bazar

BMW were mixed with the Municipal Solid Waste (MSW) which were lying openly scattered outside the boundary wall in violation of BMW Rules.

- Liquid Waste & Chemical Waste such as waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities, chemicals used in biological production, disinfection as insecticides, etc. were required to be disinfected by chemical treatment and only then these should be discharged into drains.

There was no Effluent Treatment Plant (ETP) in respect of two HCEs<sup>63</sup>. In respect of two HCEs, though ETPs were installed, the same were not functioning since June 2013 in one case<sup>64</sup> and in the other<sup>65</sup> liquid waste pipe had not been connected to the ETP. In respect of two HCEs<sup>66</sup>, ETP was not working on regular basis and the entire liquid and chemical wastes were being discharged into the public drains without chemical treatment in violation of BMW Rules.

- In one HCE,<sup>67</sup> the syringe destroyers of the Hospital Emergency ward was found to be non-functional during joint inspection and syringe, etc. were found lying on the floor.

As per section 15 of the Environment (Protection) Act, 1986, whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure. PCBA however, did not take any punitive action in this regard as envisaged in the Environment (Protection) Act.

### 6.11 Advisory Committee on Bio-Medical Wastes

As per Rule 9 of BMW Rules, the Government of every State shall constitute an Advisory Committee including PCBA as a member, which shall advise the Government and the Prescribed Authority about matters related to the implementation of these rules.

The State Government constituted the Advisory Committee in June 2009 after a lapse of more than 11 years of framing the BMW Rules. However, it was stated that not a single meeting was held, rendering the Committee practically defunct.

<sup>63</sup> (i) Maternity and Child Welfare Hospital, Dhirenpara (ii) Dr. B. Barua Cancer Institute, Gopinath Nagar, Birubari

<sup>64</sup> Mahendra Mohan Choudhury Hospital (MMCH), Pan Bazar

<sup>65</sup> District Hospital, Sonapur

<sup>66</sup> (i) Arya Hospital (ii) Hayat Hospital

<sup>67</sup> Maternity and Child Welfare Hospital, Dhirenpara

## 6.12 Recommendations

- *The Government must ensure that no HCEs, Veterinary Institutions and Animal Houses operate without authorisation of the PCBA so that the lives and health of humans and animals are not endangered .*
- *The PCBA should take penal action against the violators under Environment (Protection) Act.*



# **Chapter VII**

## **Other Wastes**



## Chapter VII

### Other Wastes

Besides Municipal Solid Waste and Bio-Medical Waste, other wastes are also being generated, the management of which are discussed in this Chapter.

#### 7.1 Hazardous Waste

Hazardous Waste<sup>68</sup> means any waste which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics cause danger or is likely to cause damage to health or environment, whether alone or when in contact with other wastes. Assam produced more than 15,000 MT of hazardous waste every year during the period from 2010-11 to 2014-15. Year-wise production can be seen in the following table:

**Table No: 7.1**  
**Total Quantity of Hazardous Waste generated during 2010-15**

Year	Landfiabile Hazardous Waste (MT)	Recyclable Hazardous Waste (MT)	Incinerable Hazardous Waste (MT)	Total Hazardous Waste (MT)
2010-11	5307.657	7298.408	2.950	12609.015
2011-12	3101.006	12276.199	72.002	15449.207
2012-13	4325.910	10691.530	8.002	15025.442
2013-14	4178.370	14042.860	268.600	18489.830
2014-15	5039.370	14539.210	325.600	19904.180
<b>Total</b>	<b>21952.313</b>	<b>58848.207</b>	<b>677.154</b>	<b>81477.674</b>

*Source: Information furnished by PCBA*

As per Rule 5 of the Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, every person who is engaged in generation, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer of hazardous waste shall require to obtain an authorisation from the PCBA, which shall maintain a register containing particulars of the conditions imposed for management of hazardous waste, and it shall be open for inspection to any person interested or affected or a person authorised by him on his behalf. The Rules further prescribe that every generator, recycler, of hazardous waste shall prepare an annual return containing the specified details and submit the same to the PCBA.

<sup>68</sup> Source: The Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008.



Further, as per Rule 22 (3) of the Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008, PCBA shall prepare an inventory of the hazardous waste within its jurisdiction and compile other related information like recycling of the hazardous waste, its treatment and disposal based on the returns filed by the respective occupier and operator of the facility.

If in inspection the body is found at fault, then PCBA can take action as per the Environment Protection Act.

It was observed in Audit that:

- The PCBA had identified 243 hazardous waste generating industries in the State up to the year 2014-15, but had issued authorisation to only 58 units.
- No details of conditions imposed while granting authorisation to any agency for management of hazardous waste was being maintained by the PCBA.
- The PCBA did not have any information about the disposal or recycling of hazardous waste generated.
- There was no Common Treatment, Storage and Disposal Facility (TSD) in the State.
- During 2014-15, only 18 out of 58 industries who had obtained authorisation had submitted the annual returns. The PCBA had not initiated any action against the defaulters for non-submission of annual return.

## 7.2 Plastic Waste

‘Plastic<sup>69</sup>’ means material which contains as an essential ingredient a high polymer and which at some stage in its processing into finished products can be shaped by flow. ‘Plastic Waste’ means any plastic product such as carry bags, pouches or multilayered plastic pouch or sachet, etc., which have been discarded after use or after their intended life is over.



*Plastic mixed with MSW*

As per Rule 5 of the Plastic Waste (Management and handling) Rules, 2011, no person shall manufacture, stock, distribute or sell any carry bag made of virgin or recycled or compostable plastic, which is less than 40 microns in thickness. Also, as per the Rule 9 (c) no person shall manufacture plastic carry bags etc., without obtaining registration certificate from the PCBA prior to the commencement of its production. Further, as per Rule 6 (c) of the Plastic Rules, the Municipal Authority

<sup>69</sup> Source: The Plastic Waste (Management and Handling) Rules, 2011.

shall be responsible for setting up, operationalisation and co-ordination of the waste management system such as safe collection, storage, segregation, transportation, processing and disposal of plastic waste, setting up of collection centres for plastic waste involving manufacturers, ensuring its channelization to recyclers and creating awareness among all stakeholders about their responsibilities.

As per section 15 of the Environment (Protection) Act, 1986, whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure.

It was noticed in Audit that:

- The Guwahati Development Department had banned (June 2012) sale of plastic carry bags of less than 40 microns of thickness. Penal action viz. fines had been prescribed in the ban order. However, plastic carry bags of less than 40 microns were being sold/used openly despite the ban. The District Administration had not taken any follow up action on the ban.
- There were 15 unregistered plastic manufacturing/ recycling units. The PCBA had not taken any action against the defaulters under the Environment (Protection) Act, 1986.
- GMC had not set up any proper segregation system and as a result of which plastic wastes were mixed up with municipal solid waste (MSW) and transported to dumping sites at Boragaon, Guwahati. Further, neither was there any recycling plant set up in Guwahati, nor was any awareness campaign carried out by the GMC.

### 7.3 Battery Waste

‘Battery<sup>70</sup>’ is a source of electrical energy and contains lead. The lead used in batteries is hazardous and requires proper handling at all stages to avoid emission of lead in atmosphere as also discharge of acid into open areas and sewages. Concentration of lead in blood above the threshold levels (from 2.33 µg/dl to 27.4 µg/ dl) can induce hypertension in adults and inhibit development of intelligence in children. Therefore, disposal and recycling



*Unauthorised person disposing lead/acid into the drain at Sharb-bhatti*

<sup>70</sup> Source: The Batteries (Management and Handling) Rules 2001.

of batteries, wherever required, should be done in units possessing environmentally sound technology.

The PCBA identified 21 battery handlers (manufacturer: one, recycler: four, bulk consumer: 14, dealer: one and auctioneer: one) in the entire State since the Battery Rules became effective in the year 2001. The Batteries (Management & Handling) Rules 2001 stipulated that it shall be the responsibility of a dealer to ensure that the used batteries are collected back as per the following Schedule against new batteries sold.

**Table No.: 7.2**  
**Schedule- collection of Used Batteries against New Batteries**

Sl. No.	Year of Implementation of Battery Rules 2001	Percentage of used batteries to be collected back
1.	During first year of implementation	50% of new batteries sold
2.	During second year of implementation	75% of new batteries sold
3.	After second year of implementation	90% of new batteries sold

Further, the Rules also stipulate that (i) dealer has the responsibility to get registered with the PCBA for five years and a provision of cancellation for failure in collection of the required number of used batteries as per the said Rules and/or non-submission of timely half yearly returns to the PCBA, and (ii) renewal of the registration shall be as per the compliance status.

It was observed in Audit that:

- During 2010-11 to 2014-15, the sole dealer<sup>71</sup> sold 19.17 lakh new batteries against which 13.31 lakh (69 per cent) used batteries were collected back instead of 17.25 lakh batteries (90 per cent). Though the dealer had not collected the required number of used batteries as per schedule prescribed in the Rules, the PCBA had not taken any action as stipulated and mentioned above. On being pointed out, the PCBA agreed with the observation and stated (September 2015) that the unit had been directed to clarify the reasons for not-collecting of required batteries. The PCBA further stated (April 2016) that the reply furnished by the dealer did not reflect the proper justification on non-compliance with provision and reminder letter was issued to the dealer regarding above matter for further replies from them since as per the Act the delayers should be given an opportunity to be heard.
- Out of 21 identified battery handlers, very few (2012-13: 12, 2013-14: six and 2014-15: 12) had submitted the returns to the PCBA. The PCBA had not taken any action against defaulters for non-submission of returns under the Environment Protection Act. On being pointed out, the PCBA stated

<sup>71</sup> M/s Exide Industry Ltd. (the database of PCBA contains name of only one battery dealer)

(August 2015) that notices had been issued (August 2015) to the manufacturers, registered recyclers of batteries including dealers, bulk consumers and auctioneer, etc. for submission of returns. Further development was awaited.

But the fact remained that section 15 of the Environment (Protection) Act, 1986, provides that whoever fails to comply with any provisions of the Act or the rules made thereunder, shall in respect of each such failure, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees or with both, and in case the failure continues, with additional fine which may extend to five thousand rupees for every day during such failure. But no action in this regard has been taken by PCBA.

## 7.4 E- Waste

'E- Waste'<sup>72</sup> means waste relating to electrical and electronic equipment, whole or in parts or rejects from their manufacturing and repair process which are intended to be discarded. E-Waste contains toxic substances such as Cadmium, Lead, mercury etc., and if discarded in the open, these toxic substances can cause severe hazard on environment and human health. Audit observed the following:

- As per the e-waste (Managements & Handing) Rules 2011, PCBA has the duty to prepare inventorisation of e-waste. However, after lapse of more than three years from the enactment of Rules, the PCBA had not prepared the inventorisation of manufacturers, collection centres, bulk consumer, dismantlers, recyclers or of the quantity of e-waste generated and handled.
- There were only four authorised collection centres in Assam as of March 2015. Out of the four centres, one centre had collected only 1.5 MT e-waste during the year 2012-13 but PCBA had no record regarding details of their disposal. On being pointed out, the PCBA stated (August 2015) that preparation of a comprehensive inventory in the State of Assam was in progress. Further development was awaited.
- The Rules also stipulate that, in case of transportation of e-wastes for dismantling or for recycling in a State other than the State where the waste is generated or collected, the transporters shall give prior intimation to the



E-waste

<sup>72</sup> Source: The E- Waste (Management and Handling) Rules, 2011.

State Pollution Control Board concerned and of the State(s) of transit. It was observed in Audit that during 2013-14, 20.046 MT of e-waste were collected by five producers/bulk consumers and transported to other States for dismantling/recycling. However, the transporters had not given prior intimation to the PCBA in this regard. On being pointed out, the PCBA stated (August 2015) that the PCBA was communicating with the identified recyclers/producers and directing them to intimate the PCBA in case of further transportation of e-waste generated in the State of Assam to recyclers located in other States.

In a further reply, the PCBA stated (April 2016) that the Board had issued notices to e-waste dismantling/recycling facilities to give prior intimation to the Board regarding transportation of e-waste outside the State.

## **7.5 Recommendations**

- *The PCBA should maintain updated information of all hazardous waste generating industries, recyclers, etc. and details of disposal of such waste.*
- *In order to ensure scientific disposal of hazardous waste, the PCBA should insist on installation of Common Treatment, Storage and Disposal Facility.*
- *The PCBA should take action against the unregistered plastic manufacturers in the State and ensure that carry bags less than 40 micron are not sold in the market.*
- *All handlers of batteries may be brought under the PCBA's registration network and strict monitoring of collection of used batteries ensured.*

# **Chapter VIII**

## **Conclusion**



## Chapter VIII Conclusion

*The rapid growth in the population and resultant urbanization has brought about a situation of trade-off between environment protection and development. The fact is undeniable that development has to take place to accommodate the growing population and their ever increasing needs. Yet, the same should not be at the cost of widespread environmental destruction.*

*The PA on environmental degradation in greater Guwahati area with special emphasis on the role of PCBA revealed that while there were multiple agencies responsible for compliance with various Environmental Laws and Waste Management rules, the State Government had entrusted with the PCBA the overarching control and monitoring of environmental issues. Overall the position of finances in the PCBA, which consistently showed excess of receipt over expenditure, suggest that the deficiencies brought out in the report could have been tackled with much more efficiency which would have helped the State of Assam curb the impact of environmental degradation much more effectively.*

*The monitoring work of the PCBA also suffered due to lesser number of technical staff as compared to the non- technical staff strength. There was substantial shortfall in conducting inspections of even the highest polluting “Red” category industries.*

*The Municipal Corporation was found to be discharging domestic effluents into water bodies without treatment. Several Industries, municipalities, healthcare establishments were found to be operating without valid authorisation. 56 out of 183 Health Care Establishments in Guwahati neither had waste treatment facilities nor tied up with other partners for Common Bio-Medical Waste Treatment Facilities.*

*Handling and management of Municipal Solid Wastes, e-wastes, Hazardous Wastes, Bio-Medical Wastes and Plastic Wastes was inadequate due to lack of active participation by all stake holders. The Board failed to take action against the defaulting individuals/ organisations to ensure the implementation of the provisions of the Environment (Protection) Act, 1986 and Rules framed thereunder.*



(C H Kharshiing)

**Pr. Accountant General (Audit), Assam**

**Guwahati**

**Dated :**

**Countersigned**



(SHASHI KANT SHARMA)

**Comptroller and Auditor General of India**

**New Delhi**

**Dated :**





# Appendices



**Appendix – I**  
**(Reference paragraph – 2.1)**  
**Position of Technical staff**

Sl. No.	Name of Post	Sanctioned Strength	Person in Position	Excess/Shortage
<b>Scientist</b>				
1.	Chief Environment Scientist	1	1	-
2.	Addl. Chief Env. Scientist	1	-	(-) 1
3.	Sr. Env. Scientist	3	-	(-) 3
4.	Exe. Env. Scientist	6	11	(+) 5
5.	Asstt. Env. Scientist	7	5	(-) 2
6.	Total			
7.	Asstt. Env. Scientist	10	5	(-) 5
8.	Scientific Asstt.-I	2	-	(-) 2
9.	Scientific Asstt.-II	1	1	-
10.	Scientific Asstt.-III	6	4	(-) 2
<b>Engineering</b>				
1	Chief Env. Scientist (CES)	1	1	-
2	Addl. Chief Env. Engineer	2	2	-
3	Sr. Env. Engineer	5	5	-
4	Executive Engineer	8	8	-
5	Asstt. Executive Engineer	18	18	-
6	Asstt. Engineer	30	27	(-) 3
<b>Total</b>		<b>101</b>	<b>88</b>	

*Source: PCBA*

**Position of non-technical staff**

Sl. No.	Name of cadre	Sanctioned strength	Person in position	Shortage
1.	Finance & Accounts	17	13	(-) 4
2.	HR & Administration	119	104	(-) 15
3.	Planning & Research	11	8	(-) 3
4.	IT	6	5	(-) 1
<b>Total</b>		<b>153</b>	<b>130</b>	

*Source: PCBA*

**Appendix – II**  
**(Reference paragraph – 3.2)**

**List of Parameters under National Water Quality Monitoring Programme**

Sl. No.	Parameters	
A	<b>Core Parameters</b>	1.pH 2. Temperature 3. Conductivity ( $\mu\text{mhos/cm}$ ) 4. Dissolved Oxygen (DO) 5. Bio-Chemical Oxygen Demand (BOD) 6.Nitrate-N (mg/l) 7. Nitrite-N (mg/l) 8. Fecal Coliform (MPN/100 ml) 9. Total Coliform (MPN/100 ml)
B	<b>General Parameters</b>	1.Turbidity (NTU) 2. Phenolphthalein Alkalinity as $\text{CaCO}_3$ 3. Total Alkalinity as $\text{CaCO}_3$ 4. Chlorides (mg/l) 5.Chemical Oxygen Demand (COD) (mg/l) 6. Total Kjeldahi-N as N (mg/l) 7. Ammonia-N as N (mg/l) 8. Hardness as $\text{CaCO}_3$ 9. Calcium as $\text{CaCO}_3$ 10. Sulphate (mg/l) 11.Sodium (mg/l) 12. Total Dissolved Solids (mg/l) 13. Total Fixed Dissolved Solids (mg/l) 14. Total Suspended Solid (mg/l) 15. Phosphate (mg/l) 16. Boron (mg/l) 17. Magnesium as $\text{CaCO}_3$ 18. Potassium (mg/l) 19. Fluoride (mg/l)
C	<b>Bio-Monitoring</b>	1.Saprobity Index 2. Diversity Index 3. P/R Ratio
D	<b>Trace Metals</b>	1.Arsenic ( $\mu\text{g/L}$ ) 2. Cadmium ( $\mu\text{g/L}$ ) 3.Copper ( $\mu\text{g/L}$ ) 4. Lead ( $\mu\text{g/L}$ ) 5. Chromium (Total) ( $\mu\text{g/L}$ ) 6. Nickel ( $\mu\text{g/L}$ ) 7. Zinc ( $\mu\text{g/L}$ ) 8. Mercury ( $\mu\text{g/L}$ ) 9. Iron (Total) ( $\mu\text{g/L}$ )
E	<b>Pesticides</b>	1.Alpha BHC ( $\mu\text{g/L}$ ) 2. Beta BHC ( $\mu\text{g/L}$ ) 3. Gama BHC ( $\mu\text{g/L}$ ) 4. O P DDT ( $\mu\text{g/L}$ ) 5. P P DDT ( $\mu\text{g/L}$ ) 6. Alpha Endosulphan ( $\mu\text{g/L}$ ) 7. Beta Endosulphan ( $\mu\text{g/L}$ ) 8. Aldrin ( $\mu\text{g/L}$ ) 9.Dieldrin ( $\mu\text{g/L}$ ) 10. Carboryl (Carbamate) ( $\mu\text{g/L}$ ) 11. 2-4 D ( $\mu\text{g/L}$ ) 12. Malathian ( $\mu\text{g/L}$ ) 13. Methyl Parathian ( $\mu\text{g/L}$ ) 14. Anilophos ( $\mu\text{g/L}$ ) 15. Chloropyriphos ( $\mu\text{g/L}$ )

**Source: Central Pollution Control Board (CPCB)**

**Appendix – III**  
**(Reference paragraph – 3.5.1)**  
**Estimation of Fluoride and Arsenic content in ground water**

Sl. No.	District	No. of samples	Fluoride content (mg/l)		Arsenic content (µg/l)		No. of samples having concentration higher than permissible limit	
			Max	Min	Max	Min	Fluoride	Arsenic
1.	Golaghat	37	1.73	0.38	107.08	1.97	10	24
2.	Karimganj	37	0.91	0.25	102.20	0.49	-	10
3.	Karbi-Anglong	7	3.47	0.04	0.80	0.35	02	-
4.	Cachar	11	0.54	0.33	34.12	0.04	-	01
5.	Lakhimpur	16	0.84	0.64	11.42	2.89	-	01
6.	Nagaon	44	0.96	0.31	9.53	0.22	-	-
7.	Kamrup	122	2.10	0.06	15.62	0.01	17	02
8.	Dhubri	30	0.78	0.44	9.27	1.29	-	-
9.	Hailakandi	19	0.85	0.25	40.49	1.43	-	02
10.	Dhemaji	13	0.71	0.50	5.80	1.89	-	-
11.	Jorhat	19	1.01	0.69	90.03	47.46	01	08
Total		<b>355</b>					<b>30</b>	<b>48</b>

*Source: PCBA*

**Appendix – IV**  
**(Reference paragraph – 4.1)**

Sl.	Air Pollutant	Possible Sources	Effects
1.	<b>Sulphur Dioxide (SO<sub>2</sub>)</b> - A corrosive gas that cannot be seen or smelted at low levels but can have a “rotten egg” smell at high levels	Sulphur Dioxide (SO <sub>2</sub> ) mostly comes from the burning of coal or oil in power plants. It also comes from factories that make chemicals, paper, or fuel.	Sulphur Dioxide exposure can affect people who have asthma or emphysema by making it more difficult for them to breathe. It can also irritate people’s eyes, noses and throats. It can also harm trees and crops, damage buildings, etc. SO <sub>2</sub> reacts in the atmosphere to form acid rain.
2.	<b>Nitrogen Dioxide (NO<sub>2</sub>)</b> - It is a reddish brown toxic gas with characteristic sharp, biting odour and is a prominent air pollutant.	NO <sub>2</sub> mostly comes from power plants, industries, cars, burning of bio-mass and fossil fuels.	People who are exposed to NO <sub>2</sub> for long time have a higher chance of getting respiratory infections. It can also react in the atmosphere to form Ozone, acid rain, particles which can harm plants and animals.
3.	<b>Particulate Matter (PM<sub>10</sub>, PM<sub>2.5</sub>)</b> - Particulate Matter is a complex mixture of suspended solid and liquid matter.	PM can be divided into two types-coarse particles and fine dust. Coarse particles are formed from sources like road dust, construction work. Fine dust is formed when fuel is burned in automobiles and power plants.	PM that is small enough can enter lungs and cause health problems. Some of these problems include asthma, bronchitis, and pneumonia in older people. PM <sub>2.5</sub> contributes to cancer.
4.	<b>Carbon Monoxide (CO)</b> - A gas that comes from the burning of fossil fuels.	CO is released when engines burn fossil fuels. Emissions are higher when engines are not turned properly. Cars emit a lot of CO. Furnaces and heaters in the home can emit high concentrations of CO, too, if they are not properly maintained.	CO makes it hard for body parts to get the oxygen they need to run correctly. Exposure to CO makes people feel dizzy and tired and gives them headaches. Elderly people with heart disease are hospitalised more often when they are exposed to higher amounts of CO.
5.	<b>Ozone (O<sub>3</sub>)</b> - A gas that can be found in two places-near the ground (Troposphere) major part of smog and upper atmosphere (Stratosphere) a protective layer which screens out harmful ultraviolet rays.	It is formed when NO <sub>2</sub> and volatile organic compounds mix in sunlight. NO <sub>2</sub> come from burning gasoline, coal or other fossil fuels.	O <sub>3</sub> can lead to more frequent asthma attacks in people who have asthma and can cause throats, coughs and breathing difficulty. It can also hurt plants and crops.
6.	<b>Lead</b> - A blue gray metal that is very toxic.	Lead can come from power plants and other industrial sources. Lead also comes from cars in areas where unleaded gasoline is not used. Lead paint is an important source of lead, especially in houses where paint is peeling. Lead in old pipes can also be a source of lead in drinking water.	High amounts of lead can be dangerous for small children and can lead to lower IQs and kidney problems. For adults, exposure to lead can increase the chance of having heart attacks or strokes.

**Source: Central Pollution Control Board (CPCB)**

**Appendix – V**  
**(Reference paragraph – 4.2)**  
**Air Quality Monitoring Stations in Guwahati**

Sl. No.	Station Name	Station Code	Station Type	District	Location
1.	Bamunimaidam	193	Residential	Kamrup Metro (Greater Guwahati area)	Head Office Building of PCBA
2.	Khanapara	596	Residential		Central Dairy
3.	Gopinath Nagar	519	Residential		ITI Building
4.	Santipur	541	Residential		Near Pragjyotish College
5.	Gauhati University	602	Residential		Guwahati University Campus
6.	Boragaon	603	Residential		IASST Campus

*Source: PCBA*



**Appendix –VI**  
*(Reference paragraph – 4.3)*

Year	2010		2011		2012		2013		2014	
Monitoring Stations	Range (Min-Max)	Mean	Range (Min-Max)	Mean	Range (Min-Max)	Mean	Range (Min-Max)	Mean	Range (Min-Max)	Mean
<b>SO<sub>2</sub> values</b>										
<b>Bamunimaidam</b>	3.00-10.50	7.20	2.00-10.50	6.20	3.30-13.50	6.30	2.50-09.50	6.90	4.30-10.50	6.60
<b>Khanapara</b>	3.00-21.00	7.30	2.50-9.80	5.80	3.00-13.50	6.10	3.30-11.00	7.20	3.00-13.00	7.30
<b>Gopinath Nagar</b>	4.30-11.00	7.90	8.30-22.00	15.20	2.00-31.50	6.40	2.80-17.50	7.20	3.30-14.50	6.90
<b>Santipur</b>	4.50-12.50	7.10	2.50-9.00	5.90	3.00-11.75	6.20	4.00-9.80	6.80	3.30-9.50	6.60
<b>Guwahati University</b>	3.00-8.00	5.70	3.00-8.80	5.70	3.30-10.50	5.70	3.30-8.80	6.70	3.80-9.50	6.60
<b>Boragaon</b>	3.00-11.30	6.20	2.50-8.80	5.60	3.00-18.30	6.00	2.80-13.80	6.80	3.30-8.30	6.30
<b>NO<sub>2</sub> values</b>										
<b>Bamunimaidam</b>	8.90-22.30	15.10	9.10-19.80	14.30	8.30-23.50	14.70	11.10-22.50	15.70	8.10-18.5	13.00
<b>Khanapara</b>	7.50-34.80	14.70	5.90-18.50	13.10	7.00-20.00	13.40	9.60-19.50	15.30	6.80-28.3	14.80
<b>Gopinath Nagar</b>	8.50-37.50	16.30	8.30-22.00	15.20	5.60-23.00	15.20	10.40-28.50	17.60	8.40-26.0	15.20
<b>Santipur</b>	10.60-22.80	15.30	7.00-18.50	13.80	7.30-22.50	14.00	10.30-21.30	14.70	7.30-19.0	12.40
<b>Guwahati University</b>	7.90-17.00	13.10	7.30-45.80	13.00	8.00-22.50	13.30	8.10-18.30	14.60	8.10-19.5	14.20
<b>Boragaon</b>	7.30-21.80	15.40	7.50-20.30	13.90	7.50-22.00	14.00	9.50-25.30	15.50	7.00-15.0	11.80
<b>RSPM Values</b>										
<b>Bamunimaidam</b>	17.50-286.00	103.80	20.50-337.00	94.60	28.00-396.00	106.30	62.00-302.50	166.3	27.50-289.50	108.0
<b>Khanapara</b>	21.50-313.50	111.90	21.00-433.00	110.0	16.00-353.50	93.70	25.50-349.70	135.6	15.50-478.00	110.0
<b>Gopinath Nagar</b>	19.00-349.50	114.10	21.00-474.50	103.2	16.50-346.50	104.30	36.00-415.00	169.5	22.00-371.50	105.4
<b>Santipur</b>	21.00-296.50	106.30	17.00-267.00	96.90	16.50-307.00	88.60	45.00-312.00	138.8	19.50-135.00	53.70
<b>Guwahati University</b>	13.00-156.50	64.30	13.00-204.00	70.10	16.50-335.00	84.00	44.50-257.00	117.6	16.50-275.50	74.70
<b>Boragaon</b>	31.00-283.50	70.00	14.00-263.50	82.20	15.50-183.50	68.90	14.00-352.00	119.7	12.00-77.50	41.60
<b>SPM Values</b>										
<b>Bamunimaidam</b>	28.50-598.50	195.10	39.00-761.00	170.9	68.00-713.50	209.60	116.00-529.50	293.4	61.50-454.50	180.20
<b>Khanapara</b>	38.00-622.50	203.60	42.50-663.50	195.6	44.00-568.00	190.70	49.00-545.00	251.4	67.50-645.50	246.80
<b>Gopinath Nagar</b>	40.00-597.00	207.10	35.50-621.00	196.4	52.50-718.00	211.00	70.00-771.00	312.0	37.50-529.00	175.70
<b>Santipur</b>	36.00-538.50	181.70	45.50-532.50	170.4	49.00-568.50	182.40	87.50-554.50	259.4	36.00-197.00	94.70
<b>Guwahati University</b>	34.50-408.00	129.50	26.00-385.50	143.0	33.00-372.00	150.30	77.00-441.50	206.6	24.00-395.00	128.50
<b>Boragaon</b>	51.00-595.00	126.70	31.00-558.50	160.5	38.50-315.00	130.90	25.50-599.00	224.1	31.00-153.50	82.30

Source PCBA

**Appendix – VII**  
**(Reference paragraph – 4.4.3)**  
**Industries emitted Particulate Matter (PM) in excess of the Standard**

Sl. No.	Name of Industry (M/s)	Stack Emission Standard for PM (mg/Nm <sup>3</sup> )	Actual Emission for PM monitored (mg/Nm <sup>3</sup> )	Year of monitoring
1.	K. D. Coke Industries, Jorabat	150	152	2011
2.	Parsnath coke Industries, Borsojai	150	153	2011
3.	Jalan Iron & Steel Works, RGB Road	150	167	2011
4.	SKJ Coke Industries, P. Boragaon	150	155	2011
5.	SM Cement, Jorabat	50	Kiln-78, Kiln-66	2011
6.	Raksha Cement Pvt. Ltd., Sonapur	50	Kiln-68, Kiln-72	2011
6.	JK Avatar Cements Pvt. Ltd., Byrnihat	50	Kiln-82, Kiln-75	2011
7.	Maha Sakti Cements, Byrnihat	50	76	2011
8.	Shiva Sakti Cements, Byrnihat	50	82	2011
9.	Purbanchal Cement Ltd., Jorabat	50	53	2011
10.	Radha Coke Products Pvt. Ltd., Jorabat	150	157	2012
11.	SKJ Coke Industries, P. Boragaon	150	164	2012
12.	SM Coke Industries, Jorabat	150	153	2012
13.	Kamrup Coke Industries, Beharbari	150	156	2012
14.	Shree Balaji Coke Industries, Azara	150	154	2012
15.	Ganesh Met Coke, Azara	150	158	2012
16.	River Valley Cement Corporation, Changsari	122	100	2012
17.	Topcem India, Gauripur	55	50	2013
18.	Jai Coke Industries, Puthimari	150	153	2013
19.	Jupitar Coke Industries, Beltola	150	155	2013
20.	Shiva Shakti Cement, Byrnihat	50	68	2013
21.	Mortex Coke, Tepesia	150	154	2013
22.	Progressive Fertichem,	1200	1227	2013
23.	Balaji Coke, Byrnihat	150	155	2013
24.	Raksha Cements Pvt. Ltd.	50	54	2013
25.	JDB Coke, Kamarkuchi	150	154	2013

Source : PCBA



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