

**AURANGABAD CANTONMENT BOARD: MICROPLAN**

**JAN, 2022**



**SUBMITTED BY**



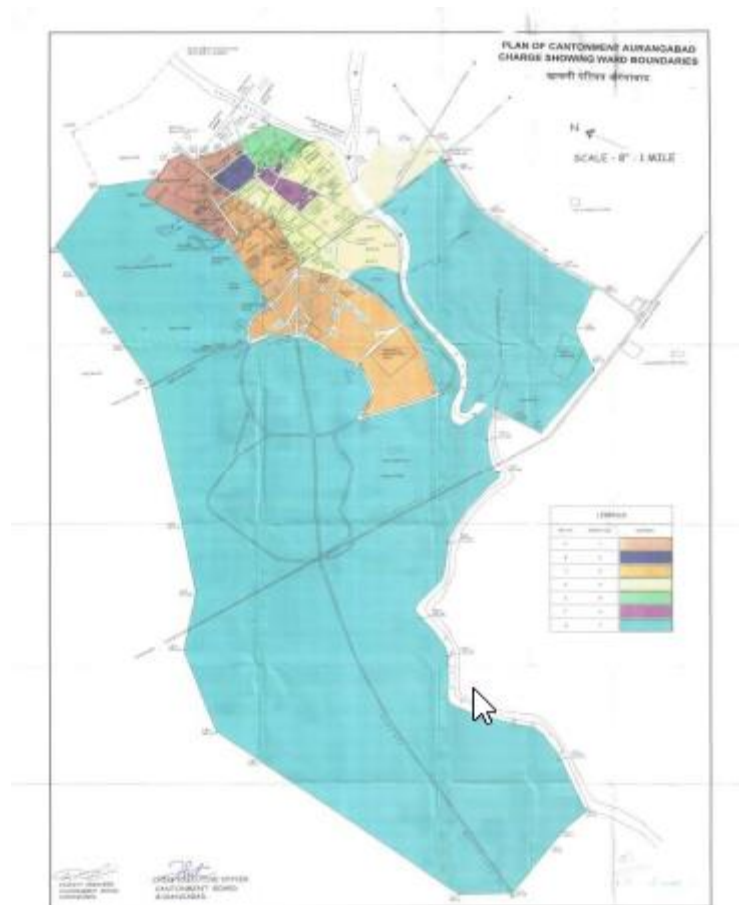
**AURANGABAD CANTONMENT BOARD**

## INTRODUCTION

Aurangabad Cantonment Board is located on west side of an Aurangabad city located at N 19° 52' 56" – E 75° 18' 32" of Maharashtra state. It is well connected by Airways through Sambhaji Maharaj Airport, Railways and land route with NH 52. The Station Commander of the Army is the President of the Cantonment Board. At present Brig.Upendra Singh Anand, is the President of the Cantonment Board Aurangabad. The Chief Executive Officer is an officer of Indian Defence Estates Service cadre of Civil Services and works under the administrative control of Director General, Defense Estates, Govt. of India, Ministry of Defence. At present, Shri Vikrant Sahadeo More, IDES, is the Chief Executive Officer of Aurangabad Cantonment.

## BASIC INFORMATION

The present population of the Cantonment board is about 18,051 as per the census of 2011. Board has 7 prabhags with the total area consisting of almost 10.48 sq km. The major attraction of the Board is the Karanpura Festival which occurs every year during the Navratri. It has an average rain fall of 756.6 mm and maximum and minimum temperatures of the city are 42.6°C and 9.1 °C respectively.



**Plan of Cantonment Board Aurangabad**

## ROADS

Cantonment Board is having nearly 7.235 Km of Tar Roads and 1.78 Km of Concrete Roads in various wards of Cantonment area.

On major roads like Income Tax Office road, Brigade Mess Road, Milind Chowk Road the thermoplastic paints and cat eyes are provided for better traffic assistance / management.







## WASTE & SANITATION

- 1.Sweeping of Roads/lanes/Bazar area
- 2.Cleaning of drains
- 3.Cleaning of Public Toilets
- 4.Cleaning of Secondary Storage Bins (Dustbins)
- 5.Door to door garbage collection service
- 6.Removal of dead animals
- 7.Spraying of insecticides
- 8.Maintenance of public gardens



## BAN ON USE OF PLASTIC

Awareness program on usage and hazards of polythene bags amongst residents and each shopkeeper in Cantonment area, has carried out by distributing pamphlets containing information regarding ban on polythene and fine to be imposed on the offenders. Surprise checking by sanitary staff is being carried out to prevent use of polythene bags.



Special Cleanliness drive at Ward No



Cleaning of gardens and public places



Organizing "Nukkad Natak" by school



Cleaning of nahallas

#### **SOLID WASTE MANAGEMENT**

Door to door garbage collection was started in civil area through auto rickshaws carrying garbage bins. An NGO – Civic Response Team has been engaged to impart training to the employees as well as creating awareness amongst the residents for segregation of garbage at source. Door to door collection of garbage with segregation has been implemented in the Civil and Military area and an improvement in sanitation, health and hygiene is seen. This has also evolved in eradicating dustbins and minimizing their count. Garbage thus collected is being deposited at trenching ground. The contractor has installed Screening machine at Trenching ground for segregation of garbage. Approval for site for dumping garbage and solid waste at trenching ground (Sy No. 207/1) has been received from Pollution Control Board. The present segregated organic garbage is laid down in rows called as windrows and sprinkled with water and sprayed with bio culture (microbial) in liquid form daily and turned with the help of JCB once in a week. This manual method with systematic and punctual process followed would ensure the heap of garbage reduced to powder – muddy substance which is manure after a process of four to five weeks. In this way the land used for dumping garbage in pits can be reclaimed and put to use for generating revenue. Non organic / Non degradable substance is being collected separately and sold by the agency. This work has been outsourced during the period under report. Bio-medical waste management and incineration facility for disposal of bio-medical waste has been started for Cantonment General Hospital through a private agency.



## RESTORATION OF KHAM



## SITE VISIT BY COMMISSIONER AURANGABAD MUNICIPAL CORPORATION & CEO ABAD CANTT BOARD





## TREE PLANTATION

During the year 4500 saplings were planted at trenching ground and various areas in the Cantonment. Survival rate was 90%



Cantonment Board Aurangabad @AurangabadCantt · Aug 8

One more CSR Project of Meatalman Auto. Ltd in Aurangabad Cantonment. Dense plantation of Native species and Beautification of Garden.

@aajayced1001 @sonamley

#हर काम देश के नाम

#Greencantt.



### Aurangabad –Monitoring Stations

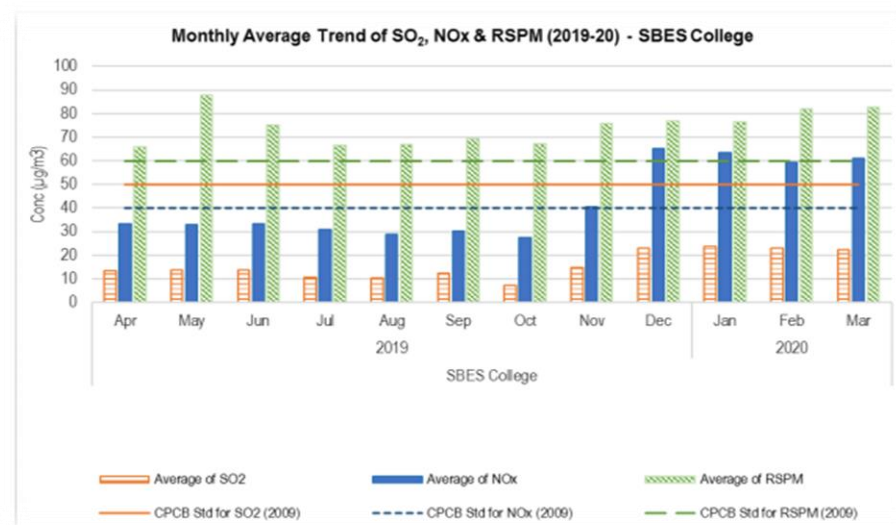
| MPCB RO | Region     | Station code | Station name                 | Type        | Latitude (deg)  | Longitude (deg) |
|---------|------------|--------------|------------------------------|-------------|-----------------|-----------------|
|         | Aurangabad | 511          | SBES College                 | Residential | 19° 52' 54.9" N | 75° 19' 33.7" E |
|         | Aurangabad | 512          | Collector Office, Aurangabad | Residential | 19° 53' 58.4" N | 75° 19' 14.2" E |
|         | Aurangabad | 513          | C.A.D.A. Office              | Residential | 19° 52' 14.3" N | 75° 21' 03.5" E |
|         | Aurangabad |              | Aurangabad CAAQMS            | Industrial  | 19° 48' 59.11"N | 75° 14' 18.65"E |

### Aurangabad – SBES College

Data for Monthly average reading recorded at SBES College – Aurangabad

| Station Name | Year | Month | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|--------------|------|-------|----------------------------|----------------------------|-----------------|
|              |      |       | 50                         | 40                         | 60              |
| SBES College | 2019 | Apr   | 13                         | 33                         | 66              |
|              |      | May   | 14                         | 33                         | 88              |
|              |      | Jun   | 14                         | 33                         | 75              |
|              |      | Jul   | 11                         | 31                         | 67              |
|              |      | Aug   | 10                         | 29                         | 67              |
|              |      | Sep   | 12                         | 30                         | 69              |
|              |      | Oct   | 7                          | 27                         | 67              |
|              |      | Nov   | 15                         | 40                         | 76              |
|              |      | Dec   | 23                         | 65                         | 77              |
|              | 2020 | Jan   | 24                         | 64                         | 76              |
|              |      | Feb   | 23                         | 59                         | 82              |
|              |      | Mar   | 22                         | 61                         | 83              |

While concentrations of RSPM exceed the standards throughout the year, NO<sub>x</sub> levels exceeds the standards from Nov-March and SO<sub>2</sub> levels are within the standards.



Monthly average reading recorded at SBES College – Aurangabad

**Data for ANNUAL AVERAGE TREND SBES COLLEGE**

| Station Name | Year  | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|--------------|-------|----------------------------|----------------------------|-----------------|
|              |       | 50                         | 40                         | 60              |
| SBES College | 05-06 | 7                          | 30                         | 166             |
|              | 06-07 | 6                          | 18                         | 85              |
|              | 07-08 | 6                          | 22                         | 79              |
|              | 08-09 | 9                          | 22                         | 94              |
|              | 09-10 | 7                          | 25                         | 98              |
|              | 10-11 | 7                          | 23                         | 94              |
|              | 11-12 | 9                          | 33                         | 90              |
|              | 12-13 | 10                         | 33                         | 93              |
|              | 13-14 | 11                         | 39                         | 102             |
|              | 14-15 | 13                         | 43                         | 97              |
|              | 15-16 | 16                         | 44                         | 111             |
|              | 16-17 | 14                         | 41                         | 108             |
|              | 17-18 | 11                         | 33                         | 78              |
|              | 18-19 | 15                         | 38                         | 70              |
|              | 19-20 | 16                         | 43                         | 74              |

Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, and RSPM at SBES College

It is evident from the annual trend of the pollutants that the average concentrations of RSPM is on a decline since the last 3 years although still above permissible limits. SO<sub>2</sub> and NO<sub>x</sub> are increasing annually with NO<sub>x</sub> crossing the limit last year by a slight margin.

**Aurangabad - Collector Office**

: Data for Monthly average reading recorded at Collector Office, Aurangabad

| Station Name                 | Year | Month | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|------------------------------|------|-------|----------------------------|----------------------------|-----------------|
|                              |      |       | 50                         | 40                         | 60              |
| Collector Office, Aurangabad | 2019 | Jun   | 11                         | 30                         | 79              |
|                              |      | Jul   | 9                          | 29                         | 66              |
|                              |      | Aug   | 11                         | 29                         | 66              |
|                              |      | Sep   | 9                          | 24                         | 64              |
|                              |      | Oct   | 12                         | 33                         | 74              |
|                              |      | Dec   | 19                         | 57                         | 79              |
|                              | 2020 | Jan   | 20                         | 57                         | 78              |
|                              |      | Feb   | 18                         | 53                         | 82              |
|                              |      | Mar   | 17                         | 44                         | 75              |

Data for Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, and RSPM at Collector Office, Aurangabad



| Station Name                 | Year  | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|------------------------------|-------|----------------------------|----------------------------|-----------------|
|                              |       | 50                         | 40                         | 60              |
| Collector Office, Aurangabad | 05-06 | 6                          | 19                         | 108             |
|                              | 06-07 | 4                          | 13                         | 73              |
|                              | 07-08 | 5                          | 16                         | 56              |
|                              | 08-09 | 8                          | 20                         | 68              |
|                              | 09-10 | 6                          | 22                         | 85              |
|                              | 10-11 | 6                          | 22                         | 69              |
|                              | 11-12 | 8                          | 29                         | 92              |
|                              | 12-13 | 9                          | 31                         | 76              |
|                              | 13-14 | 9                          | 36                         | 79              |
|                              | 14-15 | 10                         | 34                         | 78              |
|                              | 15-16 | 12                         | 35                         | 73              |
|                              | 16-17 | 11                         | 33                         | 88              |
|                              | 17-18 | 9                          | 30                         | 74              |
|                              | 18-19 | 11                         | 30                         | 63              |
|                              | 19-20 | 14                         | 40                         | 74              |

Data for annual trend of SO<sub>2</sub>, NO<sub>x</sub> and RSPM at Collector office reveals that SO<sub>2</sub> is within CPCB's permissible limits but, NO<sub>x</sub> has reached the threshold of permissible limit and RSPM exceeds the standards.

#### Aurangabad - C.A.D.A. Office

: Data for Monthly average reading recorded at C.A.D.A.

| Station Name    | Year | Month | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|-----------------|------|-------|----------------------------|----------------------------|-----------------|
|                 |      |       | 50                         | 40                         | 60              |
| C.A.D.A. Office | 2019 | Apr   | 11                         | 31                         | 89              |
|                 |      | May   | 12                         | 31                         | 87              |
|                 |      | Jun   | 13                         | 32                         | 83              |
|                 |      | Jul   | 10                         | 30                         | 70              |
|                 |      | Aug   | 10                         | 29                         | 69              |
|                 |      | Sep   | 10                         | 28                         | 63              |
|                 |      | Oct   | 10                         | 29                         | 65              |
|                 |      | Nov   | 15                         | 41                         | 77              |
|                 |      | Dec   | 22                         | 63                         | 75              |
|                 | 2020 | Jan   | 21                         | 61                         | 79              |
|                 |      | Feb   | 21                         | 57                         | 83              |
|                 |      | Mar   | 20                         | 55                         | 86              |

#### Office – Aurangabad

Monthly average readings at CADA office reveal that similar to the trend observed at other locations the maximum concentrations of NO<sub>x</sub> and SO<sub>2</sub> are during winter months. For RSPM the high concentrations are observed between March-June

Data for Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, and RSPM at C.A.D.A. Office - Aurangabad

| Station Name    | Year  | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM |
|-----------------|-------|----------------------------|----------------------------|-----------------|
|                 |       | 50                         | 40                         | 60              |
| C.A.D.A. Office | 05-06 | 7                          | 23                         | 119             |
|                 | 06-07 | 5                          | 19                         | 79              |
|                 | 07-08 | 5                          | 23                         | 79              |
|                 | 08-09 | 9                          | 21                         | 63              |
|                 | 09-10 | 6                          | 22                         | 66              |
|                 | 10-11 | 6                          | 22                         | 69              |
|                 | 11-12 | 10                         | 34                         | 75              |
|                 | 12-13 | 11                         | 35                         | 68              |
|                 | 13-14 | 10                         | 38                         | 74              |
|                 | 14-15 | 12                         | 40                         | 79              |
|                 | 15-16 | 15                         | 43                         | 75              |
|                 | 16-17 | 13                         | 39                         | 82              |
|                 | 17-18 | 9                          | 31                         | 76              |
|                 | 18-19 | 14                         | 36                         | 69              |
|                 | 19-20 | 15                         | 41                         | 77              |

Data for annual trend of SO<sub>2</sub>, NO<sub>x</sub> and RSPM at CADA office reveals that while SO<sub>2</sub> is within CPCB's permissible limits but NO<sub>x</sub> levels have shown slight increase than the permissible limits. Similar to previous years, RSPM levels for this year exceed the permissible limit.

## Aurangabad - Aurangabad CAAQMS

Data for Monthly average reading recorded at Aurangabad CAAQMS

| Station Name      | Year | Month | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM | Average of PM <sub>2.5</sub> |
|-------------------|------|-------|----------------------------|----------------------------|-----------------|------------------------------|
|                   |      |       | 50                         | 40                         | 60              | 40                           |
| Aurangabad CAAQMS | 2019 | Apr   | 10                         | 2                          | 72              | 40                           |
|                   |      | May   | 6                          | 1                          | 87              | 47                           |
|                   |      | Jun   | 5                          | 25                         | 81              | 38                           |
|                   |      | Jul   | 5                          | 14                         | 72              | 20                           |
|                   |      | Aug   | 7                          | 6                          | 66              | 27                           |
|                   |      | Sep   | 11                         | 10                         | 63              | 29                           |
|                   |      | Oct   | 8                          | 7                          | 64              | 33                           |
|                   |      | Nov   | 8                          | 4                          | 78              | 45                           |
|                   |      | Dec   | 9                          | 4                          | 87              | 49                           |
|                   | 2020 | Jan   | 8                          | 16                         | 96              | 47                           |
|                   |      | Feb   | 8                          | 18                         | 73              | 46                           |
|                   |      | Mar   | 7                          | 8                          | 72              | 34                           |

Monthly average readings at CAAQMS reveal that while NO<sub>x</sub> and SO<sub>2</sub> are within the permissible limits, however, RSPM (PM<sub>10</sub>) and PM<sub>2.5</sub> exceed permissible limits, with higher levels being observed during the winter months from Dec-Jan.

**Data for annual trend** of SO<sub>2</sub>, NO<sub>x</sub> and RSPM at Aurangabad CAAQMS reveals both SO<sub>2</sub> and NO<sub>x</sub> are within CPCB's permissible limits with only RSPM exceeding the limits and PM 2.5 being at the borderline to cross the permissible limit.

Data for Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, RSPM and PM<sub>2.5</sub> at Aurangabad CAAQMS

| Station Name      | Year  | Average of SO <sub>2</sub> | Average of NO <sub>x</sub> | Average of RSPM | Average of PM <sub>2.5</sub> |
|-------------------|-------|----------------------------|----------------------------|-----------------|------------------------------|
|                   |       | 50                         | 40                         | 60              | 40                           |
| Aurangabad CAAQMS | 16-17 | 5                          | 33                         | 86              |                              |
|                   | 17-18 | 5                          | 36                         | 71              |                              |
|                   | 18-19 | 6                          | 19                         | 74              |                              |
|                   | 19-20 | 8                          | 8                          | 76              | 39                           |

From above discussion it is clear that RSPM is above permissible limits for all the locations, whereas high NO<sub>x</sub> has been observed for Collector Office, SBES college and C.A.D.A office during winter months.

### Proposed 02 CAAQMS:-

In Aurangabad city area 02 nos of CAAQMS propose. i.e. **one at Regional Office, MPCB, Aurangabad premises and another at Deogiri College, Railway Station road,**



## FACEBOOK & TWITTER DETAILS OF AURANGABAD CANTONMENT BOARD

facebook.com/Aurangabad-Cantonment-Board-898027660222889/

Search Facebook



 **Aurangabad Cantonment Board**  
★ 5 (3 reviews) · Government organisation

Message N...

Hi! Please let us know how v...

Home About Photos Reviews More ▾

Liked

twitter.com/aurangabadcantt

Twitter

# Explore

Settings

← Cantonment Board Aurangabad  
303 Tweets



 **Cantonment Board Aurangabad**  
@AurangabadCantt

This is the official Twitter account of Cantonment Board Aurangabad. We are a local body under Ministry of Defence.

📍 Aurangabad, India 🌐 cbaurangabad.in 📅 Joined January 2016

163 Following 1,172 Followers

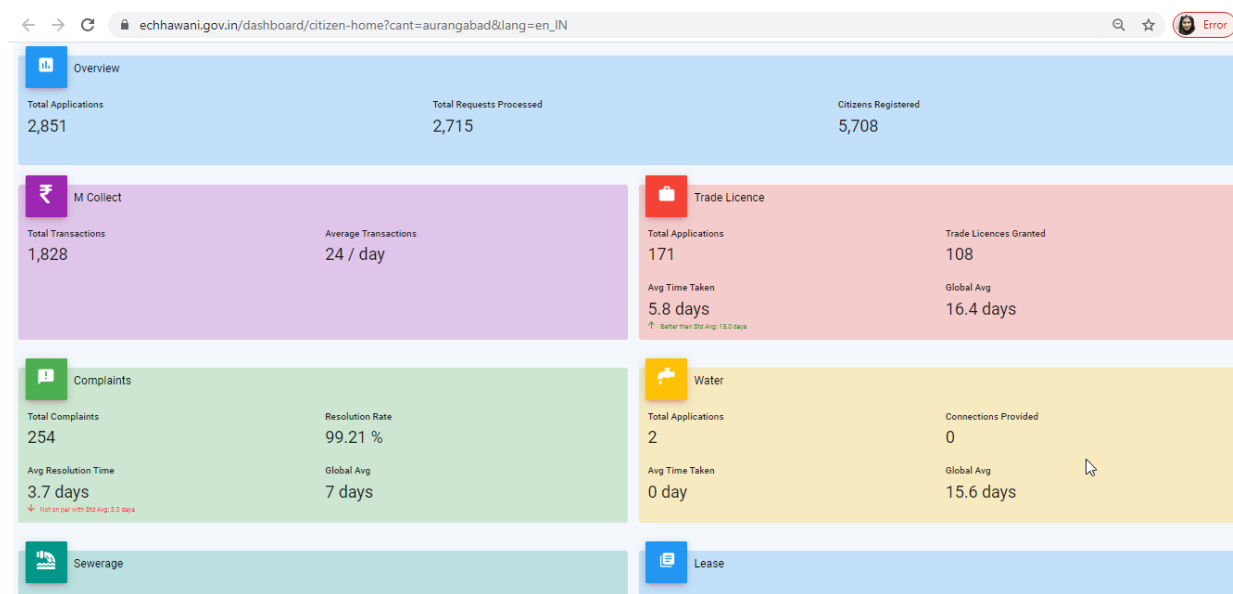
Tweets Tweets & replies Media Likes

 **Cantonment Board Aurangabad** @AurangabadCantt · Oct 27  
स्वतंत्र भारत @ 75: सत्यनिष्ठा से आत्मनिर्भरता



## Cantonment Areas Real time Executive (CARE) Dashboard

[https://echhawani.gov.in/dashboard/citizen-home?cant=aurangabad&lang=en\\_IN](https://echhawani.gov.in/dashboard/citizen-home?cant=aurangabad&lang=en_IN)



### Description:

Public Grievance Redressal (PGR) system allows citizens to file the complaints related to any issues faced within the Cantonment area and track the status of the issues raised.

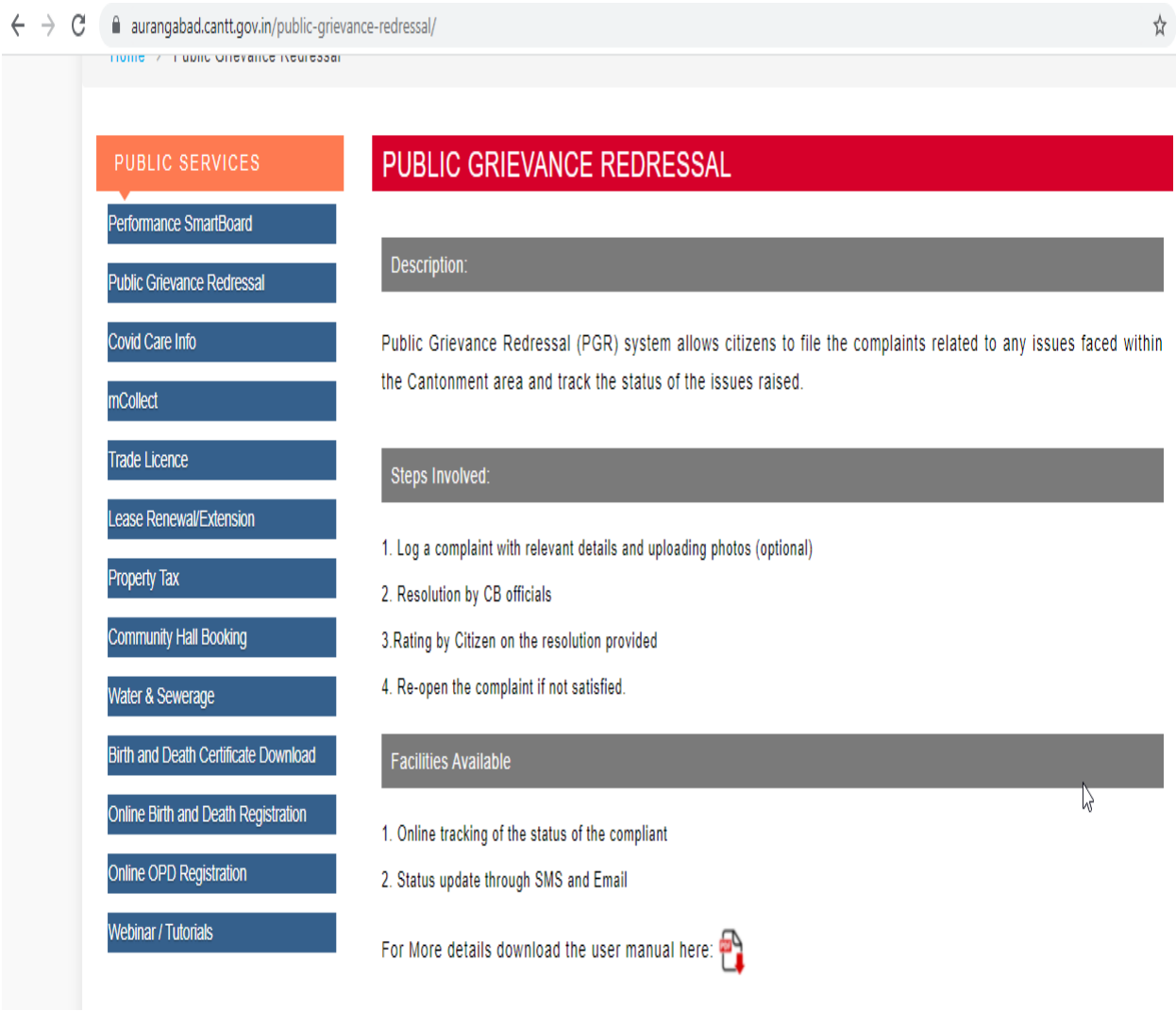
### Steps Involved:

- 1. Log a complaint with relevant details and uploading photos (optional)
- 2. Resolution by CB officials
- 3. Rating by Citizen on the resolution provided
- 4. Re-open the complaint if not satisfied.

### Facilities Available

- 1. Online tracking of the status of the complaint

- 2. Status update through SMS and Email



| Basic Information                            |                                                                                    |
|----------------------------------------------|------------------------------------------------------------------------------------|
| <b>Name of Non Attainment City</b>           | AURANGABAD CANTT BOARD                                                             |
| <b>Sate/ Union Territory</b>                 | Maharashtra                                                                        |
| <b>Name of Nodal Officer at PCB/ PCC</b>     | Mr. Umesh Waghmare                                                                 |
| <b>Email Id</b>                              | <a href="mailto:aurangabadcantonment@gmail.com">aurangabadcantonment@gmail.com</a> |
| <b>Contact Number</b>                        | 7722026837                                                                         |
| <b>Date till which progress is submitted</b> | 17/01/2022                                                                         |

| Action Point Code  | Sector                                                                | Total Number of Actions | Number of Actions Completed | Number of Actions Under Progress |
|--------------------|-----------------------------------------------------------------------|-------------------------|-----------------------------|----------------------------------|
| <b>CB</b>          | <b>CAPACITY BUILDING, MONITORING NETWORK AND SOURCE APPORTIONMENT</b> | 8                       | 3                           | 5                                |
| <b>PO</b>          | <b>PUBLIC OUTREACH</b>                                                | 7                       | 5                           | 2                                |
| <b>RD/ C&amp;D</b> | <b>ROAD DUST AND CONTRUCTION &amp; DEMOLITION</b>                     | 21                      | 9                           | 12                               |
| <b>VE</b>          | <b>VEHICLES</b>                                                       | 25                      | 13                          | 12                               |
| <b>IP</b>          | <b>INDUSTRIES</b>                                                     | 29                      | 13                          | 16                               |
| <b>BB/DF</b>       | <b>WASTE AND BIOMASS-DUMPING AND BURNING</b>                          | 7                       | 5                           | 2                                |
| <b>AQ</b>          | <b>AIR QUALITY DATA</b>                                               | 1                       | 1                           | 0                                |
|                    |                                                                       |                         |                             |                                  |



**CAPACITY BUILDING, MONITORING NETWORK AND SOURCE APPORTIONMENT**

| Action Point Code | Action Point                                        | Present Status                                                                                                           | Target                                                                    | Target Date | Deviation from Approved Action Plan Target | Annual Target | Field type | Attachment | Attachment Contents                                                                                                                                                                                                                                                                                                                | Total Funds Allocated                               | Released                                         | Funds Utilized            | Additional Funds Required |
|-------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------|--------------------------------------------|---------------|------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------|---------------------------|---------------------------|
| CB1               | Insatllation & Commissioning of Monitoring Stations |                                                                                                                          |                                                                           |             |                                            |               |            |            |                                                                                                                                                                                                                                                                                                                                    |                                                     |                                                  |                           |                           |
| CB1.1             | CAAQMS                                              | 01 no. of CAAQMS in operation at MIDC Waluj. 2 more proposed at MPCB RO & Deogiri College                                | Assesement is completed as per CPCB matrix. 2 nos. of CAAQMS proposed     | 2020        | No                                         | NA            | 1          | Annexure 1 | <a href="https://timesofindia.indiatimes.com/city/aurangabad/marathwada-gets-air-quality-checking-station/articleshow/52580739.cms">https://timesofindia.indiatimes.com/city/aurangabad/marathwada-gets-air-quality-checking-station/articleshow/52580739.cms</a> .<br>2 CAAQMS proposed at MPCB Regional Office & Deogiri College | Rs 60 Lakhs                                         | Released for 1 station & sanctioned for proposed | 100% for existing station | No                        |
| CB1.2             | Manual Stations                                     | 03 nos.of manual stations in operation                                                                                   | Assesement is completed as per CPCB matrix. Already meeting the criteria. | 2020        | No                                         | NA            | 3          | Annexure 1 | 1] Collector Office, Aurangabad<br>2] S. B. E.S. College, Aurangabad<br>3] CADA Office, Aurangabad. Data is available at <a href="https://www.mpcb.gov.in/air-quality/Aurangabad/0000000108">https://www.mpcb.gov.in/air-quality/Aurangabad/0000000108</a>                                                                         | Allocated by MPCB - Rs 8 Lakh per station per annum | 100% released                                    | 100% for existing station | No                        |
| CB2               | Air Quality Forecasting                             |                                                                                                                          |                                                                           |             |                                            |               | Yes/No     |            | Steps taken                                                                                                                                                                                                                                                                                                                        |                                                     |                                                  |                           |                           |
| CB3               | Assessment of sources                               |                                                                                                                          |                                                                           |             |                                            |               |            |            |                                                                                                                                                                                                                                                                                                                                    |                                                     |                                                  |                           |                           |
| CB3.1             | Emission Inventory                                  | SA study Interim report communicated to CPCB and study outcomes incorporated while preparing the city micro action plan. | Within 3 months with available data                                       | Dec-20      | No                                         | NA            | Yes        | Annexure 2 | Source Apportionment of study work awarded to NEERI & IITB by MPCB at the cost of Rs. 50 Lakhs vide work order MPCB/APC/SAS/WO/B-1178, dtd.                                                                                                                                                                                        | Rs 50 lakhs                                         | Complete funds released                          | 100% funds utilized       | No                        |
| CB3.2             | Emission tracking system                            |                                                                                                                          |                                                                           |             |                                            | NA            | Yes        |            |                                                                                                                                                                                                                                                                                                                                    |                                                     |                                                  |                           |                           |
| CB3.3             | Source Apportionment Study                          |                                                                                                                          |                                                                           |             |                                            | NA            | Yes        |            |                                                                                                                                                                                                                                                                                                                                    |                                                     |                                                  |                           |                           |

|       |                                                  |                                                                                                                                                                                                                                                                                         |                      |         |          |    |     |            |                                                                                                                       |                         |           |                              |            |
|-------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|----------|----|-----|------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|------------------------------|------------|
|       |                                                  |                                                                                                                                                                                                                                                                                         |                      |         |          |    |     |            | 17/03/2016. Interim report communicated to CPCB and study outcomes incorporated while preparing the city action plan. |                         |           |                              |            |
| CB3.4 | Health Impact Studies                            | MPC Board has sanctioned the fund of Rs. 92 Lakhs to J J Hospital for conducting syudy on "An open label phase IV clinical trial to access the safety and tolereberality of Ebastine (10mg) and phenylephrine (10mg)FDC as short duration therapy, with patient with allergic rhinitis. | Study in progress    |         |          |    |     |            |                                                                                                                       |                         | Allocated | To be released on completion |            |
| CB3.5 | Exposure Impact Studies                          |                                                                                                                                                                                                                                                                                         |                      |         | On Track | NA | Yes | Annexure 3 | Work order issued to J J Hospital                                                                                     | Rs 92 lakhs             | Allocated | To be released on completion | No         |
| CB4   | Training & Capacity Building                     |                                                                                                                                                                                                                                                                                         |                      |         |          |    |     |            | Steps taken                                                                                                           |                         |           |                              |            |
| CB4.1 | Training & skill development of public officals  | Could not be organized due to COVID 19                                                                                                                                                                                                                                                  | 12 (once in a month) | Planned |          | 12 | Yes |            | Demand placed under XVth FC Funds                                                                                     | NIL                     | NIL       | NIL                          | Rs 6 Lakhs |
| CB4.2 | Infrastructure development (Laboratory/ AQM Cell | M.P.C. Board is in process to setup Regional Environment Care Center (RECC) at Aurangabad, Kolhapur, Nagpur, Nashik & Pune Regional offices similar to the existing State Environment Care Center                                                                                       | 5                    |         | On Track | 1  | Yes |            | RECC being set up at Regional offices                                                                                 | Funds allocated by MPCB | NA        | NA                           | No         |

|       |                           |                                                                                                                                                                                             |                      |             |          |    |     |            |                                                                                                                                                                                                                    |              |              |              |    |
|-------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|----------|----|-----|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|----|
|       |                           | (SECC) at MPCB, Sion, Mumbai                                                                                                                                                                |                      |             |          |    |     |            |                                                                                                                                                                                                                    |              |              |              |    |
| CB4.3 | Enforcement Units         | For effective implementation city level implementation committee conducting regular meetings with respective stakeholders ensuring implementation of city action plan in time bound manner. | 12 (once in a month) | 2019        | On Track | 12 | Yes | Annexure 4 | City Level Air Quality Monitoring committee constitution Maharashtra Govt. Resolution,GR dated 18.09.2019.                                                                                                         | Not required | Not required | Not required | No |
| CB5   | Emergency Response System | For Emergency Response System (ERS) including Graded Response Action Plan (GRAP), MPC Board has prepared the draft plan and is under approval process.                                      | GRAP draft prepared  | In progress | On Track |    | Yes |            | Relevant departments including State Disaster Management, Meteorological Dept., Environment Dept. working collaboratively to refine existing emergency response system based on GRAP (Graded Response Action Plan) | Not required | Not required | Not required | No |

NOTE

|  |                                                     |
|--|-----------------------------------------------------|
|  | Action not a part of the Approved City Action Plan. |
|--|-----------------------------------------------------|

| PUBLIC OUTREACH   |                                                           |                                                                                                                                                                                                                                                                                                        |                                                              |             |                                            |                             |            |            |                                                                                                                                                                                                                                                                                        |                                   |                |                |                                                |
|-------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------|--------------------------------------------|-----------------------------|------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------|----------------|------------------------------------------------|
| Action Point Code | Action Point                                              | Present Status                                                                                                                                                                                                                                                                                         | Target                                                       | Target Date | Deviation from Approved Action Plan Target | Annual Target               | Field type | Attachment | Attachment Contents                                                                                                                                                                                                                                                                    | Total Funds Allocated             | Funds released | Funds Utilized | Additional Funds Required                      |
| PO1               | Public Outreach                                           | AQI data available at <a href="https://ncdc.gov.in/cpcb/airquality.php">https://ncdc.gov.in/cpcb/airquality.php</a> .<br><br>AQ Data is also available at MPCB Website <a href="https://www.mpcb.gov.in/air-quality/Aurangabad/000000108">https://www.mpcb.gov.in/air-quality/Aurangabad/000000108</a> | Real time AQI available on app and release of daily bulletin | Dec-21      | No                                         | Real time data for 365 days | Yes        | Yes        | AQI data available at <a href="https://ncdc.gov.in/cpcb/airquality.php">https://ncdc.gov.in/cpcb/airquality.php</a> .Data is available at MPCB Website <a href="https://www.mpcb.gov.in/air-quality/Aurangabad/000000108">https://www.mpcb.gov.in/air-quality/Aurangabad/000000108</a> | By CPCB & MPCB.                   | NA             | NA             | No                                             |
| PO1.1             | Daily Air Quality Public Information Dissemination System | 2 Environmental sensors with Display Boards for AQ put up at Kranti Chowk & Mahanubhav Ashram, Beed Bypass                                                                                                                                                                                             | Completed                                                    | On track    | No                                         | 1                           | 2          | Yes        | <a href="https://aurangabadsmartcity.in/open_data">https://aurangabadsmartcity.in/open_data</a>                                                                                                                                                                                        | Under Aurangabad Smart City Funds | 100%           | 100%           | Rs 5 Lakhs for 2 sensors in Cantt Board limits |
| PO1.2             | Social Media Platforms                                    | Official FB account and Twitter Handle                                                                                                                                                                                                                                                                 | Completed                                                    | Existing    | No                                         | NA                          | No         | Yes        | Facebook page, Aurangabad Cantonment Board. Twitter Name : Cantonment Board Aurangabad                                                                                                                                                                                                 | Not Required                      | NA             | NA             | No                                             |
| PO1.3             | Issue public advisory for                                 | In progress by MPCB                                                                                                                                                                                                                                                                                    | In Progress                                                  |             | No                                         | Public advisories to be     | Number     | No         |                                                                                                                                                                                                                                                                                        | Not Required                      | NA             | NA             | No                                             |



|       | prevention and control of air polltuion                                                | on GRAP                                                                        |                                                                                                                    |            |    | issued |    |     |                                                                                                                                                   |                          |              |              |                                |
|-------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------|----|--------|----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|--------------|--------------------------------|
| PO1.4 | Deeper public engagement and consultation (workshops/ programmes in schools/ colleges) | 5 Awareness Workshops planned along with 2 Campaigns                           | Workshops organized in Kendriya Vidyalay & Holy Cross School during phase I of Aurangabad City Awareness Workshops | Start 2018 | No | 5      | 5  | Yes | 2 workshops COMPLETED. 5 Workshops planned under XV FC Funds                                                                                      | Rs 2 Lakhs XVth FC funds | 100%         | 100%         | Rs 5 Lakhs for more campaign s |
| PO1.5 | Launch mobile app to update public about status of air quality                         | Planned to link the Sensors data with mobile app                               | In Progress                                                                                                        | On track   | No | 1      |    | No  |                                                                                                                                                   | Planned                  | No           | No           | Rs 5 Lakhs                     |
| PO2   | Public Greivance Redressal System                                                      |                                                                                |                                                                                                                    |            |    |        |    |     |                                                                                                                                                   |                          |              |              |                                |
| PO2.1 | App Based System                                                                       | MPCB's E-Catalyst Mobile App to address complaints related to AQ               | Existing                                                                                                           | On Track   | No | NA     | No | Yes | <a href="https://play.google.com/store/apps/details?id=in.gov.mpcb.mpcbapp">https://play.google.com/store/apps/details?id=in.gov.mpcb.mpcbapp</a> | MPCB                     | NA           | NA           | No                             |
| PO2.2 | Helpline Number                                                                        | Public Grievance Redressal (PGR) system allows citizens to file the complaints | Existing                                                                                                           | On Track   | No | NA     | No | No  | <a href="https://aurangabad.cantt.gov.in/public-grievance-redressal/">https://aurangabad.cantt.gov.in/public-grievance-redressal/</a>             | Not Required             | Not Required | Not Required | No                             |

|  |  |                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |
|--|--|---------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|
|  |  | related to any issues faced within the Cantonment area and track the status of the issues raised. |  |  |  |  |  |  |  |  |  |  |  |
|--|--|---------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|

| ROAD DUST AND CONTRUCTION & DEMOLITION |                                                                                                             |                                                                                                               |                          |             |                                              |                                               |            |            |                      |                                        |                |                |                                |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------|-------------|----------------------------------------------|-----------------------------------------------|------------|------------|----------------------|----------------------------------------|----------------|----------------|--------------------------------|
| RD1                                    | Road dust                                                                                                   | Present Status                                                                                                | Target                   | Target Date | Deviati on from Approv ed Action Plan Target | Annual Target                                 | Field type | Attachment | Attachment Contents  | Total Funds Allocated                  | Funds released | Funds Utilized | Additional Funds Required      |
| RD1.1                                  | Immediate lifting of solid waste generated from disilting and cleaning of municipal drains for its disposal | 25 Kms of stretch of Drains cleaned in Cannt area.15km cleaned under AMC's clean KHAM initiative by May, 2021 | All drains cleaned       | On Track    | No                                           | All drains to be clean by 15th June each year | Yes        | No         | Cannt Board Document | For Cannt Board limits by their Funds. | Yes            | Yes            | No                             |
| RD1.2                                  | Maintain potholes free roads                                                                                | Regular Maintenance of roads                                                                                  | Repair of all roads      | On Track    | No                                           | All roads repair                              | Yes        | Yes        | Cannt Board Document | Cannt Board Funds                      | Yes            | Yes            | No                             |
| RD1.3                                  | Regular cleaning of street surfaces and spraying of water to suppress dust.                                 | Regular manual road sweeping by Sweepers                                                                      | Regular road cleaning    | On Track    | No                                           | All roads cleaned                             | Yes        | No         | Cannt Board Document | Cannt Board Budget                     | Yes            | Yes            | No                             |
| RD1.4                                  | Black-topping of unpaved road                                                                               | 2 Tar Roads completed in Cannt limits.                                                                        | Paved city roads         | Dec, 2023   | No                                           | Black topping of all roads                    | Yes        | Yes        | Cannt Board Document | State Govt Funds                       | Yes            | Yes            | No                             |
| RD1.6                                  | To take appropriate action to remove road dust/silt regularly by using mechanical sweepers                  | 1 Jeep mounted road sweeping machines to be procured. 10-15km road cleaned each day                           | Mechanized road sweeping | 2023        | No                                           | Mechanic al sweeping of all roads             | 1          | Yes        | Cannt Board Document | XVth FC                                | No             | No             | Yes Rs 1 Cr for other streches |
| RD1.7                                  | End-to-end paving of the road                                                                               | In Progress                                                                                                   |                          |             |                                              |                                               |            | Yes        | Details on the steps |                                        |                |                |                                |
| RD1.9                                  | Introduce water fountain at major traffic intersection                                                      | Proposed at 1) Nehru Statue 2) Cantonment Board Office                                                        | Dec, 2022                |             | No                                           | Fountains at major intersecti ons             | 2          | Yes        | Cannt Board Document | XVth FC                                | No             | No             |                                |

|               |                                                                                                      |                                                                                                                                            |                  |  |           |                                                   |            |            |                                                                                                                                                                                                                         |                          |                    |                      |                                         |
|---------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|-----------|---------------------------------------------------|------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|----------------------|-----------------------------------------|
| <b>RD1.10</b> | <b>Widening of Roads</b>                                                                             | <b>Road Construction &amp; Widening in Progress</b>                                                                                        | <b>Dec, 2021</b> |  | <b>No</b> | <b>Major roads widened</b>                        | <b>Yes</b> | <b>Yes</b> | <b>Cantt Board Document</b>                                                                                                                                                                                             | <b>State Govt Funds</b>  | <b>In Progress</b> | <b>On completion</b> | <b>No</b>                               |
| RD1.11        | Improvement of infrastructure for decongestion of road.                                              | Steps taken                                                                                                                                |                  |  |           |                                                   | Text       | Yes        | Details on the steps                                                                                                                                                                                                    |                          |                    |                      |                                         |
| <b>RD1.12</b> | <b>Designing and Construction of environment friendly roads</b>                                      | <b>9 Concrete Roads Completed</b>                                                                                                          | <b>2021</b>      |  | <b>No</b> | <b>Most of Concrete roads</b>                     | <b>Yes</b> | <b>No</b>  | <b>Cantt Board Document</b>                                                                                                                                                                                             | <b>Cantt Board Funds</b> | <b>Yes</b>         | <b>Yes</b>           | <b>No</b>                               |
| <b>RD1.16</b> | <b>All the canals/nullah's side roads should be brick lined. Proper plantation also carried out.</b> | <b>KHAM restoration in progress. 15 Km of Nullah stretch cleaned, 25000 saplings planted</b>                                               | <b>On Track</b>  |  | <b>No</b> | <b>Most Side roads to be lined and plantation</b> | <b>Yes</b> | <b>Yes</b> | <a href="https://english.lokmat.com/aurangabad/amc-undertakes-restoration-of-citys-pride-and-soul-kham-river/">https://english.lokmat.com/aurangabad/amc-undertakes-restoration-of-citys-pride-and-soul-kham-river/</a> |                          | <b>In Progress</b> | <b>In Progress</b>   | <b>Rs 20 Lakhs for Nullah stretches</b> |
| <b>RD2</b>    | <b>Creation of green cover</b>                                                                       |                                                                                                                                            |                  |  |           |                                                   |            |            |                                                                                                                                                                                                                         |                          |                    |                      |                                         |
| <b>RD2.2</b>  | <b>Creation of green buffers along the traffic corridors and their maintenance</b>                   | <b>COMPLETED Cantonment Board Office, Dass Park situated in front of Bungalow No. V has been carried out through M/s Metalman Pvt. Ltd</b> | <b>2021</b>      |  | <b>No</b> | <b>Green buffers along traffic corridors</b>      | <b>Yes</b> | <b>Yes</b> |                                                                                                                                                                                                                         | <b>CSR Funds</b>         | <b>Yes</b>         | <b>Yes</b>           | <b>No</b>                               |

|        |                                                                                                                     |                                                                                                                                                       |                  |             |          |                                 |        |     |                      |                                       |              |               |                               |
|--------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|----------|---------------------------------|--------|-----|----------------------|---------------------------------------|--------------|---------------|-------------------------------|
| RD2.3  | Greening of open areas, gardens, community places, schools and housing societies                                    | Completed Planting and maintaining of 125 big (Indian Oxygen rich) trees and 500 small decorative trees (Kaner) in front of Holy Cross English School | 2021             |             | No       | Urban green spaces developed    | Yes    | Yes |                      | CSR Funds                             | Yes          | Yes           | No                            |
| RD2.4  | Urban Greening with vertical garden                                                                                 | In Progress                                                                                                                                           | Dec, 2023        |             | No       | Urban green spaces developed    | Yes    | Yes | Spot identified      | Xvth FC Funds                         | In Progress  | On completion | No                            |
| RD3    | installation of WAYU (Wind Augmentation and Purifying Units) at urban traffic intersection.                         | For 10 major traffic intersections                                                                                                                    | On Track         | In Progress |          | WAYU installed at intersections | Yes    | No  |                      | 10 locations @ Rs 60,000 per location |              |               | Rs 6 Lakhs from XVth FC Funds |
|        |                                                                                                                     |                                                                                                                                                       |                  |             |          |                                 |        |     |                      |                                       |              |               |                               |
| C&D1   | Construction Activities                                                                                             |                                                                                                                                                       |                  |             |          |                                 |        |     |                      |                                       |              |               |                               |
| C&D1.1 | Ensure transportation of construction materials in covered vehicles                                                 | Directions has already been sent to all concerned departments to comply the Rules                                                                     | Regular activity | Ongoing     | On track |                                 | Number | No  |                      | Not required                          | Not required | Not required  | No                            |
| C&D1.2 | Strict enforcement of CPCB guidelines for construction (use of green screens, side covering of digging sites, etc.) | Guidelines in place                                                                                                                                   | Regular activity | Ongoing     | On track |                                 | Text   | Yes | Details on the steps | Not required                          | Not required | Not required  | No                            |
| C&D1.3 | Restriction on storage of construction materials along the road.                                                    | Fines notified. Regularly violators penalized for dumping on roads                                                                                    | Regular activity | Ongoing     | On track |                                 | Yes    | Yes | Attached Sheet       | Not required                          | Not required | Not required  | No                            |



|        |                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |         |          |  |        |     |                                                                                                                                                                                                                                                                                                               |                  |              |              |    |
|--------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------|----------|--|--------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------|--------------|----|
| C&D1.4 | Covering of construction site.                                                             | Number of challans issued regarding the same                                                                                                                                                                                                                                                                                                                                                                                                               | Regular activity | Ongoing |          |  | Number |     | <a href="https://timesofindia.indiatimes.com/city/aurangabad/cover-construction-sites-ensure-proper-waste-disposal-amc/articleshow/73235119.cms">https://timesofindia.indiatimes.com/city/aurangabad/cover-construction-sites-ensure-proper-waste-disposal-amc/articleshow/73235119.cms</a>                   | Not required     | Not required | Not required | No |
| C&D1.5 | To create separate space/zone to handle solid waste, C&D waste and other waste in the city | Collection of C & D Waste Generated Within AMC Limit and Establishment & Operation OF 100 TPD Capacity Plant To Utilize it on PPP basis for 10 Years (tender floated 10th Feb, 2021)                                                                                                                                                                                                                                                                       | In Progress      | Ongoing | On track |  | 1      | Yes |                                                                                                                                                                                                                                                                                                               | Tender Published |              |              | No |
| C&D1.8 | Enforcement of Construction and Demolition Waste Rules                                     | MPCB has issued directions to all Municipal Corporations for implementation of SWM Rules, 2016 and Construction and Demolition Waste Management Rules, 2016 vide MPCB/MS/MSW/2016 dated 06/09/2016. Also Board has issued direction under section 31A of the Air(Prevention & Control of Pollution) Act, 1981 regarding implementation of Construction and Demolition waste management Rules, 2016 vide no.MPCB/RO(HQ)/B dated 12/03/2018 to all Municipal | Regular activity | Ongoing | On track |  | Text   | Yes | Construction and Demolition Rules, 2016 have been uploaded on the Board's website under the following link: <a href="http://www.mpcb.gov.in/waste_management/Construction_and_Demolition_Waste_Management.php">http://www.mpcb.gov.in/waste_management/Construction_and_Demolition_Waste_Management.php</a> . | Not required     | Not required | Not required | No |

|         |                                                                                                                                                                                    |                                                |             |         |          |  |      |     |                                        |                           |              |              |    |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------------|---------|----------|--|------|-----|----------------------------------------|---------------------------|--------------|--------------|----|
|         |                                                                                                                                                                                    | Corporation                                    |             |         |          |  |      |     |                                        |                           |              |              |    |
| C&D1.12 | Frame and implement policy for segregation of construction and demolition waste and provide a network of decentralized C&D waste segregation and collection sites across the city. | 1 site being established                       | In Progress | Ongoing | On Track |  | 1    | Yes | Notification copy Details of the sites | Tender published as above |              |              | No |
| C&D1.13 | Promote recycling of construction and demolition waste.                                                                                                                            | AMC uses C&D Waste for filling low lying areas | Regular     | Ongoing | On Track |  | Text | Yes | Used in filling low lying areas        | Not required              | Not required | Not required | No |

| VEHICLES |                                                                                               |                                                                   |             |                  |                                            |                       |            |            |                                                                                                                                                                                                                                                                                                                           | Total Funds Allocated | Funds released | Funds Utilized | Additional Funds Required |
|----------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------|------------------|--------------------------------------------|-----------------------|------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------|----------------|---------------------------|
| VE1      | Improve and strengthen PUC programme                                                          | Present Status                                                    | Target      | Target Date      | Deviation from Approved Action Plan Target | Annual Target         | Field type | Attachment | Attachment Contents                                                                                                                                                                                                                                                                                                       |                       |                |                |                           |
| VE1.1    | Number of PUC centers in the city                                                             | 68 (34 petrol and 34 diesel) PUCs in operation in Aurangabad City | 68          |                  | On Track                                   | 100% PUC in operation | 68         | Yes        | PUC List                                                                                                                                                                                                                                                                                                                  | Not Needed            | Not Needed     | Not Needed     | No                        |
| VE1.2    | Regular checking of Vehicular emission and issue of Pollution under Control Certificate (PUC) | Regularly done on a monthly basis - 6500 fined                    |             | Regular activity | On Track                                   |                       | 6500       | Yes        |                                                                                                                                                                                                                                                                                                                           | Not Needed            | Not Needed     | Not Needed     | No                        |
| VE1.3    | Auditing and reform of Pollution Under Control (PUC) certification                            | 3 per annum                                                       | 12          | Regular activity | On Track                                   |                       | 3          | Yes        |                                                                                                                                                                                                                                                                                                                           | Not Needed            | Not Needed     | Not Needed     | No                        |
| VE1.4    | linking of PUC centres with remote server and eliminate manual intervention in PUC testing.   | Linked with online server of Transport Dept                       | 100% linked | On track         | No                                         | 100% linked           | 67         | Yes        |                                                                                                                                                                                                                                                                                                                           | Not Needed            | Not Needed     | Not Needed     | No                        |
| VE1.5    | Integrate on-board diagnostic (OBD) system fitted in new vehicles with vehicle inspection.    | Number of vehicle with OBD 4130                                   |             | On track         | No                                         |                       | Number (2) |            |                                                                                                                                                                                                                                                                                                                           | Not Needed            | Not Needed     | Not Needed     | No                        |
| VE1.6    | Link PUC certificates with annual vehicle insurance                                           | Valid PUC to renew motor insurance- IRDAI                         | Notified    | On track         | No                                         | Completely Linked     | Yes        | Yes        | <a href="https://economictimes.indiatimes.com/wealth/insurance/you-need-to-have-a-valid-puc-certificate-to-renew-your-motor-insurance-irdai/articleshow/776685">https://economictimes.indiatimes.com/wealth/insurance/you-need-to-have-a-valid-puc-certificate-to-renew-your-motor-insurance-irdai/articleshow/776685</a> | Not Needed            | Not Needed     | Not Needed     | No                        |

|       |                                                                                                                                        |                                                                                                                                                       |                                     |          |    |               |     |     |                                                                                                                                                                                                                                                                                                                                                                                           |            |            |            |    |
|-------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------|----|---------------|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|----|
|       |                                                                                                                                        |                                                                                                                                                       |                                     |          |    |               |     |     | 99.cms?from=mdr                                                                                                                                                                                                                                                                                                                                                                           |            |            |            |    |
| VE3.1 | Use of off-peak passenger travel times to move freight and restrict the entry of heavy vehicles into cities during the day to continue | Heavy vehicles Restricted 7am to 11 am & 5pm-9pm                                                                                                      | Regularly enforced                  | On track | No | 100% enforced | Yes |     | <a href="https://timesofindia.indiatimes.com/city/aurangabad/7am-11pm-ban-on-pvt-luxury-buses-in-aurangabad-city/articleshow/81159994.cms">https://timesofindia.indiatimes.com/city/aurangabad/7am-11pm-ban-on-pvt-luxury-buses-in-aurangabad-city/articleshow/81159994.cms</a>                                                                                                           | Not needed | Not needed | Not needed | No |
| VE4.2 | Alternative clean fuel policy for vehicle                                                                                              | Maharashtra Govt EV Policy 2021 subsidy for 2W, cars & SUVs, incentives for charging infrastructure.                                                  | Policy Notified & being Implemented | On track | No | 100% Electric |     | Yes | <a href="https://www.indiatoday.in/auto/latest-auto-news/story/maharashtra-electric-vehicle-policy-2021-evs-to-make-up-10-per-cent-of-all-new-vehicle-registrations-by-2025-1827681-2021-07-13">https://www.indiatoday.in/auto/latest-auto-news/story/maharashtra-electric-vehicle-policy-2021-evs-to-make-up-10-per-cent-of-all-new-vehicle-registrations-by-2025-1827681-2021-07-13</a> | Not needed | Not needed | Not needed | No |
| VE4.3 | Bio fuel policy                                                                                                                        | Petrol with 10% Ethanol blending is sold out through oil companies (IOC, BPCL, HPCL) at all the pumps of the district. it is being directed by MOPNG. | Supply of 10% Blended Petrol        | On track | No | 20% Ethanol   | No  | Yes | As per present status                                                                                                                                                                                                                                                                                                                                                                     | Not needed | Not needed | Not needed | No |
| VE5   | Parking Management                                                                                                                     | Overall Grade (VE5.1+VE5.2 .../Total                                                                                                                  |                                     |          |    |               |     |     |                                                                                                                                                                                                                                                                                                                                                                                           |            |            |            |    |

|       |                                                                                                                                                                                                                                    |                                                                                                                                |                    |          |    |                            |            |     |                                                                                                                                                                                                                                                                                                                   |                            |            |             |          |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|----------|----|----------------------------|------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|-------------|----------|
|       |                                                                                                                                                                                                                                    | points)                                                                                                                        |                    |          |    |                            |            |     |                                                                                                                                                                                                                                                                                                                   |                            |            |             |          |
| VE5.1 | Prevent parking of vehicles in the non-designated areas                                                                                                                                                                            | Police to tow away vehicles in non-parking zones fine of Rs 200                                                                | Regularly enforced | On track | No | No parking except in zones | Number (2) | Yes | <a href="https://timesofindia.indiatimes.com/city/aurangabad/traffic-police-to-take-action-against-citys-road-side-parking-menace/articleshow/69499287.cms">https://timesofindia.indiatimes.com/city/aurangabad/traffic-police-to-take-action-against-citys-road-side-parking-menace/articleshow/69499287.cms</a> | Not Needed                 | Not Needed | Not Needed  | No       |
| VE6.2 | Assess and introduce a city bus system of appropriate fleet size of small buses and desirable bus type replete with GPS tracking, ETVMs for fare collection and Passenger Information Systems.                                     | 100 Aurangabad Smart City Buses on city roads since 2019                                                                       | Completed          | 2019-20  | No | Public transport existing  | 100        | Yes | <a href="https://aurangabadsmartcity.in/e10022720?tabs=menu_x_interaction">https://aurangabadsmartcity.in/e10022720?tabs=menu_x_interaction</a>                                                                                                                                                                   | Smart City Funds Rs 236 Cr | Yes        | Yes         | No       |
| VE6.3 | Develop route plan for bus operation; target trunk roads                                                                                                                                                                           | Completed, 32 routes, 22000 km network                                                                                         | Completed          | On track | No |                            | Text       | Yes | <a href="https://aurangabadsmartcity.in/e10022720?tabs=menu_x_interaction">https://aurangabadsmartcity.in/e10022720?tabs=menu_x_interaction</a>                                                                                                                                                                   | Smart City Funds Rs 236 Cr | Yes        | Yes         | No       |
| VE6.5 | Introduction of new electric buses (with proper infrastructure facilities such as charging stations) and CNG buses for public transport which will reduce plying of private vehicles on road and help to curb tail-pipe emissions. | Total number of electric buses and CNG buses - Aurangabad Smart CityProposal to purchase 30 Electric buses & Charging Stations | Ongoing            | On track | No |                            | Number (3) | Yes | <a href="https://english.lokmat.com/aurangabad/electrification-of-25-public-transport-75-charging-stations-maharashtras-new-ev-policy-focuses-on-5/">https://english.lokmat.com/aurangabad/electrification-of-25-public-transport-75-charging-stations-maharashtras-new-ev-policy-focuses-on-5/</a>               | Smart City Funds           | Proposed   | In Progress | Rs 25 Cr |

|       |                                                                                                                                                                         |                                                                                                                                                                                                                                               |      |          |    |                      |            |     |                                                                                                                                                  |                  |            |                   |               |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|----|----------------------|------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------|-------------------|---------------|
|       |                                                                                                                                                                         | Grant of authorization to Bharat Gas Resources Limited for development of CGD network in Aurangabad District. No. of CNG stations (online & daughter) - 106 No of domestic PNG connections - 708100 Inch Km of steel pipeline to be laid 2109 |      |          |    |                      |            |     |                                                                                                                                                  |                  |            |                   |               |
| VE6.6 | CNG infrastructure for auto gas supply in the city and transition of public transport vehicles to CNG mode Introduction of e-buses for Public transport in metro cities |                                                                                                                                                                                                                                               | 2022 | 2019-20  | No | CGD Network for city | Number (3) | Yes | TENDER published                                                                                                                                 | NA               | NA         | NA                | No            |
| VE6.7 | Steps for promoting battery operated vehicles like Erickshaw/ECart                                                                                                      | Proposed MoU With TATA for setting Charging Stations in city                                                                                                                                                                                  |      | On Track | No |                      | Text       | Yes |                                                                                                                                                  | Not Needed       | Not Needed | Not Needed        | Yes Rs 1-2 Cr |
| VE7.  | Traffic Congestion                                                                                                                                                      | Overall Grade VE7.1+VE7.2../total                                                                                                                                                                                                             |      |          |    |                      |            |     |                                                                                                                                                  |                  |            |                   |               |
| VE7.1 | Conducting audit of traffic intersections and install functional traffic signals at all major intersections                                                             | frequency of audit per annum, operational traffic signals/total traffic signals for major intersections                                                                                                                                       |      |          |    |                      | Number (2) |     |                                                                                                                                                  |                  |            |                   |               |
| VE7.2 | Synchronize traffic movements/Introduce intelligent traffic system for lane-driving                                                                                     | CC comissioned                                                                                                                                                                                                                                | 2021 | 2018-20  | No |                      | Text       | Yes | Smart City Board approved the MSI project award Traffic, Parking, CCTV camera, license video analytic, and infrastructure of control and command | Smart City Funds | Allocated  | Yes on completion | No            |



|        |                                                                                                                                                                |                                                          |                    |          |    |    |                       |     |                                                                                                                                |                             |            |            |            |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------|----------|----|----|-----------------------|-----|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------|------------|------------|
|        |                                                                                                                                                                |                                                          |                    |          |    |    |                       |     | centre for police (CCC) and city operations command centre for AMC (OCC). Command and Control Centre commissioned to go live , |                             |            |            |            |
| VE8    | Launch Public awareness campaign for air pollution control, vehicle maintenance, minimizing use of personal vehicle, lane discipline, etc.                     | Monthly Drives for Public Awareness                      | 2022-24            | On track | No | 12 | Drive once in a month | Yes | PUC checked during drives on a monthly basis                                                                                   | Request under XVth FC Funds | Proposed   | Proposed   | Rs 5 Lakhs |
| VE11.2 | Restriction on plying and phasing out of 15 years old commercial diesel driven vehicles.                                                                       | Number of impounded/scrapped 15yr old diesel vehicles-   | Notified On Track  |          | No |    | Number(2)             |     | GoI recent Vehicle Scrapping Policy                                                                                            | Not needed                  | Not needed | Not needed | No         |
| VE11.3 | Enforcement of law against visibly polluting vehicles: remove them from road, impose penalty, and launch extensive awareness drive against polluting vehicles. | Number of visibly polluting vehicles impounded/challaned | Regularly enforced | On track | No | 12 | Drive once in a month |     |                                                                                                                                | Not needed                  | Not needed | Not needed | No         |
| VE11.5 | To increase fine on vehicle owners (not drivers) where the visible smoke is emitted and noticed.                                                               | Regularly Fine visibly polluting vehicles                | Regularly enforced | On track | No | 12 | Drive once in a month |     |                                                                                                                                | Not needed                  | Not needed | Not needed | No         |
| VE12.1 | Introducing cycle tracks along with the roads                                                                                                                  | proposed                                                 | 2022-24            | On track | No |    | 5 roads               | Yes |                                                                                                                                | Cantt Board Funds           | No         | No         | Yes        |

| INDUSTRIES |                                                                                                          |                                                                                                                                                                                                                                                                                                       |                                |                                            |                                            |                  |                   |                                                                                                 |                     |                       |                     |                     |                           |
|------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------|--------------------------------------------|------------------|-------------------|-------------------------------------------------------------------------------------------------|---------------------|-----------------------|---------------------|---------------------|---------------------------|
|            |                                                                                                          | Present Status                                                                                                                                                                                                                                                                                        | Target                         | Target Date                                | Deviation from Approved Action Plan Target | Annual Target    | Field type        | Attachment                                                                                      | Attachment Contents | Total Funds Allocated | Funds released      | Funds Utilized      | Additional Funds Required |
| <b>IP1</b> | <b>Industrial air pollution control</b>                                                                  |                                                                                                                                                                                                                                                                                                       |                                |                                            |                                            |                  |                   |                                                                                                 |                     |                       |                     |                     |                           |
| IP1.1      | To intensify monitoring of industries to reduce of emission by the industries.                           | <b>4699 (Green-3058, Orange-596 and Red -1045 category)</b>                                                                                                                                                                                                                                           | <b>Ongoing</b>                 | <b>Enforcement activity</b>                | <b>No</b>                                  | <b>Completed</b> | <b>Number</b>     | <b>No</b>                                                                                       | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |
| IP1.2      | <b>Action against non-complying industrial units</b>                                                     | <b>Drections from April 20 to March 21 are as SCN 7,PD - 4,ID-8,CD - 2.</b>                                                                                                                                                                                                                           | <b>It is a ongoing process</b> |                                            | <b>No</b>                                  | <b>Completed</b> | <b>Number (2)</b> | <b>No</b>                                                                                       | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |
| IP1.3      | Shifting of Polluting Industries                                                                         | Number of industries shifted number of polluting industries identified                                                                                                                                                                                                                                | <b>Regular</b>                 | <b>Enforcement activity</b>                |                                            | <b>Completed</b> | <b>Number (2)</b> | <b>No</b>                                                                                       | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |
| IP1.4      | Ban on Polluting Industries                                                                              | Aurangabad is under CEPI area, hence, stringent conditions imposed during granting consent to the polluting industries including expansion of polluting units. Industries those are found violated during visits accordingly suitable actions are initiated and this is continuous / ongoing process. | <b>Regular</b>                 | <b>Actions initiated against violating</b> | <b>No</b>                                  | <b>Completed</b> | Number            | <b>No</b>                                                                                       | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |
| IP1.5      | Random auditing for Air pollution measures and Online reporting systems in the industries                | <b>Being CEPI area, polluting industries not allowed in Aurangabad</b>                                                                                                                                                                                                                                | <b>10</b>                      | <b>Regular activity</b>                    | <b>No</b>                                  | <b>Completed</b> | Number            | <b>No</b>                                                                                       | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |
| IP1.7      | Identification of air polluting industries and their regular monitoring including use of designated fuel | Most of the industries are now using gas/HSD as a fuel.                                                                                                                                                                                                                                               | <b>Wood/Coal is banned</b>     | <b>Regular activity</b>                    | <b>No</b>                                  | <b>Completed</b> | Text              | <b>Wood and coal banned,as boiler fuel. No consents are issued with coal or wood as a fuel.</b> | <b>NIL</b>          | <b>Not required</b>   | <b>Not required</b> | <b>Not required</b> | <b>No</b>                 |

|        |                                                                                                 |                                                                                                                                                                                                                                                                                   |                              |                  |    |           |            |    |                                                                                                                                                        |              |              |              |    |
|--------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------|----|-----------|------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|----|
| IP1.8  | Promoting cleaner production in industries.                                                     | Large & Medium Bulk Drug Industries have provided Solvent recovery system. They have been instructed to improve efficiency upto 98% leading to reduction in VOC emissions. RO office has mandated industries using coal, bagasse, biomass as fuel to provide ESP and Bag filters. | Wood/Coal is banned          | Regular activity | No | Completed | Text       | No | NIL                                                                                                                                                    | Not required | Not required | Not required | No |
| IP1.10 | Ensuring installation/Up-gradation and operation of air pollution control devices in industries | M/s. Badve Engineer, Khandewadi:- Recently installed wet scrubbers with increase capacity for electroplating section. M/S Mylan Lab Ltd. MIDC Waluj has installed Wet Scrubber of adequate capacity                                                                               | Regular enforcement activity | Regular activity | No | Ongoing   | Text       |    | Mostly Electroplating industries in operation and all are equipped with water scrubbing systems. Other industries have provided dust collection system | Not required | Not required | Not required | No |
| IP1.11 | Action/closure against defaulting/unauthorized industrial units.                                | Action undertaken in case of violation                                                                                                                                                                                                                                            | Regular enforcement activity | Regular activity | No | Ongoing   | Number (2) | No |                                                                                                                                                        | Not required | Not required | Not required | No |
| IP1.12 | Ensuring emission standards in industries                                                       | By regular monitoring                                                                                                                                                                                                                                                             |                              |                  |    | Ongoing   | Text       | No | NIL                                                                                                                                                    | Not required | Not required | Not required | No |
| IP1.13 | Disposal of all non-hazardous wastes into the designated dumping sites                          | By regular monitoring                                                                                                                                                                                                                                                             |                              | Regular activity | No | Ongoing   | Number (1) | No | NIL                                                                                                                                                    | Not required | Not required | Not required | No |
| IP1.15 | Industries allowed with stringent Environmental norms only.                                     | No polluting activities are allowed                                                                                                                                                                                                                                               | Regular enforcement activity | Regular activity | No | Ongoing   | Number     | No | NIL                                                                                                                                                    | Not required | Not required | Not required | No |

|        |                                                                                                                                                                                                |                                                                              |                                                      |                         |           |                  |        |           |                                          |                     |                     |                     |           |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------|-------------------------|-----------|------------------|--------|-----------|------------------------------------------|---------------------|---------------------|---------------------|-----------|
| IP1.25 | Initiated Star Rating Programme                                                                                                                                                                | <b>Already initiated</b>                                                     | <b>Enforced</b>                                      | <b>Regular activity</b> | <b>No</b> | <b>Completed</b> | Yes    | <b>No</b> | <b>MPCB's STAR RATING FOR INDUSTRIES</b> | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP1.26 | Bank guarantee should be taken for the compliance of conditions imposed in CTO/CTE for control of Environmental Pollution from industries.                                                     | <b>Yes</b>                                                                   | <b>Already started</b>                               | <b>Regular activity</b> | <b>No</b> | <b>Ongoing</b>   | Yes    | <b>No</b> |                                          | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>Np</b> |
| IP1.28 | Implementation of SOx and NOx standards notified by MOEF&CC                                                                                                                                    | Compliance status- whether all industries as notified in standards complied? | Already started                                      |                         |           |                  | Yes/No |           |                                          |                     |                     |                     |           |
| IP1.29 | Prepare and implement local area action plan for pollution hotspots and strict enforcement of air pollution control measures in all industries, including those located in unauthorized areas. | <b>, During visits operations of APC is strictly seen.</b>                   | <b>Regular enforcement activity</b>                  |                         | <b>No</b> | <b>Ongoing</b>   | Yes    | <b>No</b> | <b>NIL</b>                               | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP1.30 | Assess the number of industrial units that are non-compliant and prepare unit/plant wise action plan for time bound compliance or be shut down.                                                | <b>Already doing</b>                                                         | <b>MPCB took actions on non compliant units</b>      |                         | <b>No</b> | <b>Ongoing</b>   | Yes    | <b>No</b> | <b>NIL</b>                               | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP1.31 | Carry out pollution load estimation from industrial sector to enable setting of target for emission                                                                                            | Whether action completed                                                     |                                                      |                         |           |                  |        |           | Details on the action undertaken         |                     |                     |                     |           |
| IP1.32 | Industrial units to install water spraying system of internal roads and washing of tyres of vehicles                                                                                           | <b>Will be informed to all industry during visit</b>                         | <b>Will be informed to all industry during visit</b> |                         | <b>No</b> | <b>Ongoing</b>   | Yes    | <b>No</b> | <b>NIL</b>                               | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
|        |                                                                                                                                                                                                |                                                                              |                                                      |                         |           |                  |        |           |                                          |                     |                     |                     |           |
| IP2    | <b>Material Storage and handling in industrial</b>                                                                                                                                             |                                                                              |                                                      |                         |           |                  |        |           |                                          |                     |                     |                     |           |

|       |                                                                                                                                           |                                                                                           |                                                                                                                                                                                       |           |    |           |        |    |             |              |              |              |    |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|-----------|--------|----|-------------|--------------|--------------|--------------|----|
| IP2.1 | Industry should Store and handle all A class petroleum products & Solvents in the tanks having floating roof.                             | Action Completed                                                                          | No separate storage yards of storage of petroleum products are in existence. However if any industry is storing the HSD,FO in large quantity, information will be given to shift over |           | No | Completed | Yes    | NO | NIL         | Not Required | Not Required | Not Required | No |
| IP2.2 | Industry should devise time bound plan, to switch over the existing A class solvent storage from fixed roof to floating roof              | Action Completed                                                                          | No separate storage yards of storage of petroleum products are in existence. However if any industry is storing the HSD,FO in large quantity, information will be given to shift over |           | No | Completed | Yes    | NO | NIL         | Not Required | Not Required | Not Required | No |
| IP3   | OCEMS in Industries                                                                                                                       |                                                                                           |                                                                                                                                                                                       |           |    |           |        |    |             |              |              |              |    |
| IP3.1 | There should be provision to use CEMS data as legal evidence and a policy be framed in consultation with Central Pollution Control Board. | CBMWTSDF, CETP & all 17 category industries installed CEMS system and connected to server | CBMWTSDF, CETP & all 17 category industries installed CEMS system and connected to server                                                                                             | Installed | No | Completed | Yes    | No | Policy copy | Installed    | No           |              |    |
| IP3.2 | Implement Continuous Emission Monitoring System (CEMS) across all targeted and applicable polluting industry                              | Already installed                                                                         |                                                                                                                                                                                       | Installed | No | Completed | Number | No | NIL         | Installed    | No           |              |    |
| IP4   | Clean fuel in industries                                                                                                                  |                                                                                           |                                                                                                                                                                                       |           |    |           |        |    |             |              |              |              |    |

|       |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                               |                  |  |         |        |    |  |              |              |              |    |
|-------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|---------|--------|----|--|--------------|--------------|--------------|----|
| IP4.1 | Introduction and shifting towards cleaner fuels in industries | <p>Industry has changed the fuel from F.O. to LPG.</p> <p>M/s. Allana: - Industry has changed the earlier fuel F.O. to HSD and Tylo. Also, for removal of odour provided biofilters recently.</p> <p>M/s. Sterlite, A-1/7 :- Operating with LNG as a fuel to reduce air pollution.</p> <p>M/s. Sterlite, Waluj MIDC: - Industry has submitted proposal to convert fuel F.O to LNG and FO to LDO (power) applied for Consent to Operate.</p> <p>M/s. Carlsberg: - Industry has submitted proposal to convert Coal to Biomass briquette. C to E approved and work start.</p> <p>M/s. Endurance, L-6/3:- In process to change the fuel from F.O. to LPG.</p> <p>M/s. Endurance, B-2:- In process to change the fuel from F.O. to LDO.</p> <p>M/s. Endurance, K-226/1 and 227 :- In process to change the fuel from F.O. to LDO.</p> | MPC Board not allow coal and wood as a fuel to boiler or for any other processess, during visits information is given to all industries about Boards circular | Regular activity |  | Ongoing | Yes/No | No |  | Not required | Not required | Not required | No |
|-------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|---------|--------|----|--|--------------|--------------|--------------|----|



|             |                                                                                                                                                                                                        |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--|----------------|---------------|-----------|----------------------------------|---------------------|---------------------|---------------------|-----------|
| IP4.2       | Conversion to CNG/PNG from pet coke /wood / coal and urgent ban on furnace oil, pet coke, which are dirty industrial fuels with high sulphur and heavy metals                                          | <b>Board has issued circular on 5.2.2020 to remove 90% sulphur content from Furnace oil through scrubbing system. Also pet coke is banned .</b> | <b>MPC Board not allowed coal and wood as a fuel to boiler or for any other processes, during visits information is given to all industries about Boards circular</b> | <b>Regular activity</b>             |  | <b>Ongoing</b> | Number Yes/No | <b>No</b> | Notification copy                | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP4.3       | Strict enforcement against illegal use of such fuels, including fuels which do not have specifications laid down or are included in the acceptable fuels as mandated by state pollution control boards | <b>Ongoing</b>                                                                                                                                  | MPC Board will initiate actions on violeting units                                                                                                                    | <b>Regular activity</b>             |  | <b>Ongoing</b> | Yes           | <b>No</b> | Details on the action undertaken | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP4.4       | Establish a protocol for using cleaner fuels & technology in industries                                                                                                                                | Whether protocol formulated?                                                                                                                    |                                                                                                                                                                       |                                     |  |                | Yes/No        |           | Protocol copy                    |                     |                     |                     |           |
| IP4.5       | Restriction on using un-authorised fuels in industries                                                                                                                                                 | <b>In progres</b>                                                                                                                               | <b>MPC Board will initiate actions on violeting units</b>                                                                                                             | <b>Regular activity</b>             |  | <b>Ongoing</b> | <b>Yes</b>    | <b>No</b> | Details on the action undertaken | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| <b>IP11</b> | <b>Control of air pollution from generator sets</b>                                                                                                                                                    |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
| IP11.1      | <b>Allow only DG sets meeting emission and design of chimney/ exhaust, acoustic enclosures standards to operate</b>                                                                                    | <b>Whether action completed</b>                                                                                                                 | <b>Will ckeck the compliance during visit and initiate actions.</b>                                                                                                   | <b>Regular enforcement activity</b> |  | <b>Ongoing</b> | Yes           | <b>No</b> | <b>NIL</b>                       | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
| IP11.2      | <b>Curtail use of DG Sets in social events by providing temporary electric connections</b>                                                                                                             | <b>Whether action completed</b>                                                                                                                 | <b>Industry operates DG sets only when electricity is failure</b>                                                                                                     | <b>Regular enforcement activity</b> |  | <b>Ongoing</b> | Yes           | <b>No</b> | <b>NIL</b>                       | <b>Not required</b> | <b>Not required</b> | <b>Not required</b> | <b>No</b> |
|             |                                                                                                                                                                                                        |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
| <b>IP12</b> | <b>Control of air pollution from waste incineration</b>                                                                                                                                                |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
| IP12.1      | Strong siting policy for Waste to Energy Plants                                                                                                                                                        | Whether policy notified?                                                                                                                        | <b>NA- No waste to energy project is in operation</b>                                                                                                                 |                                     |  |                | Yes/No        | Yes       | Copy of policy                   |                     |                     |                     |           |
|             |                                                                                                                                                                                                        |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
| <b>IP13</b> | <b>Renewable Energy</b>                                                                                                                                                                                |                                                                                                                                                 |                                                                                                                                                                       |                                     |  |                |               |           |                                  |                     |                     |                     |           |
| IP13.1      | Link energy requirments for solar power plants to shift to zero emission target                                                                                                                        | Whether action completed                                                                                                                        |                                                                                                                                                                       |                                     |  |                | Yes/No        | Yes       | Details on the action undertaken |                     |                     |                     |           |

|        |                                                                                                        |                                                             |                                                                                                     |                 |  |         |            |     |                                  |              |              |              |    |
|--------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------|--|---------|------------|-----|----------------------------------|--------------|--------------|--------------|----|
| IP13.2 | Identify and target commercial and industrial establishments for installation of roof top solar system | Number of commercial and industrial establishments targeted | More than 20,000 sq mtr commercial establishment will be indentified to check roof top solar system | Regular ctivity |  | Ongoing | Number     | No  |                                  | Not Required | Not Required | Not Required | No |
| IP13.3 | Identify canals and open spaces for installation of solar systems                                      | Number of open spaces identified and solar system installed |                                                                                                     |                 |  |         | Number (2) |     |                                  |              |              |              |    |
| IP13.4 | Organise consumer outreach programme for roof top solar programme                                      | Whether action completed                                    |                                                                                                     |                 |  |         | Yes/No     | Yes | Details on the action undertaken |              |              |              |    |

|             |                                                                                                                                                                                                                                                                                                                                                                                                            |                  |         |    |                                                                                     |              |              |              |    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------|----|-------------------------------------------------------------------------------------|--------------|--------------|--------------|----|
| Green Cover | Enhancing green cover                                                                                                                                                                                                                                                                                                                                                                                      | Regular activity | Ongoing | No | 79 nos of industries filled data, planted 1,41,464 nos of trees since last 2 years. | Not required | Not required | Not required | No |
|             | <p>Aurangabad is under CEPI area, hence, stringent conditions imposed during granting consent to the polluting industries including expansion of polluting units. Industries those are found violated during visits accordingly suitable actions are initiated and this is continuous / ongoing process.</p> <p>Most of the industries are now using gas/HSD as a fuel. This is also on gouing process</p> |                  |         |    |                                                                                     |              |              |              |    |

In this area electroplating industries are mostly in operation and all are equipped with water scrubbing systems also other industries have provided dust collection system to control the air emissions.

During visit if any industry found not operating Air pollution control equipments MPC Board initiate action. This is on going process.

| WASTE AND BIOMASS- DUMPING AND BURNING |                                                                                              |                                                                                                                                                                                                                                     |                     |             |                                            |                 |            |            |                                           | Total Funds Allocated | Funds released | Funds Utilized | Additional Funds Required |
|----------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|--------------------------------------------|-----------------|------------|------------|-------------------------------------------|-----------------------|----------------|----------------|---------------------------|
| BB1                                    | Biomass Burning                                                                              | Present Status                                                                                                                                                                                                                      | Target              | Target Date | Deviation from Approved Action Plan Target | Annual Target   | Field type | Attachment | Attachment Contents                       |                       |                |                |                           |
| BB1.1                                  | Regular check and control of burning of municipal solid wastes                               | Inspections Regularly conducted                                                                                                                                                                                                     | Continuous activity |             | No                                         | 12              | Yes        | Yes        | Penalty collected                         | Not required          | Not required   | Not required   | No                        |
| BB1.2                                  | Defaulters for open burning to be imposed fines                                              | Penalty imposed                                                                                                                                                                                                                     | Continuous activity |             | No                                         | 12              | Yes        | Yes        |                                           | Not required          | Not required   | Not required   | No                        |
| BB1.5                                  | Launch extensive drive against open burning of bio-mass, crop residue, garbage, leaves, etc. | Drive launched with help of CRT NGO                                                                                                                                                                                                 | Regular in process  |             | On Track                                   | 12              | Yes        | Yes        | Details                                   | Not required          | Not required   | Not required   | No                        |
| BB1.6                                  | Construction of advanced waste management Site.                                              | contractor has installed Screening machine at Trenching ground for segregation of garbage. Approval for site for dumping garbage and solid waste at trenching ground (Sy No. 207/1) has been received from Pollution Control Board. | Site exist          | On Track    | No                                         | Site exists     | Yes        | Yes        | Report on the site including its location | Yes                   | Yes            | Yes            | No                        |
| BB1.7                                  | Regular collection and control of municipal solid wastes.                                    | Door to door garbage collection was started in civil area through auto rickshaws carrying garbage bins. An NGO – Civic Response Team has been engaged to impart training to the employees as well as creating awareness             | 100% collection     | On Track    | No                                         | 100% collection | yes        | Yes        | Details                                   | Yes                   | Yes            | Yes            | No                        |

|       |                                                                                                                   |                                                                                                                                                                                                                             |                       |          |          |                          |            |     |                                                                                                 |                   |          |                |                                       |
|-------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------|----------|--------------------------|------------|-----|-------------------------------------------------------------------------------------------------|-------------------|----------|----------------|---------------------------------------|
|       |                                                                                                                   | amongst the residents for segregation of garbage at source.                                                                                                                                                                 |                       |          |          |                          |            |     |                                                                                                 |                   |          |                |                                       |
| BB1.8 | Providing Organic Waste Compost machines , decentralization of processing of Waste, dry waste collection centers. | 5.5 to 6.0 TPD waste generated.<br>4.0 to 4.2 TPD wet waste generated.<br>Composting Site Near Cantonment VET Naka, Waluj Road, Golwadi, Aurangabad.<br>Survey No. - 207/1<br>Total Area - 13 Acre<br>Shed Area - 25m × 11m | 100% waste processing | On Track | No       | 100% Waste processing    | Number (6) | Yes | Details of the sites and machines including images, location, waste collected/processed per day | Cantt Board Funds | Yes      | Yes            | Decentralized Composting Unit Rs 2 Cr |
| BB3   | Proper collection of Horticulture waste and its disposal following composting-cumgardening approach               | 5.5 to 6.0 TPD waste generated.<br>4.0 to 4.2 TPD wet waste generated.<br>Composting Site Near Cantonment VET Naka, Waluj Road, Golwadi, Aurangabad.<br>Survey No. - 207/1<br>Total Area - 13 Acre<br>Shed Area - 25m × 11m | Existing site         |          | On Track | 100% Wet waste Composted | 1          | Yes |                                                                                                 | Yes               | Complete | Fully utilized | No                                    |
| BB4   | Recycling plants for dry waste.                                                                                   | Dry waste management in the city is being done with the help of NGO                                                                                                                                                         | Completed             |          | On Track | 100% Dry waste recycled  | 3          | Yes |                                                                                                 | Yes               | Complete | Fully utilized | No                                    |

|  |  |                    |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--------------------|--|--|--|--|--|--|--|--|--|--|--|
|  |  | CARPE in the city. |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--------------------|--|--|--|--|--|--|--|--|--|--|--|



**CB1: Installation & Commissioning of Monitoring Stations: Aurangabad City****CB1.1 List of CAAQMS stations**

| <b>City</b> | <b>No. of stations</b> | <b>Locations</b>                         |
|-------------|------------------------|------------------------------------------|
| Aurangabad  | 1                      | Waluj Industrial Association, MIDC Waluj |

**CB2.2 List of Manual stations**

| <b>City</b> | <b>No. of stations</b> | <b>Locations</b>                  |
|-------------|------------------------|-----------------------------------|
| Aurangabad  | 1                      | S.B.E.S College, Aurangabad       |
|             | 2                      | Collector Office, Aurangabad      |
|             | 3                      | C.A.D.A Office, Aurangabad        |
|             | 4                      | MPCB Office Premises, Chikalthana |



# MAHARASHTRA POLLUTION CONTROL BOARD

Tel : 2402 0781 / 2401 0437

Fax : 2402 4068

Visit us at :

Website : <http://mpcb.mah.nic.in>

E-mail : [mpcb@vsnl.net](mailto:mpcb@vsnl.net)



Kalpataru Point,  
2nd , 3rd & 4th floor,  
Opp. Cineplanet,  
Near Sion Circle, Sion (E),  
Mumbai - 400 022.

No: MPCB/APC/SAS/WO/B-1178

Date : 17/03/2016

To,  
Prof. Virendra Sethi  
Centre for Environmental Science and Engineering  
IIT (B), Mumbai,  
Powai, **Mumbai-400076.**

Dr. Rakesh Kumar,  
Chief Scientist, NEERI  
89-b, Mumbai Zonal Lab,  
Dr Annie Besant Road,  
Worli, Mumbai, Maharashtra 400018

**Sub : Work Order for the Project "Air Quality Monitoring and Emission source apportionment studies for 10 cities" in the state of Maharashtra.**

Ref : 1. CPCB letter dtd : 28/01/2015.  
2. Approval in 164<sup>th</sup> board meeting held on 25/03/2015.  
3. proposal received from IIT(B), Mumbai & NEERI Mumbai.

Sir

With reference to above, MPCB is pleased to accept above proposal (ref.3) for conducting source apportionment study to be carried out in 10 cities in Maharashtra, namely: Mumbai, Pune, Nagpur at the rate of Rs.75 lakhs/city and Nashik, Amravati, Aurangabad, Chandrapur, Kolhapur, Navi Mumbai & Solpaur cities at the Rate of Rs.50 lakhs/city.

The cost of the project for 10 cities shall be Rs. 225 lakhs + 350 Lakhs = **Rs. 575 lakhs** (Five crore seventy five lakhs only) and applicable taxes shall be extra payable by the Board.

The Objectives, Scope of the project, Methodology and Deliverables, Other Terms and conditions shall be as per the TOR terms & conditions are given below:

**1. Objectives:** Main objectives of the proposed study are:

- To measure baseline air pollutants (Particulate Matter) in different parts of the city this includes "hot spots" on curbside as well.
- To inventories the various pollutants in the city.
- To conduct source apportionment study for PM.
- Suggest Action Plan based on various options delineated in Six City Study of MOEFCC or any relevant workable options.



## 2. Scope of Work:

- To undertake the project for Air Quality Monitoring, Emission Inventory and Sources Apportionment Studies for the respective cities. The detail scope of the project is as per the Terms of Reference (TOR) enclosed at Annexure I.

## 3. Methodology & Deliverable

The methodology regarding Air monitoring at selected sites as per requirement, Data acquisition, shall be as per the TOR enclosed at **Annexure I**.

**4. Data interpretation** : Analysis, Modelling, & Apportionment shall be as per Annexure I.

## 5. Time period:

- Air Quality Monitoring and source apportionment studies in the city shall be conducted over a period of 6 months and the project shall be completed within 12 months from the date of start of the project.
- The project time period shall be in two parts 1. Short term study (3 months) 2. Long term study (Total 12 months). The total project shall be completed within 12 months.

## 6. Report Submission:-

- The final Short Term study report & proposed action plan shall be submitted within 03 months.
- The final Long Term study report & proposed action plan shall be submitted within 12 months.
- Thus, the total study period shall not exceed more than 12 months.

## 7. Project Management :

The execution of project will be monitored by the technical committee formulated by MPCB. The separate order in this regard shall be communicated to IIT (B) & NEERI.

The technical committee is drawn from all participating organizations; In addition, eminent experts from other organizations shall be co-opted or invited for specific meetings as and when necessary.

## 8. Cost of the project :

The cost of the project will range between 50-75 lakhs + Applicable Service Tax. This cost includes the cost of tests and cost of equipment and consumables for undertaking project in each of the cities

1. Mumbai, Pune, Nashik Cities: Rs. 75 Lakhs each \* 3 Rs. 225 (in lakhs)

2. Nashik, Amravati, Aurangabad, Chandrapur, Kolhapur,  
Navi Mumbai & Solpaur Cities:Rs. 50 Lakhs each \* 7 Rs. 350(in lakhs)

**Total = Rs. 575 Lakhs**  
**(+Applicable taxes extra )**



The studies shall be carried out in consultancy mode as per rules at NEERI Mumbai and IIT Bombay (Dean (R&D)). 20% overhead for agency are included in the above costs. NEERI and IIT together has samplers and facilities for many analysers and instruments which need not be purchased for the project (approximate cost Rs. 3.50 crores).

**8. Payments Terms :** MPC Board shall released the payment as mentioned below on receipt of recommendations from project monitoring committee constituted as per TOR.

**A. First Installment:**

- a. 100% of all equipment cost
- b. 70% of all remaining costs.

**B. Second Instalment:** 20% of the remaining cost (after the field study, all secondary data based EI)

**C. Third installment:** Last 10% after the submission of final draft report.

IIT Bombay will bear 70% of the work of project and NEERI Mumbai will bear 30% of the project work. However, completion of the entire project work shall be with IIT(B) and NEERI, Mumbai jointly. The IIT(B) & NEERI shall submit monthly progress report to MPCB. The draft report of each above mentioned city shall be presented to respective city stake holders before submitting final drafts to MPCB. (Including short term & long term action plans)

**9.** Separate Memorandum Of Understanding (MoU) shall be sign between MPCB, IIT (B) Mumbai & NEERI in reference to developing partnership among the institutes and MPCB for timely execution of above said project as per TOR.

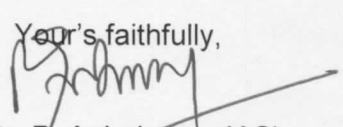
**10.** MPCB will take the review of project on monthly basis.

**11.** IIT (B)/ NEERI shall submit the revised timeline for 10 cities Air Quality Study program including short term & long term measures.

You are requested to acknowledge the acceptance of above work order and submit the same to this office for further necessary action, preferably within 7 days.

DA: As above

Yours faithfully,

  
(Dr. P. Anbalagan, IAS)  
Member Secretary

Copy submitted to: Hon'ble Chairperson, MPCB, Sion, Mumbai for information please

Copy to : 1. Chief Accounts Officer, MPCB, Sion, Mumbai for necessary action as stated above  
2. Joint Director (APC), MPCB, Sion, Mumbai-For information & necessary follow in the matter.  
3. Regional Officer, MPCB- Mumbai / Amravati / Aurangabad / Chandrapur / Kolhapur / Pune / Nagpur / Nashik / Navi Mumbai / Solapur : They are directed to extend the necessary co-operation in conducting the study and providing necessary data required for preparing action plans.



*Draft Interim Report*

**Air Quality and Emission Source Apportionment Studies for  
Ten Cities of Maharashtra**

**AURANGABAD CITY**

**Sponsor**



*Maharashtra Pollution Control Board, Mumbai*



**CSIR-National Environmental Engineering Research Institute  
(CSIR-NEERI), Nagpur, India**

**&**

**Indian Institute of Technology Bombay  
Powai, Mumbai 400076**

**January 2020**

# Contents

| No.       | Title                                                    | Page No. |
|-----------|----------------------------------------------------------|----------|
| <b>1.</b> | <b>Introduction</b>                                      |          |
| 1.1       | Background of the city                                   | 1        |
| 1.2       | Demographic structure                                    | 1        |
| 1.3       | Climate and Meteorology                                  | 3        |
| 1.4       | Industry                                                 | 4        |
| 1.5       | Trade and Commerce                                       | 5        |
| <b>2.</b> | <b>Status of Air Environment</b>                         |          |
| 2.1       | Ambient air quality (secondary data)                     | 6        |
| 2.2       | Current ambient air quality                              | 7        |
| <b>3.</b> | <b>Emission Inventory</b>                                |          |
| 3.1       | Introduction                                             | 10       |
| 3.2       | Area Sources                                             | 12       |
| 3.2.1     | Domestic and commercial combustion                       | 12       |
| 3.2.1.1   | Bakery                                                   | 12       |
| 3.2.1.2   | Open Eat outs                                            | 12       |
| 3.2.1.3   | Hotels and Restaurants                                   | 13       |
| 3.2.1.4   | Crematoria                                               | 13       |
| 3.2.1.5   | Household fuel                                           | 14       |
| 3.2.1.6   | Recommendations                                          | 15       |
| 3.2.1.7   | Solid waste emissions                                    | 15       |
| 3.2.1.8   | Recommendations                                          | 16       |
| 3.2.2     | Other Area Sources                                       | 16       |
| 3.2.2.1   | Construction                                             | 16       |
| 3.2.2.2   | Road Dust                                                | 16       |
| 3.3       | Point Source                                             | 18       |
| 3.3.1     | Recommendations                                          | 20       |
| 3.4       | Line Source                                              | 20       |
| 3.5       | Gridded Emission Inventory                               | 24       |
| 3.6       | Overall PM <sub>10</sub> contribution by various sources | 25       |
| <b>4.</b> | <b>Dispersion Modelling</b>                              |          |
| 4.1       | Dispersion Modelling                                     | 26       |
| <b>5.</b> | <b>Action plan</b>                                       |          |
| 5.1       | Action plan for air pollution control                    | 27       |
| 5.2       | Monitoring Mechanism for Implementation                  | 31       |
| 5.3       | <b>Implementation Status</b>                             | 31       |

# List of Tables

| No.  | Title                                                          | Page No. |
|------|----------------------------------------------------------------|----------|
| 1.1  | Summary of demographic structures                              | 3        |
| 2.1  | Description of sampling sites                                  | 7        |
| 3.1  | Data requirement and probable sources                          | 10       |
| 3.2  | Emission load from bakeries                                    | 12       |
| 3.3  | Emission load from open eat outs                               | 13       |
| 3.4  | Emission load from hotels, restaurants                         | 13       |
| 3.5  | Emission load from crematories                                 | 14       |
| 3.6  | Distribution of domestic fuel consumption pattern              | 14       |
| 3.7  | Assumptions per capita fuel consumption                        | 14       |
| 3.8  | Emission load from solid waste burning                         | 15       |
| 3.9  | Emission load from construction                                | 16       |
| 3.10 | Road length in the city                                        | 16       |
| 3.11 | Vehicular weight                                               | 17       |
| 3.12 | Emission load from road dust                                   | 18       |
| 3.13 | Emission factors for PM <sub>10</sub> from area sources        | 18       |
| 3.14 | Industrial scenario of Aurangabad                              | 18       |
| 3.15 | Emission factors for point source                              | 19       |
| 3.16 | Point source emission inventory                                | 19       |
| 3.17 | Number of vehicles in district                                 | 20       |
| 3.18 | Vehicle count in Aurangabad city                               | 21       |
| 3.19 | Emission factors for line sources                              | 22       |
| 3.20 | Contribution of line sources to PM <sub>10</sub> emission load | 22       |
| 3.21 | Grid wise emission load for PM <sub>10</sub> (TPD)             | 24       |
| 3.22 | Emission load contribution by all sources                      | 25       |
| 5.1  | Action plan for air pollution reduction                        | 27       |

## List of Figures

| No.   | Title                                                   | Page No. |
|-------|---------------------------------------------------------|----------|
| 1.1   | Map of Aurangabad Tehsil                                | 2        |
| 1.2   | Municipal boundary of Aurangabad city                   | 3        |
| 1.3   | Windrose pattern                                        | 4        |
| 2.1   | Average AAQ (secondary data)                            | 6        |
| 2.2.a | Location of sampling sites                              | 8        |
| 2.2.b | PM <sub>10</sub> and PM <sub>2.5</sub> monitored values | 9        |
| 3.4   | Location of points for traffic counts                   | 21       |
| 3.5   | Percent emission load contribution from line source     | 23       |
| 3.6   | % emission load contribution from all sources           | 25       |
| 4.1   | GLC for Aurangabad city                                 | 26       |

## List of Annexure

| No.                  | Title                                                                       |
|----------------------|-----------------------------------------------------------------------------|
| <b>Annexure I</b>    | Design of a Clean Tandoor Community Kitchen System (CTCKS)                  |
| <b>Annexure II</b>   | Design of Air Pollution Control System for Open Pyre Type Green Crematorium |
| <b>Annexure III</b>  | Design of Passive Gas Venting System for Landfill Sites                     |
| <b>Annexure – IV</b> | Dust Control Measures                                                       |
| <b>Annexure – V</b>  | Wind Augmentation and purifying Unit (WAYU)                                 |



## **1. Introduction**

### **1.1 Background of the City**

Aurangabad District is located mainly in the Godavari River Basin and partly in the Tapi River Basin. The district is from 19 to 20 degrees north longitude and 74 to 76 degrees east latitude. Aurangabad city is situated on the bank of river Kham a tributary of the Godavari River. The entire city is situated at the latitude of 19°53'50" N and longitude of 75° 22'46" E. It is located 512 meters above Sea Level. The city is surrounded by hills of the Vindhya Ranges and the river Kham passes through it.

The city is a tourism hub which is surrounded by many historical monuments including the Ajanta Caves and Ellora Caves which are UNESCO World Heritage Sites. Bibi Ka Maqbara and Panchakki are also tourist's places in Aurangabad. Aurangabad is the administrative headquarter of the Aurangabad Division or Marathwada region and is entitled as "The City of Gates" and the strong presence of these can be felt as one drives through 52 gates in the city.

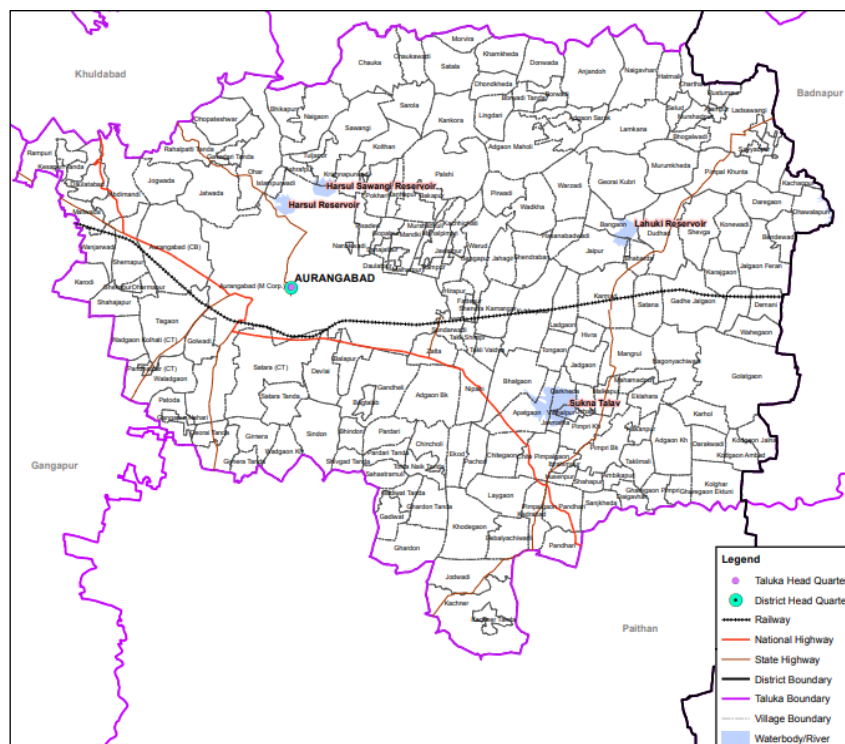
According to the evaluation of 2011, the city had a population of 1.1 Million. In order to check out the population of Aurangabad in 2020, we need to have a look at the population of the past 5 years. It has been seen that every year (2012-17) the population increases by 0.22 Million. So the population of Aurangabad is forecasted to reach 4.4 Million by 2020.

### **1.2 Demographic Structure of the City**

According to the 2011 Indian Census, Aurangabad has a population of 11,75,116, of which 6,09,206 are males and 5,65,910 are females. Population in the age range of 0 to 6 years is 1,58,779. The total number of literates in Aurangabad was 8,89,224 which constituted 75.67% of the population with male literacy of 79.34% and female literacy of 71.72%. The effective literacy rate of Aurangabad was 87.5%, of which male literacy rate was 92.2% and female literacy rate was 82.5%. There were 2,36,659 households in Aurangabad in 2011.

Aurangabad has central MSRTC bus stand for public transport centre. Buses are available to every major bus depots of Maharashtra. The city has one more additional bus stand name as CIDCO bus stand. This is constructed for serving load of old bus stand. Ola Cabs service is available in city. Aurangabad railway station is the major railway station under Nanded railway division of the South Central Railway zone. It is located on the Secunderabad-Manmad section. The city has rail connectivity with major cities such as Hyderabad, Delhi, Nizamabad, Nagpur, Nasik, Pune, Nanded and Latur Road. This railway line runs on diesel locomotive engines. Aurangabad Airport (Chikhalthana Airport) is an airport serving the city and has connecting flights to all major cities of the country.

Aurangabad Municipal Corporation (AMC) is the local civic body. It is divided into six zones. The Municipal Council was established in 1936, the Municipal Council area was about 54.5 km<sup>2</sup>. It was elevated to the status of Municipal Corporation including eighteen peripheral villages, making the total area under its jurisdiction to 138.5 km<sup>2</sup> extended its limits. The city is divided in 115 electoral wards called as Prabhag.



**Fig. 1.1: Map of Aurangabad Tehsil**



**Fig. 1.2: Municipal boundary of Aurangabad city**

**Table 1.1: Summary of Demographic Structure in Study Area**

| S. No. | Demographic Parameters        | Aurangabad Municipal Corporation |
|--------|-------------------------------|----------------------------------|
| 1      | State/District                | Maharashtra/Aurangabad           |
| 2      | No. of Wards/Prabhags         | 115                              |
| 3      | Total No. of Households       | 236659                           |
| 4      | Total Population              | 1309106                          |
| 6      | Sex Ratio (Females/100 males) | 923                              |

According to 2011 Census, the sex ratio in the District is recorded as 923. This is lower compared to the State average 929 (Source: Primary Census of Aurangabad District, Maharashtra state, 2011).

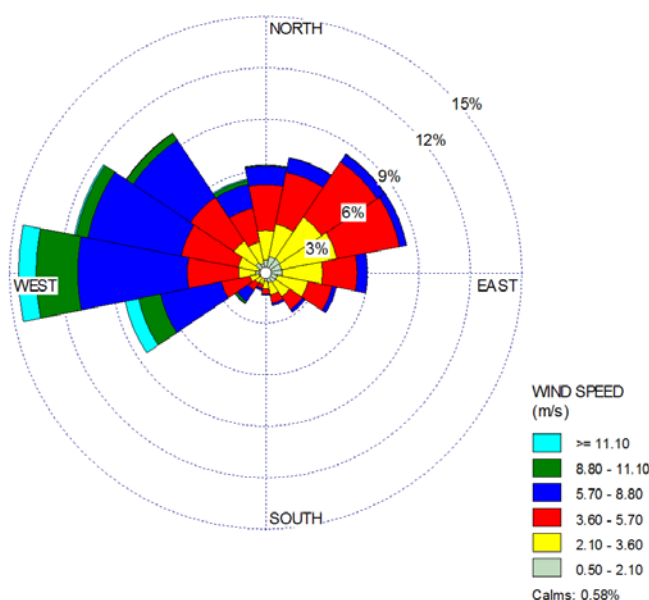
### 1.3 Climate and Meteorology

The climate of the District is characterised by a hot summer and general dryness throughout the year except during the south-west monsoon season. The year may be divided into four seasons. The cold season is from December to February and is followed by the summer

season from March to May. The south west monsoon season is from June to September while October and November constitute the post-monsoon season.

The average annual rainfall of Aurangabad is 731.0 mm. In general, the amount of rainfall increases as one proceeds from west to east. About 83 per cent of the total annual rainfall is received during the south-west monsoon season. July is the rainiest month of the year. Some rainfall occurs during May, October and November and is mainly in the form of thunder showers. The variation in the annual rainfall from year to year is large.

The summer season from March to May is a period of rapid and continuous increase in both day and night temperatures.



**Fig.1.3:** Windrose pattern

## 1.4 Industry

Industrially Maharashtra is one of the advanced States in the country and Aurangabad is one of the developing Districts of the State. Now a day's Aurangabad attracts many industrialists and many large scale industries have been started in the since past like two-wheelers, Videocon, Colgate, Garware Plastics, Crompton and Pharmaceutical companies are functioning in the District. Other small scale industries are also in Aurangabad District such as oil mill, ginning, dairy products, leather goods, wool weaving etc. Aurangabad District is famous for Himroo mashroo weaving industries. Paithan has been associated with fine silk

Paithani sarees. Agriculture is the main economic activity of the District. The raw materials available in the District are mostly agricultural products like cotton, groundnut, sugarcane etc. These materials have encouraged the establishment of number of ginning factories and sugar factories in the District.

### **1.5 Trade and Commerce**

The District is famous for Himroo cloth and Paithani sarees. The chief manufactured articles are two wheelers, industrial goods, chemicals, wine, tyres, animal skin, sugar cane, wheat, cotton, tobacco, food grain, wooden furniture, agricultural instruments, medicines, plastics, sugar, Jowar, groundnut, bidi etc. and chief exported commodities are medicines, polyester films, tyre, milk, animal skin, sugar, cotton bales, Jowar, auto parts, industrial goods, maize, Paithani sarees etc., are exported to all over India and overseas also. The chief imported commodities are wheat, rice, cloth, cotton and sugar cane etc. Most of these goods are imported from surrounding places. Apart from the weekly markets and fairs Aurangabad, Paithan, Vaijapur and Sillod are important trade centres also.

---

## 2. Status of Air Environment

### 2.1 Ambient Air Quality – Secondary Data

The Annual average concentration of ambient air quality data for Aurangabad city is analysed from MPCB data and it is observed that the levels of pollutants are increasing annually. The table represents the values of RSPM & SPM for the last five years (2009-2016). Based on last 5 year NAMP (national Ambient Monitoring Plan) data obtained from the MPCB website, PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> concentration is plotted. Since MPCB provides the AAQ data on SPM, RSPM.

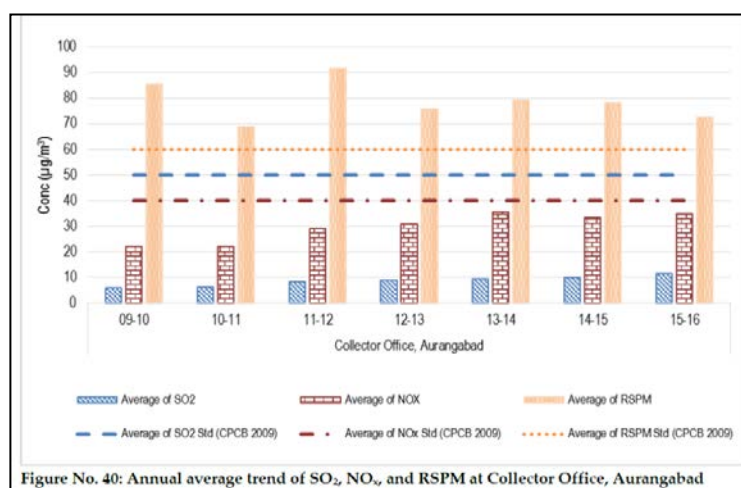


Figure No. 40: Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, and RSPM at Collector Office, Aurangabad

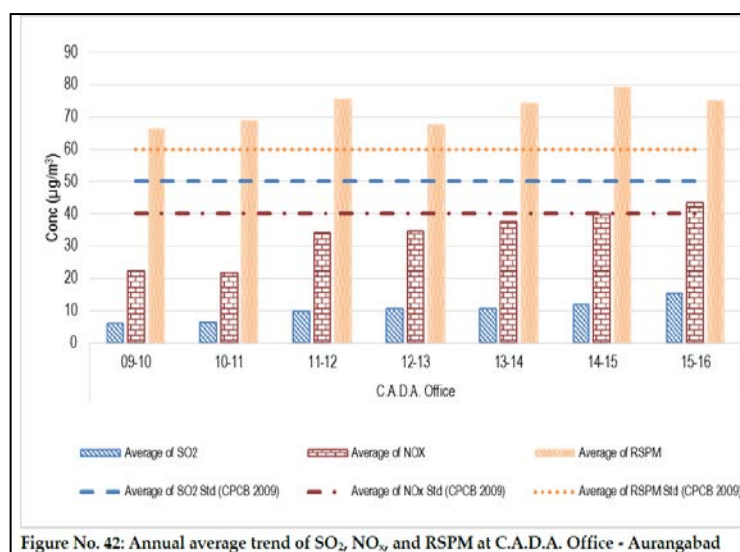


Figure No. 42: Annual average trend of SO<sub>2</sub>, NO<sub>x</sub>, and RSPM at C.A.D.A. Office - Aurangabad

**Fig. 2.1: Average AAQ for Aurangabad city**



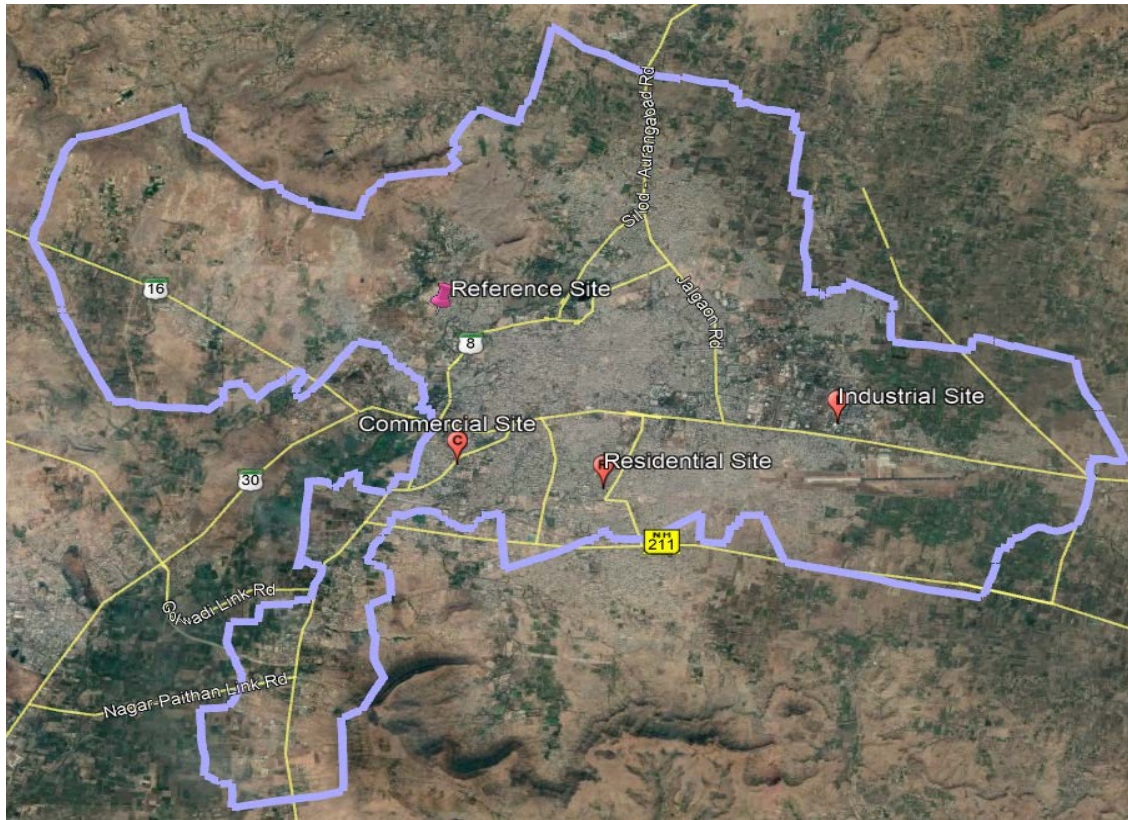
## 2.2 Current Ambient Air Quality

Ambient air quality monitoring exercise was carried out keeping in view the protocol for source apportionment (SA) study. CPCB guidelines document for source apportionment through receptor modeling was followed. Monitoring for particulate Matter of diameter 10 micron and 2.5 micron (PM<sub>10</sub> and PM<sub>2.5</sub>, respectively) was carried out following the standard operating procedures prescribed in CPCB guidelines document on SA studies. The sampling was carried out at 4 sites selected based on the land-use activity and dispersion modeling results. The location of the sites is given in **Fig. 2.2.a**. The description of the sampling sites is given in **Table 2.1**. The results are shown in **Fig.2.2.b**.

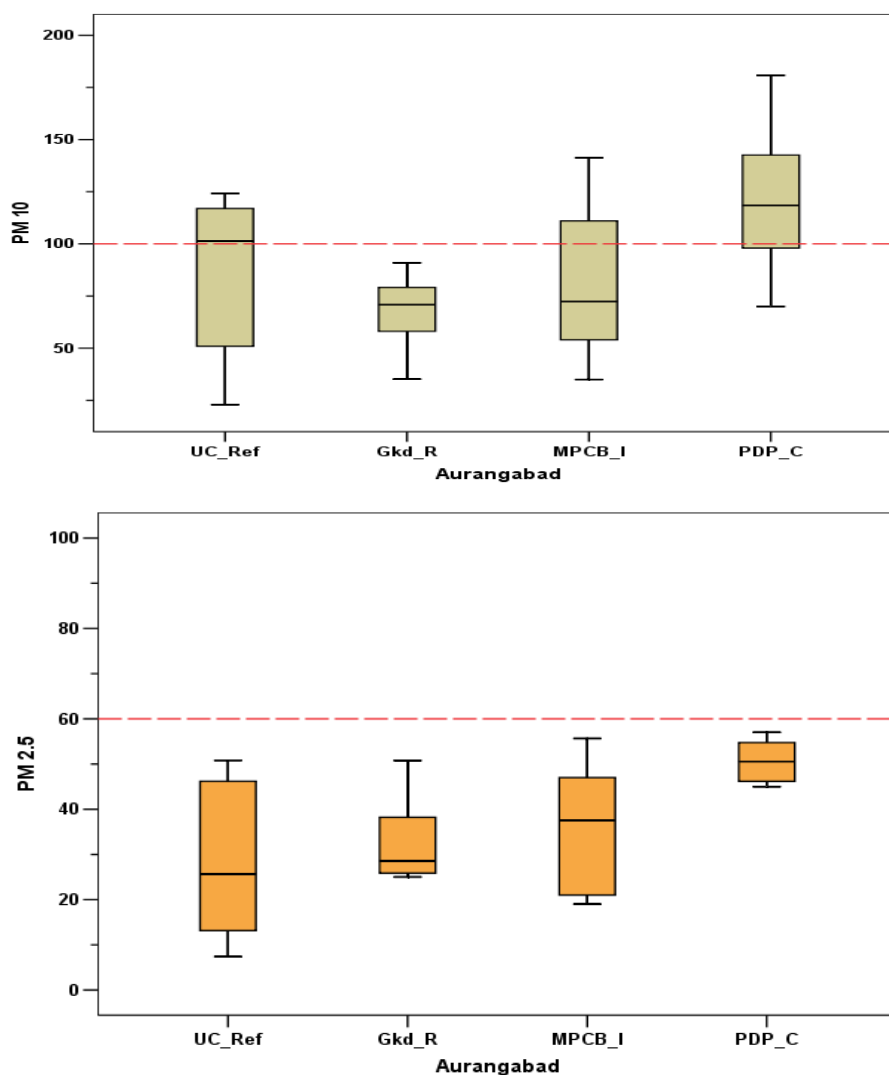
**Table 2.1: Description of Sampling Sites**

| <b>Sampling Location</b> | <b>Type</b> | <b>Geographic Location</b>     | <b>Characteristics</b>                                                                                   |
|--------------------------|-------------|--------------------------------|----------------------------------------------------------------------------------------------------------|
| University Campus        | Reference   | 19°53'45.30"N<br>75°18'43.61"E | 1 km away from Main road of the city, near BAMU staff quarters. Internal road 0.5 km away from the site. |
| MPCB Office              | Industrial  | 19°52'26.07"N<br>75°23'10.64"E | 1km away from Nagpur-Mumbai Highway, unpaved roads nearby                                                |
| Padampura                | Commercial  | 19°51'57.58"N<br>75°19'7.27"E  | Hotels, Shops, continuous flow of vehicles (autorickshaws), near to railway station                      |
| Garkheda                 | Residential | 19°51'40.23"N<br>75°20'42.35"E | 2 kms away from highway, cement road construction going nearby                                           |





**Fig. 2.2.a: Location of sampling sites**



**Fig.2.2.b: PM<sub>10</sub> and PM<sub>2.5</sub> monitored values**

Air quality status at four sites in terms of PM<sub>10</sub> and PM<sub>2.5</sub> is given in **Fig. 2.2.b**. It can be seen that PM<sub>10</sub> concentration violated the CPCB threshold (100 µg/m³) during the entire study period at commercial/traffic site (Padampura) and slightly high concentrations were seen at reference site (University campus). It was due to heavy traffic load on roads and the open burning activities in commercial area. At university campus site, open burning was seen daily and a stone crusher was seen in operation 2 kms away from the site. At residential site (Garkheda Parisar), PM<sub>10</sub> was below standard limit. At industrial site (MPCB office), PM<sub>10</sub> is observed to be slightly higher than the standard concentration. This may be due to poor roads condition in industrial areas and due to industrial activities. The PM<sub>2.5</sub> on the other hand is observed to be below the CPCB threshold of 60 µg/m³ at all the sites except at commercial area (Padampura).

### 3. Emission Inventory

#### 3.1 Introduction

The general sources based on Point, Area and Line source category are considered to facilitate the preparation of emission inventory. Data requirement for preparation of emission inventory along with its probable sources is presented in **Table 3.1**. For area sources, the emissions from domestic fuel consumption, bakeries, hotels, dhabas and open eat outs are considered. The details of the respective sources are given in the appropriate sections. For the emission load estimation from area source and point source, emission factors derived by CPCB and USEPA are used, for vehicular source ARAI/CPCB has provided the emission.

**Table 3.1: Data Requirement and Probable Sources for Preparation of Emission Inventory**

| No. | Task                                                                        | Data Required                                                                                                                                                                                                                                                                                        | Probable Source                                                                                                                                                                                                                                                                                       |
|-----|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | Mapping of road network and other details for delineation of zones / sector | Base maps, road network details, population density, industrial activities                                                                                                                                                                                                                           | Traffic Commissioner, RTO, Municipal ward office                                                                                                                                                                                                                                                      |
| 2.  | Emission inventory for vehicular sources                                    | <ul style="list-style-type: none"><li>• Secondary data on vehicle counts and locations, in-use vehicle population</li><li>• Registered data on vehicles (year-wise) and growth rate for past 15 years</li><li>• Vehicle usage characteristics</li><li>• Number of garages/service centers.</li></ul> | <ul style="list-style-type: none"><li>• Transport commissioner's office, RTOs, Reports, SIAM etc.</li><li>• Primary data through questionnaire</li><li>• Petrol pumps/Local Agencies/Marketing Terminal/PUC centers/Parking lot/</li><li>• Vehicle service centers/Individual vehicle owner</li></ul> |

|    |                                                                         |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                           |
|----|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                                                         | <ul style="list-style-type: none"> <li>• Number of PUC centers</li> <li>• Planned technological interventions</li> <li>• Sale of Petrol/Diesel/ LPG per month</li> <li>• Emission factors for emission load estimation</li> </ul>                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                           |
| 3. | Emission Inventory for Industrial Sector                                | Major types of air polluting industries - Fuel usage (quantity), fuel type (quality) and pollutant load from various industries                                                                                                                                                                                                 | PCB, CPCB, Industrial Development Corporation, Industries Association, Fuel supply agencies                                                                                                                                                                                                                                                                                               |
| 4. | Emission Inventory for Area Sources (residential and commercial sector) | <ul style="list-style-type: none"> <li>• Population and demography</li> <li>• Data on domestic fuel</li> <li>• Number of registered hotels, Restaurants, bakeries etc.,</li> <li>• Number of Crematoria</li> <li>• Data on refuse burning</li> <li>• Data on Incinerators</li> <li>• Sale of LPG/kerosene/coal/ wood</li> </ul> | Census office, Municipal Corporation. District Collector's office, District fuel supply office, Rationing office, Fuel supply dealers, Development Authority, Associations of Hotels, Restaurants, Bakeries, Health department of Municipal Corporation. Primary data through questionnaire Residential/Hotels and restaurant owners/bakery owners /commercial establishments/ crematoria |

## 3.2 Area Sources

The individual sources that cannot be considered as point and mobile / line sources are categorized as area sources, which includes; bakeries, open eat outs, hotels/restaurants, crematories, construction, domestic cooking, paved/unpaved road dust, solid waste burning. The details of the major area sources in short are given below. The details on the solid waste generation and construction activities are given in the respective sections.

### 3.2.1 Domestic and Commercial Combustion

#### 3.2.1.1 Bakery

There are total 147 bakeries registered in the city. Major fuel used in bakeries is coal, wood and LPG. Out of 147 bakeries, 78 bakeries uses coal, 57 bakeries as wood and 12 bakeries uses LPG as fuel for the production of bakery products.

#### Emission Estimates:

Emissions (Kg/d) = No. of Bakeries x Fuel Consumption (Kg/d) x Emission Factor

The PM emission load from bakeries is given in **Table 3.2**.

**Table 3.2: Emission Load from Area Sources – Bakery**

| Source | Fuel/Type | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------|-----------|------------------------|-------------------------|
| Bakery | Wood      | 0.006                  | 0.0045                  |
|        | Coal      | 0.001                  | 0.0005                  |
|        | LPG       | 0.008                  | 0.0005                  |

TPD=tons/day

#### 3.2.1.2 Open Eat-outs

Based on the survey, it was observed that 131 open eat out units are operating in the city. All the units were operated on LPG. Maximum open eat outs contains tea stall. Average operating hours of street vendors is 12 hours. The actual number of tea stalls/snack bars/fast food centres could be more than the observed number, however the data collected by survey is considered for the emission estimates.

#### Emission Estimates:

Per capita consumption for each type of fuel is taken as

Total emissions = LPG burning

Emission from fuel burning (PM) per day

= Number of street vendors operating on particular fuel x fuel consumption per day x emission factor

The PM emission load from open eat-outs is given in **Table 3.3**.

**Table 3.3: Emission Load from Area Sources – Open Eat-outs**

| Source       | Fuel/Type | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------------|-----------|------------------------|-------------------------|
| Open eat out | LPG       | 0.00306                | 0.00204                 |

### **3.2.1.3 Hotels and Restaurants**

There 344 hotels in the city. Hotels and restaurants are mostly LPG based (99%).

#### **Emission Estimates:**

Emission Load from LPG

Only PM<sub>2.5</sub> emissions are present in the LPG

Total emissions (PM<sub>2.5</sub>) due to LPG burning in Hotels

= Number of Hotels x LPG consumption (TPD) x Emission Factor (Kg/MT)

Emission Load from Coal

= No. of Hotels x Coal consumption (TPD) x Emission Factor (Kg/MT)

The PM emission load from hotels is given in **Table 3.4**.

**Table 3.4: Emission Load from Area Sources – Hotels & Restaurants**

| Source | Fuel/Type | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------|-----------|------------------------|-------------------------|
| Hotel  | LPG       | --                     | 0.005                   |
|        | Wood      | 0.002                  | 0.0013                  |
|        | Coal      | 0.003                  | 0.002                   |

### **3.2.1.4 Crematoria**

There are 22 crematories in the city. About 3338 number of bodies/year are burnt. Crematoria are operating as wood and kerosene based units. Based on the survey, it was observed that the wood consumed per body is 300 Kgs and kerosene consumed per body is 5 litres.

**Emission Estimations:**

Emission (TSP) = No. of Hindu Death /yr \* wood required per body (Kg) \* emission factor +  
 Number of Hindu Death /yr \* kerosene required (litres) \* emission factor

The PM emission load from crematories is given in **Table 3.5**.

**Table 3.5: Emission Load from Area Sources – Crematories**

| Source     | Fuel/Type | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|------------|-----------|------------------------|-------------------------|
| Crematoria | Wood      | 0.0183                 | 0.0122                  |
|            | Kerosene  | 0.000039               | 0.000026                |
|            | Cowdung   | 0.00025                | 0.00017                 |

**3.2.1.5 House Hold Fuel Consumption**

There are 115 Prabhags in the city. The emission load is however calculated based on the data from the report of Census of India (2011). As per the Prime Minister Ujjawala Yojana, 2017, report the consumers for LPG use are increasing day by day. The distribution of the fuel consumption pattern of the households is given below (**Table 3.6**);

**Table 3.6: Distribution of Domestic Fuel Consumption Pattern**

| No. of households | Firewood | Crop residue | Cow dung | Coal | Kerosene | LPG  |
|-------------------|----------|--------------|----------|------|----------|------|
| 315530            | 1578     | 63           | 631      | 1262 | 6571     | 3944 |

For emission calculations, the quantity of fuel required per house is assumed as given in table 3.7. (NEERI Mumbai SA study report)

**Table 3.7: Assumptions of Per Capita Fuel Consumption Pattern**

| Fuel         | Per capita consumption | Unit       |
|--------------|------------------------|------------|
| LPG          | 12                     | Cylinder/y |
| Kerosene     | 0.833                  | L/d        |
| Wood         | 4                      | kg/d       |
| Coal         | 5                      | Kg/d       |
| Cow dung     | 3                      | Kg/d       |
| Crop residue | 3                      | Kg/d       |



### 3.2.1.6 Recommendations

- The fuel used in hotels, bakeries, open eat outs can be reduce or shifted to alternate fuel pattern.
- Bakeries must use electric ovens for the production of bakery products.
- Crematories need installation with efficient pyres and chimneys for release of emissions.
- Crematories must be shifted from wood to biomass briquettes to reduce PM emissions.

### 3.2.1.7 Solid Waste Emissions

Aurangabad is grappling with the issue of garbage disposal. Aurangabad generates about 500 Metric ton (MT) of municipal solid waste. Villagers said no to dump the municipal garbage in Naregaon. The AMC is under identifying new site for solid waste dumping and is working for new methods to reduce the solid waste generation along with local NGOs. New dumping site is yet to finalize by Aurangabad Municipal Corporation. Still the problem was MSW dumping is not solved. There are in all 120 vehicles which comprise of tractors & hydraulic loader Autos and tipper trucks for lifting and transportation of MSW. Vehicles collect garbage and transport to Naregaon landfill site. Overall 10% of the solid waste generated is disposed off. The AMC is under identifying new site for solid waste dumping and is working for new methods to reduce the solid waste generation along with local NGOs. New dumping site is yet to finalize by Aurangabad Municipal Corporation. Still the problem was MSW dumping is not solved. A notice inviting expression of interest dated Feb 05, 2018 is available at AMC website to make available necessary land for segregation of dry and wet waste generated in Aurangabad Municipal Corporation area.

The PM emission load from open burning of MSW is given in **Table 3.8**.

**Table 3.8:** Emission Load from Area Sources – Solid Waste Burning

| Source       | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------------|------------------------|-------------------------|
| Open burning | 0.002                  | 0.0015                  |

### 3.2.1.8 Recommendations

1. Urgent need to identify the landfill site for MSW treatment and processing.
2. Collection and transportation facilities required in evening hours at commercial areas.

### 3.2.2 Other Area Sources

#### 3.2.2.1 Construction

There are total 209 numbers of building construction sites in Aurangabad city. The total construction is spread over a land of 202 acres. Out of 209, 50 projects construction is yet to start (data from RERA website). The year of completion for all construction sites is December 2020.

#### Emission Estimation:

$PM_{10}$  Tons /years = 1.2 x total number of acre – months (AP42, Section 13.2.3.3)

Acre-months: construction area (acres) x months of activity (18 for new and 6 for old/on-going construction)

The PM emission load from construction activity is given in **Table 3.9**.

**Table 3.9: Emission Load from Area Sources – Construction**

| Source       | Type     | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------------|----------|------------------------|-------------------------|
| Construction | Building | 0.072                  | 0.0321                  |
|              | Road     | 0.081                  | 0.052                   |

#### 3.2.2.2 Road dust

Due to poor roads and no wall to wall pavements, dust is seen deposited all over the corner of roads. This leads to resuspension of dust. The roads need urgent repairment with a layer of bitumen.

**Table 3.10: Road Length in the City**

| Road Type                 | Length (Km) |
|---------------------------|-------------|
| Bitumen                   | 560         |
| Concrete Road/Paver block | 213         |
| WBM                       | 562         |
| Un surface Road           | 316         |
| Total                     | 1651        |

**Table 3.11: Vehicle Weight**

| Vehicle     | 2w  | 3w  | 4w   | Bus/Truck |
|-------------|-----|-----|------|-----------|
| Weight (Kg) | 175 | 450 | 1425 | 7500      |

(Source: NEERI Report-Mumbai, 2010)

**Emission Estimates:****Paved Road dust**

Emission factor,  $E_{Pvd} = \{k \times (sL/2)^{0.65} (W/3)^{1.5} - C\} (1-P/4N)$

E = particulate emission factor (having units matching the units of k)

k = particle size multiplier for particle size range and units of interest (k (g/vkt) = PM<sub>2.5</sub> -1.1, PM<sub>10</sub>-4.6)

sL = road surface silt loading (grams per square meter) (g/m<sup>2</sup>) – 0.531(Source: NEERI Report-Mumbai, 2010)

W = average weight (tons) of the vehicles traveling on the road (as per above table)

P=No. of wet days with at least 0.254 mm of precipitation during avg. period (assumed 120 days)

C= Break and tire wear correction (PM<sub>2.5</sub>=0.1005, PM<sub>10</sub>=0.1317)

N = No. of days in averaging period (365 /year, 30/monthly, 91/seasonal);

Emission from Paved Road (g/d)=  $E_{Pvd} \text{ (g/VKT)} \times \text{VKT (km/d)}$

**Emission Estimation for Unpaved Dust**

Emission factor,  $E_{unpvd} = \{([k (s/12)^a (S/30)^d] / (m/0.5)^c - C)\} \times (365-P) / 365$

E = size specific emission factor, (lb/vmt),

s= surface material silt content (%), m= surface material moisture content (%),

S=mean vehicle speed (mph);

k =particle size multiplier (lb/vmt) (PM<sub>2.5</sub>= 0.21, PM<sub>10</sub>=1.386)

P=No. of wet days with at least 0.254 mm of precipitation during avg. period

C= Break and tire wear correction (PM<sub>2.5</sub>=0.00036, PM<sub>10</sub>=0.00047) - lb/VMT

a for PM<sub>2.5</sub>=1, PM<sub>10</sub>=1;

c for PM<sub>2.5</sub>=0.2, PM<sub>10</sub>=0.2;

d for PM<sub>2.5</sub>=0.5, PM<sub>10</sub>=0.5.

Emission from Unpaved Road (g/d)=  $E_{Unpvd} \text{ (g/VKT)} \times \text{VKT (km/d)}$

The emission factors for area sources are given in **Table 3.13**. The PM<sub>10</sub> emission load of different area sources is given in **Table 3.12**.

**Table 3.12: Emission Load from Area Sources – Road Dust**

| Source    | Type    | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|-----------|---------|------------------------|-------------------------|
| Road dust | Paved   | 0.017                  | 0.010                   |
|           | Unpaved | 0.04                   | 0.02                    |

**Table 3.13: Emission factors for PM<sub>10</sub> from area sources**

| Fuel         | EF   | Unit           | Source                        |
|--------------|------|----------------|-------------------------------|
| LPG          | 1.95 | g/lit          | NEERI Report-<br>Mumbai, 2010 |
| Wood         | 15.3 | Kg/mg          |                               |
| Kerosene     | 1.95 | g/kg           |                               |
| Cow dung     | 5.04 | g/kg           |                               |
| Coal         | 20   | Kg/mg          |                               |
| Crop         | 11   | Kg/ton         |                               |
| Diesel       | 0.25 | Kg/KL          |                               |
| Construction | 1.2  | T/Acres-months | AP42, 13.2.3.3                |

### 3.3 Point Source

As per emission inventory, the percent emission contribution to PM<sub>10</sub> is around 32% from industrial sector (coal, pet coke, furnace oil, Bagasse and wood).

**Table 3.14: Industrial Scenario of Aurangabad**

| S. No. | Head                                                                               | Unit      |
|--------|------------------------------------------------------------------------------------|-----------|
| 1      | Registered Industrial Unit                                                         | 9659 nos. |
| 2      | Registered Medium & Large Unit                                                     | 32 nos.   |
| 3      | No. of Industrial areas in Municipal limit (Chikhalthana and Railway Station MIDC) | 02        |
| 4      | No. of Industrial Area                                                             | 04        |
| 5      | Turnover of Small Scale Ind. in Lacs                                               | 148645    |
| 6      | Turnover of Medium & Large Scale Industries in Lacs                                | 22948     |

Source: MSME, 2016-17

Based on the consent data collected from the MPCB website, it is observed that there are total 117 air polluting industries in Aurangabad Industrial Clusters, out of which 24 air polluting industries in Chikhalthana MIDC, 18 in Shendra MIDC, 68 in Waluj MIDC and 7 in other areas. Chikhalthana MIDC area falls in Municipal corporation boundary of Aurangabad city. The emission sources for point sources are given in **Table 3.15**. Fuel based contribution is given in **Table 3.16**. There are no brick kilns and stone crusher inside the municipal corporation boundary limits.

**Emission Estimates:**

Emission = Fuel consumption x EF

**Table 3.15: Emission factors (EF) used for Point Source Emission Load Estimation**

| Fuel used             | EF                                | Unit         | Source                                                                          |
|-----------------------|-----------------------------------|--------------|---------------------------------------------------------------------------------|
| Coal                  | PM – 5A                           | kg /Mg       | AP-42 (Table 1.1-3-4), A-ash content                                            |
| Wood                  | PM – 17.3                         | Kg/Mg        | AP42 (Sec. 1.9, Pp. 1.10.4, Table 1.9.1)                                        |
| Furnace Oil           | TSP – {9.19(S)<br>+ 3.22} * 0.120 | kg /Mg       | EPA-42: Table 1.3 – 1 And Table 1.3 – 3; S – Sulphur<br>Content In Fuel         |
| DG                    | PM10-<br>1.33*10 <sup>-3</sup>    | kg/Kw-<br>Hr | AP-42 (Table 3.3-1) EF For Uncontrolled Gasoline &<br>Diesel Industrial Engines |
| HSD                   | TSP – 0.24                        | kg/KL        | NEERI Report-Delhi, 2010                                                        |
| LDO                   | TSP -0.24                         | kg/KL        | NEERI Report-Mumbai, 2010                                                       |
| Bagasse               | TSP -7.8                          | kg/ton       | EPA-AP42: Table 1.8-1, Uncontrolled Emission Factors                            |
| Biomass<br>Briquettes | PM10 – 11                         | kg/ton       | NEERI Report-Mumbai, 2010                                                       |
| LPG                   | PM10 – 2.1                        | Kg/MT        | NEERI Report-Mumbai, 2010                                                       |
| Pet coke              | PM10 – 0.04                       | Kg/Mg        |                                                                                 |

**Table 3.16: Point Source Emission Inventory**

| Emission Sources<br>types | PM10<br>(TPD) | PM 2.5<br>(TPD) |
|---------------------------|---------------|-----------------|
| Briquettes                | 0.25          | 0.10            |
| Furnace Oil               | 0.15          | 0.06            |
| Coal                      | 0.02          | 0.0015          |
| Diesel                    | 0.09          | 0.06            |
| HSD                       | 0.002         | 0.00            |
| LDO                       | 0.004         | 0.002           |
| LPG                       | --            | 0.001           |
| Wood                      | 0.18          | 0.12            |
| Bagasse                   | 0.00          | 0.00            |
| Propane Gas               | 0.017         | 0.011           |
| Pet coke                  | 0.018         | 0.010           |

An additional MIDC is sanctioned near Aurangabad named as five star Shendra-Bidkin MIDC. This MIDC is available for large scale industrial setup.

### 3.3.1 Recommendations

- Change in coal quality with less ash content will reduce the PM emission to a larger extent.
- It is further to note that information on small scale and medium scale industries is fully not available and accounting for those industries contribution is difficult.

**Some of the technologies developed by NEERI to curb air pollution load from area sources can be implemented phase wise. (Annexure I to III)**

### 3.4 Line Source

There are about 1183919 Lakhs registered vehicles in Aurangabad District. The distribution of vehicles based on RTO data is given in **Table 3.17**. The distribution of different vehicles is given in **Table 3.18**. Currently the city buses operated by AMC are running on diesel. At present 15 buses are available for fleet and more are yet to arrive. The city has more number of autorickshaws for local transportation. Apart from the city bus services ST bus service facilities is provided by the MSRTC Aurangabad depot.

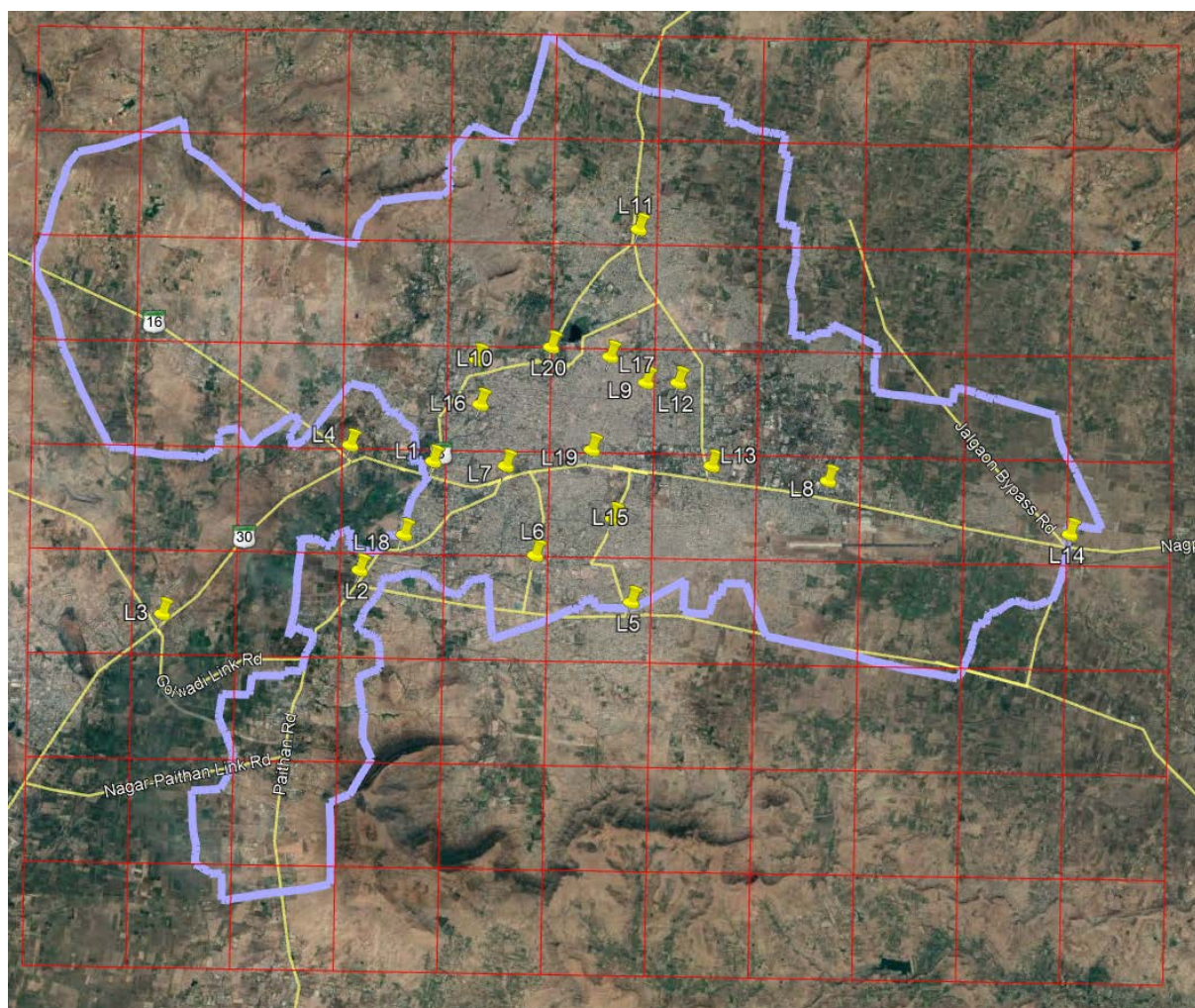
**Table 3.17: Number of Vehicles in the District**

| S. No.       | Type of vehicles                        | No of Vehicles |
|--------------|-----------------------------------------|----------------|
| 1            | 2W                                      | 932739         |
| 2            | Cars                                    | 63826          |
| 3            | Jeeps                                   | 29322          |
| 4            | Station Wagons                          | 452            |
| 5            | Auto Rickshaws                          | 27806          |
| 6            | Stage Carriages                         | 5959           |
| 7            | Contract Carriages/Mini-bus/ School van | 1544           |
| 8            | School Buses                            | 1114           |
| 9            | Pvt. Service Vehicles                   | 1997           |
| 10           | Ambulance                               | 504            |
| 11           | Trucks & Lorries                        | 14806          |
| 12           | Tankers                                 | 4727           |
| 13           | Delivery Van (4W)                       | 26403          |
| 14           | Delivery Van (3W)                       | 30393          |
| 15           | Tractors                                | 24852          |
| 16           | Trailers                                | 14901          |
| 17           | Others                                  | 492            |
| <b>Total</b> |                                         | <b>1183919</b> |



**Table 3.18: Vehicle Count in Aurangabad city**

| Vehicle Type | No. of Vehicles |
|--------------|-----------------|
| 2W           | 332180          |
| 3W           | 104047          |
| Car          | 104122          |
| 4W           | 36195           |
| Total        | 576544          |



**Fig. 3.4: Location of points for traffic counts**

#### **Emission Estimates:**

For emission calculations, the % of petrol and diesel vehicles is assumed as below:

| % of vehicles | Petrol | Diesel |
|---------------|--------|--------|
| Cars          | 55%    | 45%    |
| 3W            | 73%    | 27%    |

Source: Press Information Bureau, Min. of Petroleum and Natural gases, Govt. of India, (2014)



2W and 3W BS-III vehicles are assumed to be 80%, and BS-IV vehicles are 20% as it was introduced in mid-2017. Cars are assumed to be of 80% for BS-IV and 20% for BS-III norms.

Estimation of vehicle kilometres (km) travelled by each type of vehicle

$$VKT = RL * N$$

Where, VKTI = Vehicle km travelled by vehicle type, RL = Road length, N = Number of vehicles travelling for vehicle type per day

The road network data is given in **Fig. 3.6a**. Road length in each grid is computed using GIS software.

$$PM = \sum VKT \times EF \times N$$

Where, PM= Particulate matter load from vehicle type in tonnes/year, N = Number of activity days in a year (200 days), EF = Emission factor for a vehicle type

The emission factors are given for each vehicle type in **Table 3.19**. The vehicle contribution to total PM load is given in **Table 3.20** and % contribution to PM<sub>10</sub> by different types of vehicles is given in **Fig. 3.6b**.

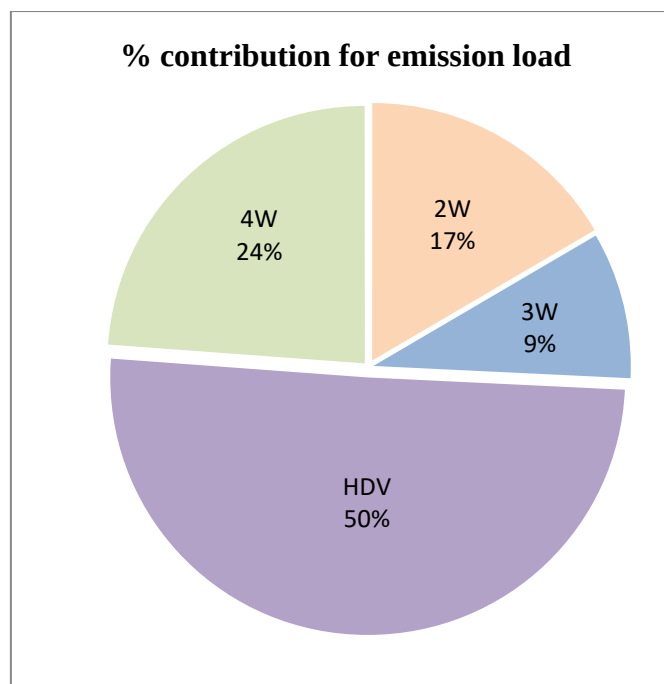
**Table 3.19: Emission Factors Automotive Research Association of India (ARAI), 2007**

| Vehicles         | Petrol Vehicles |       |        | Diesel Vehicles |       |        |
|------------------|-----------------|-------|--------|-----------------|-------|--------|
|                  | BS-III          | BS-IV | BS-VI  | BS-III          | BS-IV | BS-VI  |
| EF (g/km)        |                 |       |        |                 |       |        |
| 2W               | 0.035           | 0.02  | 0.0010 | 0               | 0     | 0      |
| 3W               | 0.05            | 0.03  | 0.0250 | 0.05            | 0.035 | 0.0250 |
| 4W               | 0.050           | 0.035 | 0.0045 | 0.05            | 0.008 | 0.0045 |
| Trucks/Trailors  | 0               | 0     | 0      | 0.42            | 0.071 | 0.0045 |
| Mini Buses/Buses | 0               | 0     | 0      | 0.3             | 0.051 | 0.0045 |

Source: Air Quality –Indian Clean Air Programme (ICAP), Automotive Research Association of India (ARAI), 2007

**Table 3.20: Contribution of line sources to PM10 emission load**

| Vehicles     | PM <sub>10</sub> (TPD) | PM <sub>2.5</sub> (TPD) |
|--------------|------------------------|-------------------------|
| 2W           | 0.205                  | 0.087                   |
| 3W           | 0.137                  | 0.025                   |
| 4W           | 0.252                  | 0.168                   |
| HDV          | 0.533                  | 0.356                   |
| <b>Total</b> | <b>1.127</b>           | <b>0.636</b>            |



**Fig. 3.5: Percent emission load contribution from line source**

### 3.5 Gridded Emission Inventory

The gridded emission load grid wise is given in **Table 3.21** below.

**Table 3.21: Grid wise (2km x 2km) PM<sub>10</sub> Emission Load (TPD)**

| <b>Grid Name</b> | <b>PM 10 (TPD)</b> | <b>Grid Name</b> | <b>PM 10 (TPD)</b> |
|------------------|--------------------|------------------|--------------------|
| A6               | 0.00039            | G2               | 0.00021            |
| A7               | 0.05858            | G3               | 0.00027            |
| B1               | 0.0002             | G4               | 0.00033            |
| B5               | 0.09873            | G5               | 0.22935            |
| B6               | 0.09293            | G6               | 0.06411            |
| C1               | 0.05709            | G7               | 0.00023            |
| C3               | 0.0001             | H1               | 0.00021            |
| C4               | 0.00002            | H2               | 0.00027            |
| C5               | 0.00016            | H3               | 0.00027            |
| C6               | 0.01987            | H4               | 0.01702            |
| C7               | 0.25562            | H5               | 0.03847            |
| C8               | 0.00032            | H6               | 0.0456             |
| C9               | 0.00002            | H7               | 0.00027            |
| D2               | 0.00021            | I1               | 0.00033            |
| D3               | 0.00021            | I2               | 0.00735            |
| D4               | 0.00027            | I3               | 0.00125            |
| D6               | 0.00678            | I4               | 0.00075            |
| D7               | 0.00442            | I5               | 0.00113            |
| E2               | 0.00021            | I6               | 0.00249            |
| E3               | 0.00023            | I7               | 0.00027            |
| E4               | 0.00022            | J1               | 0.00021            |
| E6               | 0.08459            | J2               | 0.00033            |
| E7               | 0.00409            | J3               | 0.00098            |
| E8               | 0.0001             | J4               | 0.00541            |
| F3               | 0.00033            | J5               | 0.00715            |
| F4               | 0.00046            | J6               | 0.00046            |
| F5               | 0.00005            | K3               | 0.0005             |
| F6               | 0.00047            | K4               | 0.00692            |
| F7               | 0.0016             | K5               | 0.00586            |
| F8               | 0.00027            | K6               | 0.00046            |

**Some of the technologies developed by NEERI to curb air pollution load from line sources can be implemented phase wise. (Annexure IV and V)**

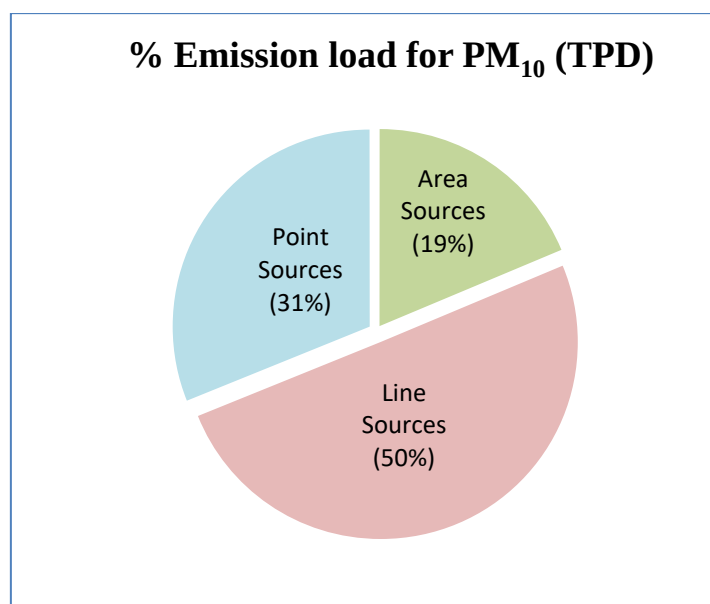
### 3.6 Overall PM<sub>10</sub> Contribution by Various Sources

**Table 3.13** shows the PM<sub>10</sub> emission load contribution by various sources. It can be observed that vehicular source is the most predominant source for higher emission load followed by industrial sources. Out of overall vehicular sources, 50% emission load is due to heavy duty vehicles.

**Table 3.22: Emission Load Contribution by all Sources**

| Source        | PM <sub>10</sub> load (TPD) | PM <sub>2.5</sub> load (TPD) |
|---------------|-----------------------------|------------------------------|
| Area Sources  | 0.45                        | 0.20                         |
| Line Sources  | 1.21                        | 0.75                         |
| Point Sources | 0.75                        | 0.40                         |

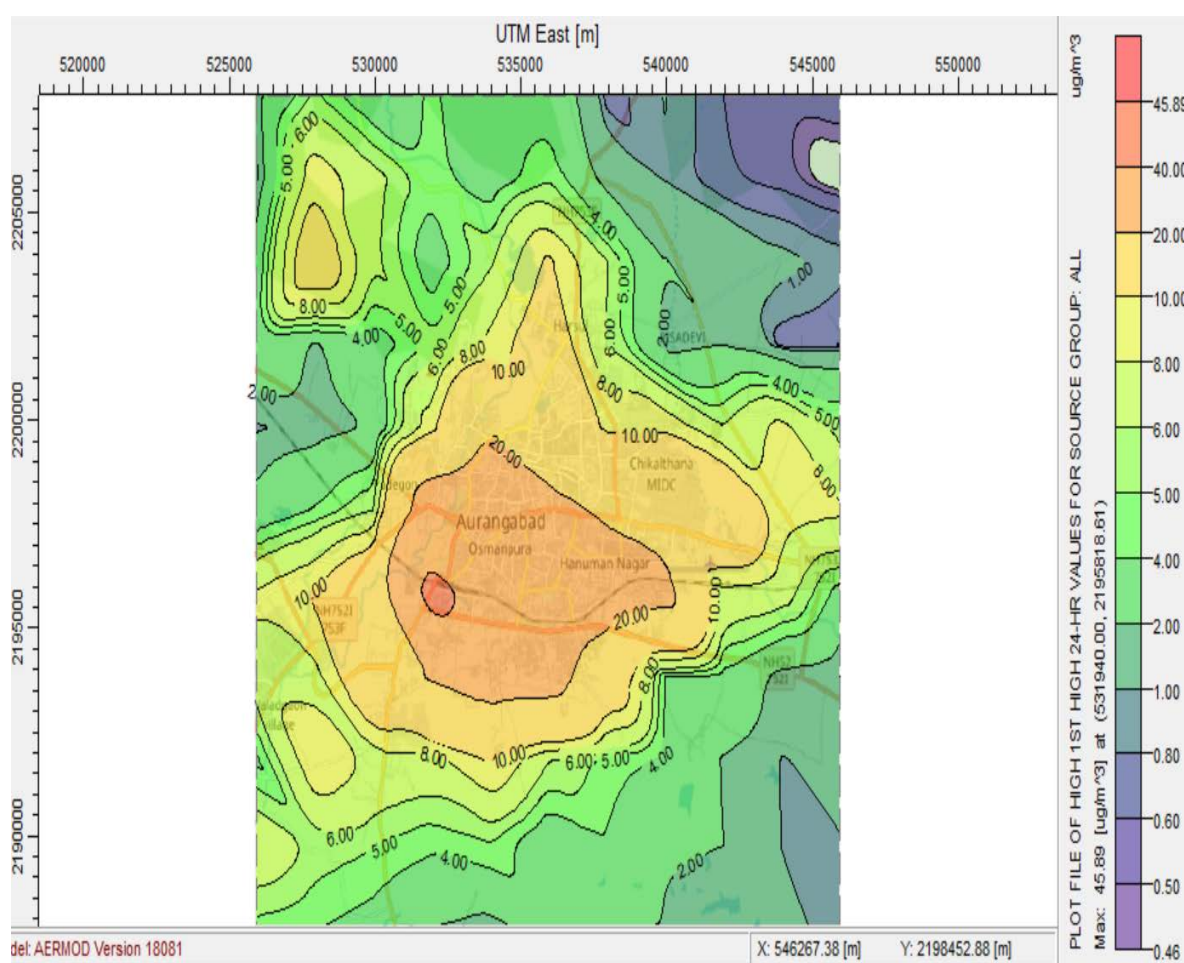
\* Industries located outside Aurangabad City are excluded



**Fig. 3.6: Percent Emission load contribution from all sources**

## 4.1 Dispersion Modeling

Based on the grid-wise emission inventory, dispersion modeling exercise was carried out for Aurangabad city through AERMOD software. The results are given in **Fig. 4.1**. The maximum GLC is observed at to be  $45 \mu\text{g}/\text{m}^3$  near the main traffic junction (Baba petrol pump Chowk). This may be due to passing of heavy traffic load from the square.



**Fig. 4.1: GLC for Aurangabad city**

### 5.1 Action Plan for Control of Air Pollution

The action plan based on the emission load and its reduction is presented in **Table 5.1**.

**Table 5.1: Action Plan for Control of Air Pollution**

| Sources             | Short Term-<br>2019        | Long Term-<br>2022         | Action Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|----------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Line Sources</b> |                            |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Vehicles            | 10% reduction in emissions | 30% reduction in emissions | <ul style="list-style-type: none"><li>• Launch extensive drives against polluting vehicles for ensuring strict compliance.</li><li>• Increase in public transportation (No public transport buses yet in Aurangabad city. If Biodiesel used as a fuel, reduction will be more).</li><li>• Prevent parking of Vehicles at non-designated areas.</li><li>• Widening of roads and wall to wall pavement.</li><li>• Steps for Promoting Battery operated vehicles.</li><li>• Synchronize Traffic movements/Introduce Intelligent Traffic systems for Lane Driving .</li><li>• Provide good public transport system.</li><li>• Electric / Hybrid Vehicles.</li><li>• OE-CNG for new public transport buses.</li><li>• Bio-diesel (B5/B10: 5 – 10% blended).</li><li>• Restrict commercial vehicles entering city by having ring roads.</li></ul> |

The above mitigation measures reduce the line source emissions by 10% in short term and 30% in long term.

#### Point Sources

| Industry | To get the 10% reduction in emissions till 2019 | To get the 30% reduction in emissions till 2022 | <ul style="list-style-type: none"> <li>• Action against industries doing high air pollution.</li> <li>• Alternate fuel (replacement of wood to Biomass briquettes, Indian coal to Indonesia or SA coal, ash content of briquettes after burning – 0.22%, One cubic meter (or approximately one ton) of briquettes produces as much heat as five cubic meters of air-dried and split firewood while burning, Briquettes produce 10 times less carbon dioxide than natural gas and 50 less carbon dioxide than coal).</li> <li>• Installation of CAAQMS. Installation/ up gradation of air pollution control systems.</li> <li>• Regular audit of stack emissions for QA/QC.</li> <li>• Use of alternate fuel instead of pet coke at tyre manufacturing units</li> </ul> |
|----------|-------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|-------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The above mitigation measures reduce the point source emissions by 10% in short term and 30% in long term

#### Area Sources

| Fuel burnt Res and commercial Cooking | 10% reduction in emissions | 50% reduction in emissions |                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------|----------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Domestic combustion                   |                            |                            | <ul style="list-style-type: none"> <li>• Household wood and cow-dung burning is to be reduced. Increase in LPG usage through Ujjawala Yojana scheme.</li> <li>• Alternate fuel options e.g. solar needs to be assessed and exercised.</li> <li>• Crop residue burning needs to be completely banned.</li> </ul> |



|                                  |                            |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------|----------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hotels, dhabas and open eat-outs |                            |                            | <ul style="list-style-type: none"> <li>• Use of LPG in hotels and eateries.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                |
| Bakery                           |                            |                            | <ul style="list-style-type: none"> <li>• In bakeries, electric ovens and LPG must be used.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                 |
| Crematoria                       |                            |                            | <ul style="list-style-type: none"> <li>• If wood replaced by electricity burners in Crematoria there will be less emissions of particulate matter.</li> <li>• Control equipments must be installed for air pollution control.</li> <li>• 50% Wood in each crematorium if replaced by biomass briquettes. This type of fuel used in crematoria gives 36% less emissions for PM<sub>2.5</sub> and 86% less SO<sub>2</sub> generation.</li> </ul>                                        |
| Solid waste/open burning         | 10% reduction in emissions | 50% reduction in emissions | <ul style="list-style-type: none"> <li>• On an urgent basis Aurangabad needs MSW dumping and treatment yard.</li> <li>• Penalty against people burning the MSW.</li> <li>• Policies against burning of MSW.</li> <li>• Implementation and penalty for societies not segregating waste which are generating MSW of 100 Kgs and more.</li> <li>• Awareness among people for segregating waste at source.</li> <li>• Bio-methanization and biogas plant need to be installed.</li> </ul> |

|                                                                                                                                                                             |                            |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Road dust and C&D                                                                                                                                                           | 20% reduction in emissions | 40% reduction in emissions | <ul style="list-style-type: none"> <li>• New bypass for the city</li> <li>• Hand Sweeping / Mechanical sweepers</li> <li>• Cement Concrete roads</li> <li>• Wall to wall road pavement</li> <li>• No entry to heavy vehicles during day time.</li> <li>• Regular water spraying and maintenance of Bus depots, increase in green cover at the periphery of bus depot</li> <li>• Major traffic intersections to have water fountains</li> <li>• Enforcement of construction &amp; demolition rules, implementation of measures for control of emissions during activity.</li> <li>• Control measures for fugitive emissions from material handling, conveying and screening operations through water sprinkling, curtains, barriers and suppression units.</li> <li>• Ensure carriage of construction material in closed/covered Vessels.</li> </ul> |
| <b>Assumptions or required actions to reduce the emissions:</b> The above action plan shall reduce the PM <sub>10</sub> emissions from construction activity and road dust. |                            |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## **5.2 Monitoring Mechanism for Implementation**

The aforesaid action plan shall be implemented by Maharashtra State Pollution Control Board with co-ordination of Department of Environment and Forest, Govt. of Maharashtra, Urban Development and Housing Department, Govt. of Maharashtra, Transport Department, Aurangabad Municipal Corporation, Traffic police and District administration. Maharashtra State Pollution Control Board shall regularly review the implementation of aforesaid action plan.

## **5.3 Implementation Status**

The Chief Secretary, Govt. of Maharashtra to convene the meetings with different concerned departments and direct for compliance of directions for implementation of air quality of Aurangabad. The Principal Secretary, Environment and Forest, Govt. of Maharashtra to also convene the meeting for follow up of the aforesaid directions. The Hon'ble Deputy Chief Minister to also review the issues subsequently for improvement of ambient air quality of Aurangabad.

## References

1. Air Quality –Indian Clean Air Programme (ICAP) (2007). Automotive Research Association of India (ARAI) Available via <http://cpcb.nic.in/>.
2. Brief Industrial Profile of Aurangabad District (2016-17). MSME Development Institute, Govt. of India, Ministry of MSME.
3. Census of India (2011). Available via [censusindia.gov.in/2011-common/census\\_2011.html](http://censusindia.gov.in/2011-common/census_2011.html).
4. CPCB Six City Study Report (2010). Air Quality Assessment, Emission Inventory and Source Apportionment Studies, Central Pollution Control Board, New Delhi.
5. Environment Status Report (2016-17). Prepared by Core Project Engineers and Consultant Pvt. Ltd. for Aurangabad Municipal Corporation.
6. Ma et al., Aerosol and Air Quality Research, 17: 636–643, 2017
7. NEERI Report-Delhi (2010). Air Quality Assessment, Emission Inventory and Source Apportionment Studies-Delhi, National Environmental Engineering Research Institute.
8. NEERI Report-Mumbai (2010). Air Quality Assessment, Emission Inventory and Source Apportionment Studies-Mumbai, National Environmental Engineering Research Institute.
9. Nowak et al. (2014). Trees and Forests Effect on Air Quality and Human Health in the United States. Environmental Pollution 193. 119-129.
10. Primary Census Abstract (2011). For Aurangabad District, Maharashtra State.

*Draft Interim Submission*

**Annexure – I**

**Design of a Clean Tandoor  
Community Kitchen System (CTCKS)**

---

## **Design of a Clean Tandoor Community Kitchen System (CTCKS)**

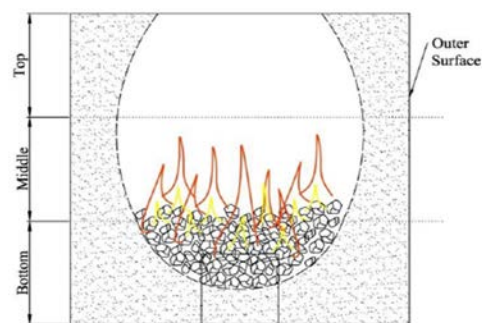
The objective of the experiment is to design a clean tandoor community kitchen system to reduce air pollution. There are no standards or guidelines to evaluate the performance of the tandoors w.r.t. its thermal efficiency, emissions and safety. While such standards are developed for the cook stoves however, tandoors are not considered probably due to their limited use. Also there is no BIS/ISI product Quality Mark for Tandoor in India to ensure quality of the tandoor even w.r.t. to material of construction. In most of the cases, it was found that there was no control devices installed at any tandoor facilities surveyed.

Air quality policies have so far focused on formulating and implementing abatement strategies for ambient (outdoor) air pollution, while indoor air quality sources (or human exposure) have not been adequately taken into account. To date, it is not clear whether measures implemented on outdoor air pollution will prove effective (and sufficient), once the total picture, that is the relative contribution of indoor and outdoor sources to total human exposure, is clear. Indeed, compliance with existing National Ambient Air Quality Standards (NAAQS), intended to protect public health, depends exclusively on outdoor measurements of pollutants. However, such measurements are subject to biases because most people spend much of their time indoors in different microenvironment than outdoor, and air pollutant concentrations are often much higher in these micro-environment than ambient with higher exposure conditions too, e.g. during cooking, etc. Therefore, estimates of human exposure to inhaled air pollutants are necessary for a realistic appraisal of the health risks these pollutants pose and for the design and implementation of strategies to control and limit those risks.

Based on the Material of Construction (MoC) the tandoor can be classified as Stainless Steel (SS), Sheet (Aluminium/Mild Steel) and Iron/Steel Drum (made from cutting the liquid fuel/oil drums etc.). The cost of the tandoor varies based on the MoC i.e. SS (Round/Square) Tandoor would cost between Rs. 16,000 – 22,000 or even higher, whereas the Sheet (Aluminium/Mild Steel) based are priced at Rs. 8,000 – 12,000 and Drum Based at Rs. 3,000 – 5,000. As per secondary data and surveyed tandoors it was found to be natural draft. The insulation material used at tandoor covers use of clay, glass-wool, ceramic, vermiculite, fire brick, mud etc. in order to retain heat for longer duration. It was observed that the cooking area is mostly outdoor (>92%). The tandoor was used “outdoor” primarily means that the tandoor oven for cooking purpose is placed beside but outside the compound walls of the restaurant premises under a shaded, however this is just adjacent to the seating area for customers and therefore emissions from tandoor can easily disperse inside the eating/seating area, unless a proper ventilation is provided. No control device to reduce the emission or ventilation to reduce the exposure

was present in over 90% of the surveyed restaurants thus showing least concerns on emission exposure. It was also observed that, the quantity of fuel used varies from 5kg to 40kg per day. Cost of the fuel lies in the range of Rs.20-40 per kg of coal (>70%). Over 41% of the tandoors were ignited in the morning for full day operation. About 0.11 to 0.35 kg of ash is generated by burning per kg of charcoal/coal for over 71% of the restaurants. The ash and un-burnt fuel was disposed in dustbin using polythene bags.

The thermal profile across the tandoor over was also recorded using Amprobe IR-750 Temperature Gun (n=139) to understand the temperature requirements of the tandoor surveyed, for effective cooking. The tandoor oven can be divided into 3 major sections: Top, Middle and Bottom as depicted below. The combustion of coal/charcoal takes places in the bottom section. The middle section transfers the heat to the top section where the food is cooked. The median temperatures at the top, middle and bottom sections were observed as 184°C, 383°C and 580°C respectively, where the median outer body temperature of the tandoor was 56°C owing the insulation layer between the tandoor oven and the outer body of the tandoor.



Classification of Temperature Zones in Tandoor Bhatti

A cleaner, efficient tandoor is proposed based on Pellet based fuel with forced Draft arrangement with an aim to design a clean combustion device in order to reduce the emissions, keeping in mind that functionality and feel of the tandoor doesn't change significantly in order to bypass any hurdle in the adoption of the proposed design. A tandoor system can be primary divided into two parts: firstly, combustion chamber section and oven section. Considering the combustion chamber section in the existing designs in it was observed that most of the tandoors were natural draft with insufficient air to fuel ratio. Therefore, in order to supply sufficient oxygen, a forced Draft fan is considered to increase the air to fuel ratio in order to improve the fuel combustion. Also the quality of coal used in tandoor is a major concern which is also responsible for higher emissions, keeping this in mind, low cost biomass pellets is suggested as an alternate fuel for heating the tandoor oven to reach the desired temperature. The advantage with using a pellet based forced draft combustion tandoor will be reduced emissions with increased thermal efficiency, which can be supported by retrofitting the commercial size forced draft improved Cookstove readily available in market and are tested by BIS 2013 to meet the efficiency and emission standards.



However, since these cookstove are designed for semi-commercial and community cooking, some modifications will be required, which can be done by the respective developer/manufacturer. These stoves are listed in **Annexure** and can be readily retrofitted to a tandoor oven to improve the combustion process. The design of the tandoor oven is kept similar to the available designs of tandoor, so that it doesn't affect the functionality issues or create any adoption hurdle. The selection of material of construction of tandoor should consider the following: clay for oven with high heat capacity material to retain heat for longer duration and body parts material for its long life and selection of low cost and effective insulation for tandoor oven.

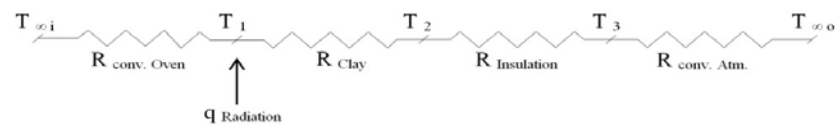
Figure 1 to 4 below shows the concept design of the tandoor drawn not to scale as the size of the tandoor may vary based on required power output. The proposed tandoor system also incorporates a continuous pellet/fuel fed mechanisms so as to enable the uninterrupted and automatic supply of fuel to the combustion chamber for continued functioning of tandoor system. The proposed design of the tandoor can be fitted with chimney (natural or induced forced draft). However, the design of chimney will depend on the available space and vary from restaurant to restaurant. The design of chimney is not dealt in this study but it is recommended to use and install commercial available chimneys along with the proposed tandoor in order to reduce the human exposure. Although this would significantly reduce the pollutant exposure, however would anyway contribute to ambient air.

Advantages of pellet based tandoor also leads to reduced ash generation. Pellets based tandoor will also generate market for pellet industry and enable the use of agro-waste residues for development of an alternative fuel, promote employment generation in rural areas and would partly contribute to emission control and avoid disasters like smoke haze from stubble burning.

### **Design Methodology**

The community tandoor involves different modes of heat transfer phenomena occurring simultaneously inside a tandoor, which can be described under three primary categories: Conduction, Convection and Radiation. The process of heat transfer involves heat transfer from the burning of fuel, convection within the hot gases, heating of the tandoor clay by convection and radiation; conjugate heat transfer between the heated gases inside the tandoor chamber and the tandoor clay; conduction of heat across the tandoor surface (clay and insulation); convection between the outer tandoor surface and the surrounding atmosphere. The process of heat transfer is dominated by radiation as compared to other modes of heat transfer. In a tandoor, three modes of heat transfer i.e. Conduction, Convection & Radiation are accounted together for minimizing the heat transfer through the walls and heat balance

Eq. (1) and Eq. (2).can be given as:

$$\dot{Q}_{cond.} + \dot{Q}_{conv.} + \dot{Q}_{rad.} = \dot{Q}_{total} \quad (1)$$


$$\frac{T_{\infty i} - T_1}{R_{conv \cdot oven}} + q_{rad} + \frac{T_2 - T_1}{R_{clay}} + \frac{T_3 - T_2}{R_{insulation}} + \frac{T_{\infty o} - T_3}{R_{conv \cdot Atm}} = \dot{Q}_{total} \quad (2)$$

The conjugate heat transfer between the hot gases (fluid) and the tandoor clay (solid) can be given by Eq. (3) and Eq. (4):

$$T_{w,s} = T_{w,f} \quad (3)$$

$$k_s \left( \frac{\partial T}{\partial n} \right)_{w,s} = k_f \left( \frac{\partial T}{\partial n} \right)_{w,f} \quad (4)$$

The heat transfer coefficient can be calculated using the existing relation in Eq. (5):

$$h = \frac{Nu_L * k}{L} \quad (5)$$

In order to minimize the heat losses and to prevent the heat transfer from the oven to the atmosphere, effective heat insulation material is needed in between the oven and the outer tandoor casing. Critical thickness of Insulation is determined, where thickness of insulation corresponding to the critical radius of insulation is calculated to decrease the heat transfer. If insulation thickness is beyond its critical radius, heat transfer rate increases. This radius at critical heat loss is given as Eq. (6).

In order to minimize the heat losses and to prevent the heat transfer from the oven to the atmosphere, effective heat insulation material is needed in between the oven and the outer tandoor casing. Critical thickness of Insulation is determined, where thickness of insulation corresponding to the critical radius of insulation is calculated to decrease the heat transfer. If insulation thickness is beyond its critical radius, heat transfer rate increases. This radius at critical heat loss is given as Eq. (6):

$$r_{cr} = \frac{k}{h} \quad (6)$$

### Design of Forced Draft Stove

The following relations were used to design the pellet based forced draft cookstove.

**Power Output:** Power output rating is determined by the formula in Eq. (7):

$$P_o = F \times H_{\text{fuel}} \times \eta / 360000 \text{ kW} \quad (7)$$

Energy input: The amount of energy supplied by the fuel fed into the stove can be computed using the formula in Eq. (8):

$$FCR = \frac{Q_n}{CV \times \eta} \quad (8)$$

Combustion chamber diameter: The diameter of the combustion chamber is calculated by using the following formula in Eq. (9):

$$D = \sqrt{\frac{1.27 \times FCR}{SGR}} \quad (9)$$

Height of the combustion chamber: The height of the chamber is calculated by using the following formula in Eq. (10):

$$H_b = \frac{SGR \times T}{\rho} \quad (10)$$

Amount of Primary Air needed for gasification ( $P_a$ ): According to Mukunda et al. (2010) primary air, which is mainly responsible for gasification is usually 1.5 times FCR as depicted in Eq. (11):

$$P_a = 1.5 \times FCR \quad (11)$$

Area for Primary Air Requirement ( $A_p$ ): The total primary area required for forced air flow is divided into two parts for design suitability. A primary window is provided at bottom to feed wood logs and other lower bulk density materials. Holes are provided at the top section of the combustion chamber for gasification of fuel. Therefore 13 holes were drilled throughout the circumference of the stove (Eq. (12)):

$$A_p = \frac{P_a}{\rho_{\text{air}} \times v} \quad (12)$$

According to Mukunda et al. (2010) secondary air, which is mainly responsible for combustion is usually 4.5 times FCR as given in Eq. (13):. Velocity was assumed as 1 ms<sup>-1</sup> for penetration of air into the reactor (Witt, 2005).

$$S_a = 4.5 \times FCR \quad (13)$$

### Tandoor Design Details

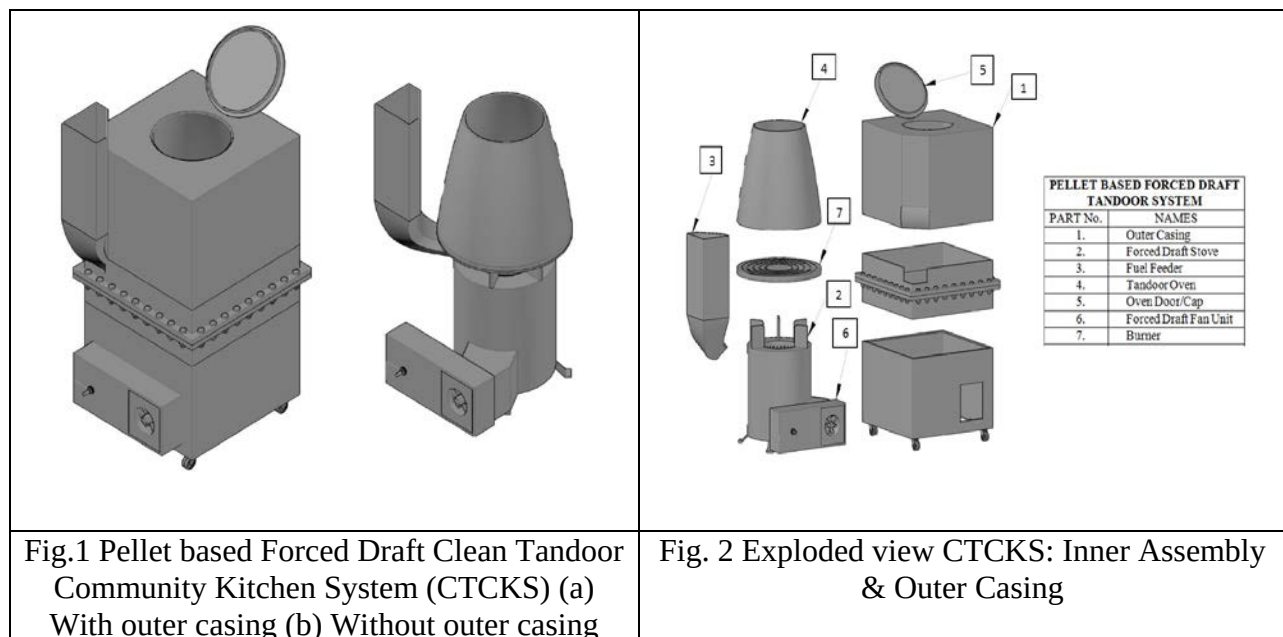
The material of construction for proposed tandoor may vary across different manufactures but it is recommended to use mild steel, stainless steel and Iron based alloys for all primary purposes of constructions. The use of these materials for tandoor fabrication will enable the tandoor to be economically viable and it is within the budget of potential users. The design has been optimized

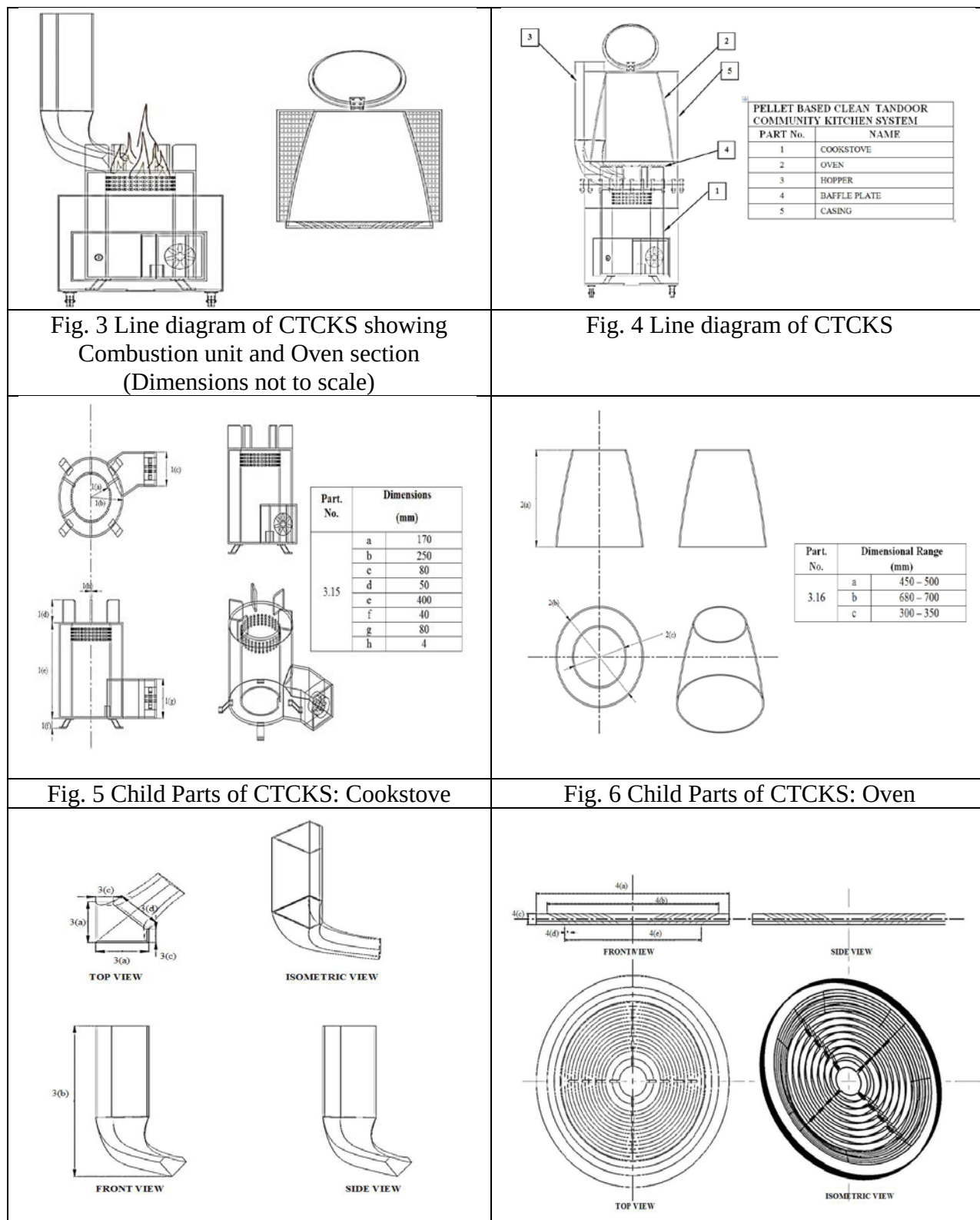
keeping the user requirements in mind. As such, no further training or skilled trainer is required for use of proposed product design. The material details for different child parts of pellet based tandoor are tabulated in Table below. The conceptual designs of Clean Tandoor Community Kitchen System (CTCKS) are depicted in Figures 1-4 (Not drawn to scale). Based on design value, from expression for diameter, height, combustion chamber and air requirement, design specifications of improved pellet stove is tabulated in Figure. The detailed design of the different child parts along with their dimensional details required to fabricate the CTCKS is delineated below.

#### Illustrative materials for different parts of CTCKS

| Part Name    | Material                        | Thickness               |
|--------------|---------------------------------|-------------------------|
| COOKSTOVE    | Stainless Steel                 | Min. 1 mm               |
|              | Mild Steel                      | Min. 1.6 mm             |
|              | Cast iron                       | Min. 6 mm               |
| OVEN         | Mud Clay                        | As per existing tandoor |
| HOPPER       | Sheet Metal                     | Min. 1.6 mm sheet       |
|              | Aluminum Alloy                  | Min. 1 mm sheet         |
| BAFFLE PLATE | Stainless Steel                 | Min. 1 mm               |
|              | Mild Steel                      | Min. 1.6 mm             |
|              | Cast iron                       | Min. 6 mm               |
| CASING       | Sheet Metal (Aluminum) (1.5 mm) | Min. 1.5 mm sheet       |
|              | Stainless Steel (1.6mm)         | Min. 1.6 mm sheet       |
| INSULATION   | Sand                            | Min. 50 mm              |
|              | Ceramic wool                    | Min. 16 mm              |
|              | Liquid Foam                     | Min. 10 mm              |

NOTE: Dimensional tolerances shall be  $\pm 3$  percent. Various components of the tandoor shall be manufactured as per standard engineering practices. The construction of the tandoor shall be sturdy as per the given design details, so that while in actual use on level floor they should not get shaky or fall with little impacts





| Part. No.                           | Dimensional Range (mm) |           | Part. No.                                 | Dimensional Range (mm) |           |
|-------------------------------------|------------------------|-----------|-------------------------------------------|------------------------|-----------|
| 3.17                                | a                      | 160 – 180 | 3.18                                      | a                      | 680 – 700 |
|                                     | b                      | 600 – 700 |                                           | b                      | 580 – 600 |
|                                     | c                      | 80 – 100  |                                           | c                      | 35 – 40   |
|                                     | d                      | 170 – 200 |                                           | d                      | 20 – 30   |
|                                     |                        |           |                                           | e                      | 540 – 560 |
| Fig. 7 Child Parts of CTCKS: Hopper |                        |           | Fig. 8 Child Parts of CTCKS: Baffle Plate |                        |           |

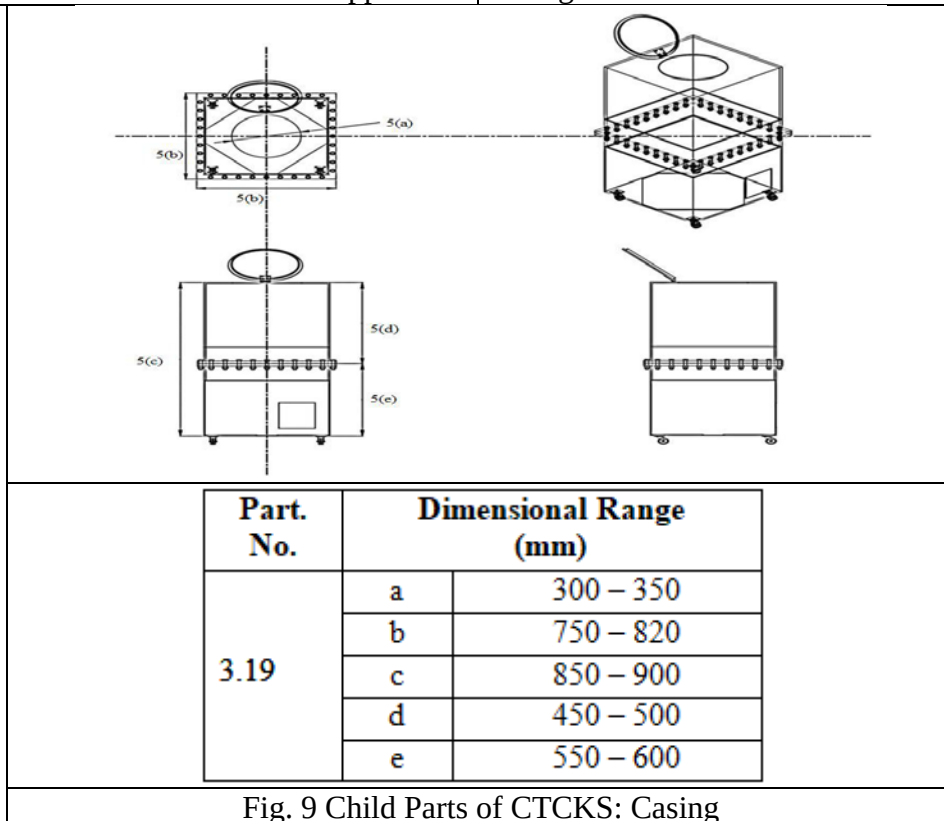


Fig. 9 Child Parts of CTCKS: Casing

In order to assemble the child parts of Clean Tandoor Community Kitchen System as per there construction, the following sequence shall be followed:

The forced draft cookstove (Fig. 5) shall be mounted by a baffle plate (Fig. 8), which will act as guided vanes to divert the flames of the stove (generated from the burning of pellets) to heat the inner wall of the tandoor called as oven (Fig. 6). A hopper (Fig. 7) can be attached in the space between the baffle plate (Fig. 8) and forced draft cookstove (Fig.4) in order to maintain continuous fuel feeding to the combustion chamber for its continued operation. This assembled unit thus formed is depicted in Fig. 4. The assembled unit will be inscribed in an outer casing (Fig. 9). The insulation material is provided between the tandoor oven (Fig. 6) and outer casing (Fig. 9) in order to prevent the heat losses from the tandoor oven (Fig. 3.16). An oven door/cap (Fig. 9) is provided to cover the tandoor oven (Fig. 3.16) when the tandoor system is not in use. This will prevent heat/energy losses and will save fuel, as already practiced in conventional tandoors.

Although it appears that the contribution of tandoors to ambient air quality is not very significant, however considering the exposure risks as well as number of unregistered restaurants, it will be worth introducing an improved tandoor for such application. It is therefore expected that the improved design of Clean Tandoor Community Kitchen System will bring air quality improvement as well as health benefits in the entire region, if implemented in large scale. Following actions are recommended for implementation in hotel/restaurant enterprises:

- All the restaurants/hotel enterprises of sitting capacity more than 10 should not use coal/charcoal and shift to pellets as a primary fuel to fire the tandoors. The use of pellets in tandoors will reduced the air emissions significantly while also reducing the fly ash generation.
- The tandoor manufacturing is quite an unorganized sector while there are no emission norms for this commonly used combustion cooking device. It is therefore recommended that similar to improved cookstove, emission norms and test protocols should be developed by responsible agencies for tandoor.
- Pellet based tandoor will also generate market for pellet industry and enable the use of agro-waste for development of an alternative fuel, promote employment generation rural areas and pollution from stubble burning can be significantly avoided, as it has already become a matter of great concern. In this way, introduction of pellet based tandoor become an effective option also to reduce indirect pollution load.
- The crop residue burning from nearby areas can be partly minimized by turning local biomass to pellets and with introduction of improved tandoor even in these localities for local consumption of pellets.
- The use of electric or gas-based tandoors may also be promoted in small capacity restaurants/hotel enterprises (less than 10 customers) as well as those can afford the same. Pellets are also economically viable option with cost to CV ratio of approx. Rs 2/- per 1000 calorie energy output (CV) as against Rs 4/- per 1000 calorie energy output for charcoal (considering cost as Rs 8/kg for pellets and Rs 30/kg for charcoal). The advantage of charcoal is slow burning rate (smoldering combustion) without forced draft. This can be partly compensated with an automatic pellet feeder and controlling air to fuel ratio through forced draft flow rate.

Its widespread adoption in crop burning states will create local demand for stubble based pellets and other fuels, thus reducing air pollution from open crop/stubble burning.

**Annexure :**

**MNRE's Approved Models of Community Size Cookstoves - Natural Draft/ Forced Draft**

| <b>III. Community Size Cookstoves - Natural Draft</b> |                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                                                                                |                                                                                       |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1.                                                    | Shri Vikram S. Kale,<br>Proprietor,<br>Vikram Stoves &<br>Fabricators.<br>A-37, MIDC, P O Box<br>No.25<br>Osmanabad-413501,<br>Maharashtra<br>Telefax : 02472<br>228401.<br>(M)<br>09422465477,9922157<br>777,9422465457<br><a href="mailto:vikramskale@rediffmail.com">vikramskale@rediffmail.com</a><br><a href="http://www.vikramstoves.com">www.vikramstoves.com</a>                     | Vikram Jumbo<br>Bio Super, top<br>feeding | Thermal Efficiency : 28.10%<br>CO : 1.15g/MJd<br>TPM : 123.67mg/MJd<br>Power Output : 3.64 kW  |    |
| 2.                                                    | Digvijay Sales &<br>Engineering Works,<br>IshkrupaVidyanagar,<br>Parali Vajjinath-<br>431515, Beed-<br>431515(MS)<br>Manufacturing Unit:<br>VimalUdyog B-110,<br>Additional MIDC,<br>Harangul, Latur-<br>413512, Maharashtra<br>(M) 9869254891<br><a href="mailto:digvijaysalesengworks@rediffmail.com">digvijaysalesengworks@rediffmail.com</a>                                             | Digvijay Community<br>Chulha Top feeding  | Thermal Efficiency : 30.28%<br>CO : 1.73g/MJd<br>TPM : 168.85mg/MJd<br>Power Output : 4.209 kW |   |
| <b>IV. Community Size Cookstoves - Forced Draft</b>   |                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                                                                                |                                                                                       |
| 1.                                                    | Shri Ashwin Patel,<br>DirectorAlpha<br>Renewable Energy<br>Pvt. Ltd.At. & Po.<br>Vasna (Borsad), Ta.<br>Borsad, Dist. Anand,<br>Gujarat, India-388 540<br>Tele:02696-290380;<br>(M):09904184849<br><a href="mailto:info@alphaindia.co.in">info@alphaindia.co.in</a> ,<br><a href="mailto:ap@wallguard.net">ap@wallguard.net</a>                                                              | XXXL Plus Stove                           | Thermal Efficiency : 35.52%<br>CO : 1.97g/MJd<br>TPM : 78.93mg/MJd<br>Power Output : 3.78 kW   |  |
| 2.                                                    | Shri Sashidhara B T,<br>Proprietor Sacks Right<br>Energy<br>InnovationsNo.83/84,<br>Kempegowda Circle<br>14th A Cross,<br>Thigalarapalya<br>Main Road, Peenya<br>2nd Stage, Bangalore -<br>560 058<br>(M):<br>9900241276,98864258<br>79<br>Email: <a href="mailto:wedesignforyou2000@gmail.com">wedesignforyou2000@gmail.com</a><br><a href="mailto:Sin_e@yahoo.co.in">Sin_e@yahoo.co.in</a> | Ojas - M06<br>(Fuel-Pellets)              | Thermal Efficiency : 35.11%<br>CO : 1.05 g/MJd<br>TPM : 69.01 mg/MJd<br>Power output : 5.43 kW |  |



|    |                                                                                                                                                                                                                    |                                                             |                                                                                                  |                                                                                       |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 3. | Mr. Sandeep Kashyap,<br>M/s. Navitas Green<br>Power(Fuel<br>Management) Pvt. Ltd.<br>Udyog Vihar, Gurgaon<br>Ph- 0124-4987400<br>124-4987499(Fax)<br>Mb: 9910402185<br>Email-<br>sandeep.kashyap@sar-<br>group.com | Navshakti<br>Cookstoves,<br>Model: NSTF10<br>(Fuel -Pellet) | Thermal Efficiency : 42.80%<br>CO : 1.03g/MJd<br>TPM : 68.45mg/MJd<br>Power Output : 12.2 kW     |    |
|    |                                                                                                                                                                                                                    | Navshakti Continous<br>Cookstove, Model<br>No. NSCF10       | Thermal efficiency : 35.42%<br>CO : 1.34 g/MJd<br>TPM : 123.28mg/MJd<br>Power output : 11.46 kW  |    |
| 4. | Teri, PMU Lab<br>Jagdishpur, Amethi,<br>U.P                                                                                                                                                                        | IMPMETAL TERI<br>SPFB_0514b                                 | Thermal efficiency : 37.12%<br>CO : 1.59 g/MJd<br>TPM : 105.62mg/MJd<br>Power output : 9.11 kW   |    |
| 5. | M/s. Supernova<br>Technologies Pvt. Ltd.<br>Gujarat<br>Tel: +91 2692 237037<br>sntgstove@yahoo.com<br>,<br>sntggujarat@gmail.com<br>www.supernovawinds<br>olar.com                                                 | Supernova-SGDCM                                             | Thermal efficiency : 36.10%<br>CO : 4.63 g/MJd<br>TPM : 112.17mg/MJd<br>Power output : 4.62 kW   |    |
| 6. | M/s TERI , Darbari<br>Seth Block, IHC<br>Complex, Lodhi Road,<br>New Delhi-110003                                                                                                                                  | IMPMETAL-TERI-<br>SPFC-1114                                 | Thermal efficiency :36.49 %<br>CO : 1.71 g/MJd<br>TPM : 133.65mg/MJd<br>Power output : 3.36 kW   |   |
|    |                                                                                                                                                                                                                    | IMPMETAL-TERI-<br>SPFM-0414N                                | Thermal efficiency :35.41 %<br>CO : 1.889 g/MJd<br>TPM : 116.63mg/MJd<br>Power output : 4.256 kW |  |
| 7. | M/s Phoenix Udyog<br>(P) Ltd., Nahan Road,<br>Moginand, Kala-Amb-<br>173030, Dist. Sirmour<br>(Himachal Pradesh)<br>Tel: 09816103575<br>Email: phoenix.hp@rb<br>sgroup.in                                          | TERI SPFB-0514C                                             | Thermal efficiency :37.32 %<br>CO : 0.830 g/MJd<br>TPM : 92.38 mg/MJd<br>Power output : 9.05 kW  |  |
|    |                                                                                                                                                                                                                    | TERI SPFM-0414E                                             | Thermal efficiency :35.75 %<br>CO : 2.22 g/MJd<br>TPM : 138.73mg/MJd<br>Power output : 4.26 kW   |  |

*Draft Interim Submission*

**Annexure – II**

**Design of Air Pollution Control System for  
Open Pyre Type Green Crematorium**

---

## **Design of Air Pollution Control System for Open Pyre Type Green Crematorium**

A short term and localized air pollution control system is proposed in terms of design of air pollution control system for green crematoria. Cremation is the combustion, vaporization and oxidation of dead body with wood/fuel to basic chemical compounds, such as gases, ashes and mineral fragments retaining the appearance of dry bone. Normally wood, kerosene and dung cake is used for subjecting the dead bodies to flame in these crematoria. The emissions from it contain various pollutants due to incomplete / intermittent and complete combustion of fuel as well as flesh during the process. These ranges from PM, VOCs, CO, NO<sub>x</sub>, SO<sub>x</sub>, heavy metals (cadmium, mercury, and lead), dioxins and furans. Their presence in large numbers in an urban area creates lots of air pollution in the surrounding areas. These emissions can represent significant acute (short term) and chronic (long-term) health hazards to nearby residents. These health effects include irritation of the skin, eyes, and mucous membranes, central nervous system depression, respiratory effects and cancer. In view of this, there is a need to reduce the emissions from these units through design of air pollution control system for green crematoria.

The burning takes about 8-10 hours in which the flesh and wood is burnt. About 250-300 kgs of wood is required per body. Particles and gases from the cremation sites can be carried over long distances by wind and then settle on ground or water and other receptors. The effects of this settling include: making lakes and streams acidic; changing the nutrient balance; depleting the nutrients in soil; damaging sensitive forests and farm crops; and affecting the diversity of ecosystems.

There are two main types of crematoria found in urban environment depending on the type of fuel:

- Open pyre crematoria using wood as fuel (found in abundant) and
- Crematoria using electricity /Natural gas as fuel.

Most of these types are not having any air pollution control systems attached to it. In developed countries these crematoria's are fired by fuel and have primary/secondary combustion chambers for increasing the performance of combustion process. The air pollution control system is usually attached to these units. The emission control options for crematoria's are can hence be categorized as by use of clean fuel, change in technology and application of air pollution control systems.

### ***Electric Cremation vs The Traditional Funeral Pyre***

Electric cremation commissioned as a part of the Ganga Action Plan. The basic idea was to serve the purpose of river friendly cremation. Electric cremation is comparatively less expensive. Relatives can take the mortal remains within a few hours of cremation. In electric cremation, wood is not burned and there are no gas emissions. It is no doubt an unconventional way of cremation

but it helps in saving resources like wood (500-600 kg of firewood), kerosene (three litres of kerosene), some prefer desi ghee, and 300-400 cowdung cakes per dead body. It is the most economical option for funeral.

There has always been a controversy on the use of the electric crematoriums due to rituals as most persons follow the traditional burning of the bodies. In metropolitan cities it is promoted by the Government, private NGOs and environmentalists, but not to a great extent and most of these have failed due to finance and religious reasons.

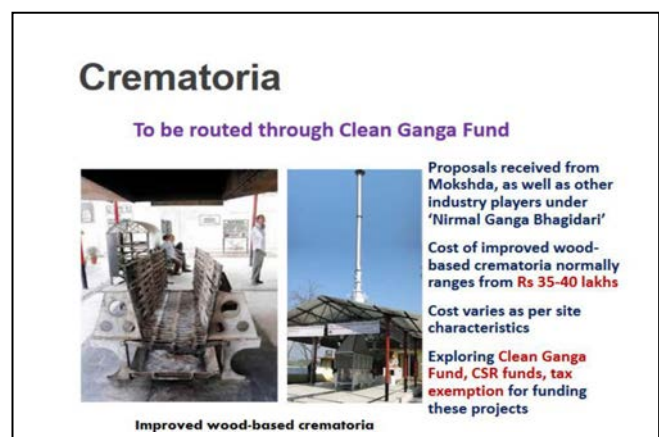
According to a report, all the year round, around 50 to 60 million trees are burned during cremations in India. While burning the wood, there is also emission of million tonnes of carbon dioxide gas which is not good for the environment. Also, cremation in open grounds generates large amounts of ashes, which are later thrown into rivers and water bodies, especially the Ganga river, thereby polluting the water. These are all environmental threats caused by cremation.

However, electric cremation has not been popularized much in India, as Hindus still do not want to shed away their traditional belief. Orthodox families believe that a electric crematorium, which also is a covered crematorium, won't allow the soul to be released from the body and thereby it mingles with other souls and the concerned person will not be reincarnated again.

### **Green Cremation system**

It is an alternate method of cremation in which the Hindus can also follow all their traditional rituals. It is affordable, energy efficient, and generates less water and air pollution, while all the religious needs of Hindus are taken into consideration. Cremation is done by cow dung are significance to the scarcity of wood. Although, other gases evolving due to cow dung need further study, particulate matter may drastically reduce.

In the Green Cremation system, a man sized metal grate is constructed beneath a roof and a chimney, and woods are placed on the metal base. The use of chimney enables better air circulation and reduces heat loss. It uses much lesser amount of wood (around 150-200 kg) to burn a body as compared to the wood (500-600 kg) used in the traditional funeral pyre. Also, it takes less time for the entire cremation, somewhere around 2 hours, as compared to 6-8 hours in the traditional cremation. While the emissions are reduced by 60%, the cost is also reduced significantly. Further the

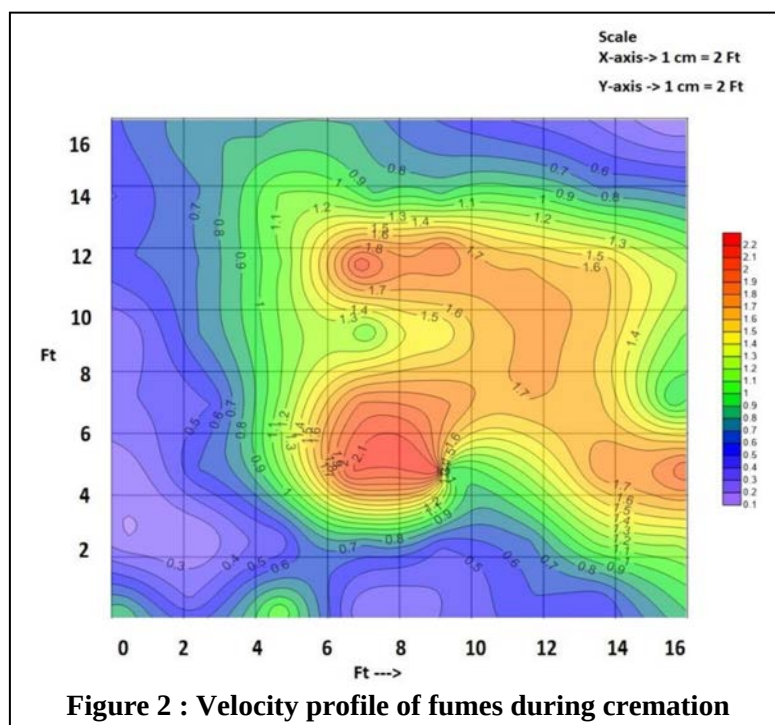


Technical drawing of the CSIR-NEERI, Nagpur, showing a plan view and a foundation plan. The plan view includes a dome structure labeled 'DOME' with 'JURY INDICATOR' inside, and a 'PLAN VIEW' showing a circular structure with a diameter of 750. The foundation plan shows a cross-section of the structure with dimensions 750, 875, 1475, and 450. A vertical section shows a 'DOME' structure with a 'JURY INDICATOR' inside, and a 'FOUNDATION PLAN' showing a cross-section of the structure with dimensions 750, 875, 1475, and 450.

### Past Studies for Single Open Pyre Crematoria Emission Control at Nagpur, undertaken by CSIR-NEERI, Nagpur

The performance of the reactive scrubbing emission control system of NEERI was tested to handle gases over a wide temperature range and inlet particulate concentrations (1500 to 2,000 mg/m<sup>3</sup>) typical for crematoria offgas. Tests showed that the scrubbing process is very efficient and easily

reduces these emissions to less than 350-400 mg/m<sup>3</sup>. The ability to control solids loading in the scrubber liquid was also accomplished in this scrubber. The advantages of using this type of separation device are its compact size, low equipment cost, as it is constructed entirely of MS that can tolerate the corrosive nature of the scrubber solution. Tests done with a various oxidizing agents like with lime showed that the scrubber was able to remove nearly 70 percent of the particle matter along with acidic gases. The Velocity and temperature profile studies were undertaken around the cremation site during burning process as per **Figure 2**.

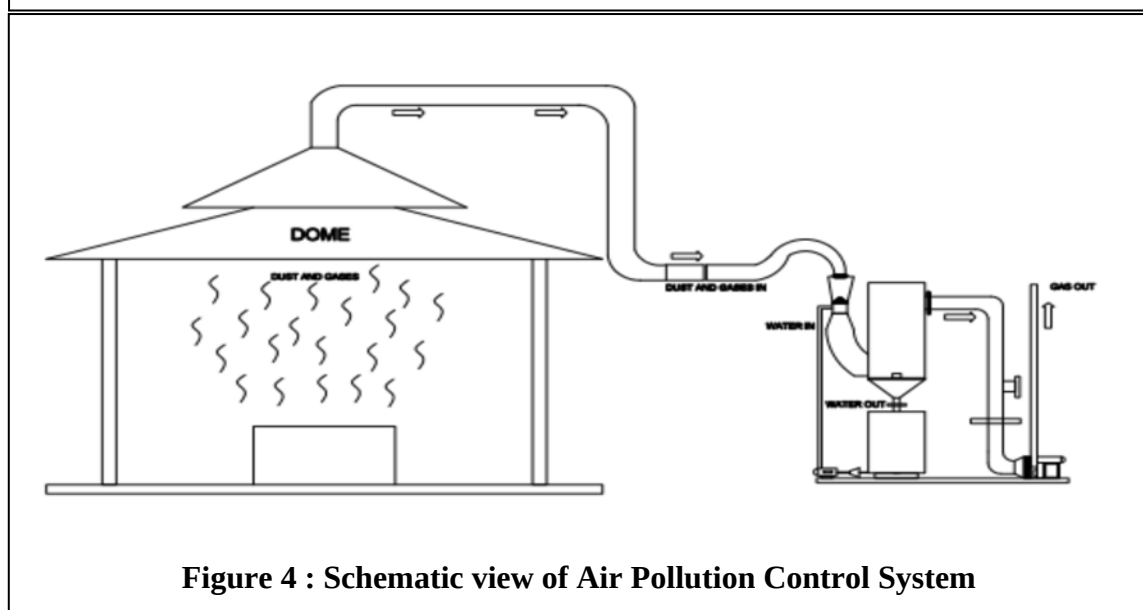
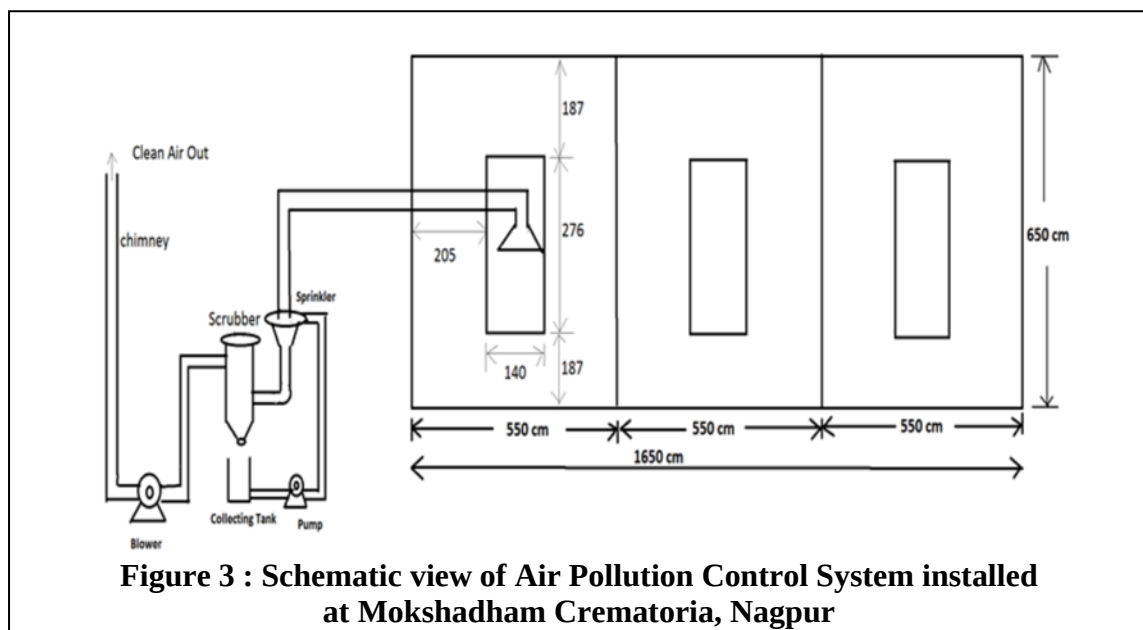


According to the velocity profile and temperature profile studies a hood and ducting was sized and installed at the shed of the single chamber open pyre crematoria and emission monitoring was undertaken to monitor various types of emissions during cremation of a dead body in a crematorium because of burning of wood, use of diesel, kerosene, cow-dung cakes and flesh burning. The hood is provided over the cremation in order to cover maximum area of dissipation of gases. Emissions like PM, CO, NO<sub>x</sub>, SO<sub>2</sub>, NH<sub>3</sub>, HC, etc. were monitored apart from flue gas hydraulic data. The emission load is estimated based on the input received from some crematoria and along with off gas flow, velocity and temperature profile, a hood and ducting followed by a reactive venturi scrubber is sized and installed as given in **Figure 3 and 4**.

These off gases are sucked at varying rates from and are further contacted with the liquid in the venturi scrubber to get maximum reduction by efficient gas /liquid contact (**Figure 5**). Plain water and lime are used to study the performance. The suction capacity is adjusted depend on the emission rate from the burning, wind flow. The liquid to gases ratio are basis of maximum liquid



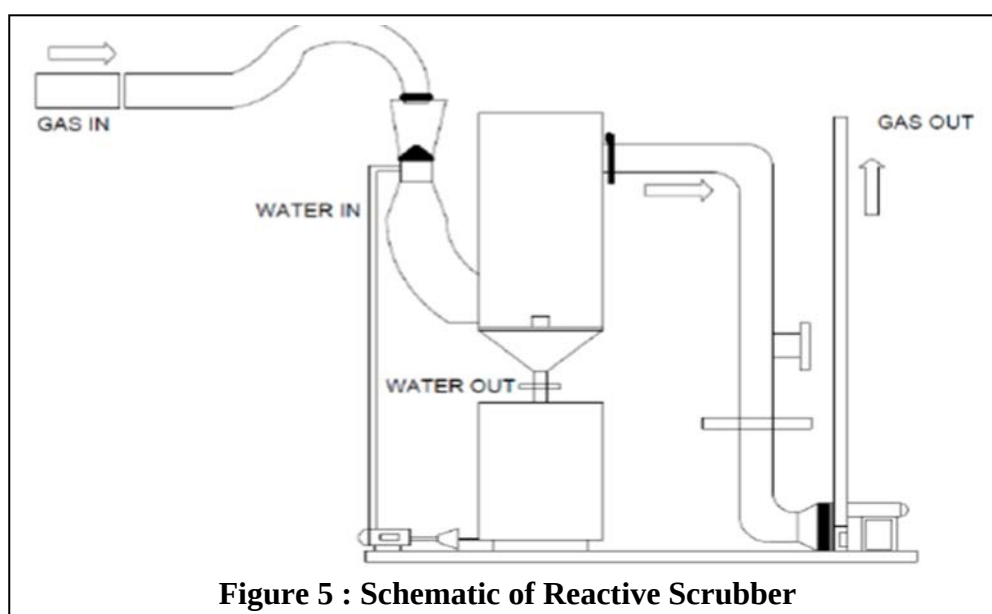
droplet contact with the incoming gaseous pollutant. The dust and gas pollutant get absorbed into the liquid and collect into the receiver. Recycle of liquid are also provided with the help of pump to maximize use of slurry/water. The distribution of particle size tends to be heterogeneous, ranging from some very large ash particles greater than 200 microns to fine dusts less than 75 microns. There may also be emissions of sub-micron metal salts (metal fume) and sub-micron particulate material formed from the condensing products of incomplete combustion. Visible smoke emissions are closely related to total particulate matter. Dark smoke is associated with sub-micron particles, formed from condensing products of incomplete combustion. Modern, secondary, combustion control cremator units should be able to absorb these species effectively into the solvent. In this study total particulates are monitored and their scrubbing efficiency was observed.



The salient feature of Emission Control System installed in single chamber open pyre crematoria for demonstration as given in **Figure 1** is as follows:

- Hood size = 2500\*2500\*1000m height
- Ducting = 250 mm diameter 10m
- Scrubber Flow Rate = 8000m<sup>3</sup>/hr.
- Diameter of scrubber tank = 1200mm,
- Blower capacity = 7.5hp @1440rpm, variable speed
- Rotary air lock valve arrangement
- Water Pump capacity : 1 HP variable speed
- Material of Construction: mild steel of 4mm thickness
- The hood is supported by structural channel.
- Electrical 3 phase connection is required for 10 HP load
- Civil work for foundation of blower & Scrubber is required.
- Stack of 10 m height
- Capital Cost Approx. Rs. 8-10 Lakhs

Application of such emission control system in the single chamber Mokshada type crematoria at Mumbai may be done after the field evaluation studies of off gases emanating from such units.



### Gaseous Emission Control System

As crematoria flue gases contains higher percentage of organic, inorganic matter and particulate dust material which can be removed efficiently by Venturi Scrubber. Gases from the Venturi Scrubber outlet are further fed into a packet bed demister-cum-aerosol trap which serves dual purpose of removing water droplets as well as condensed fumes. This bed can be recycled at regular intervals of time. It can work on longer period though, if the flue gas contains less moisture. Cleaned gas escapes into the atmosphere from the last unit through an I.D. fan



## Design of APC System Emission capture system

In order to capture the existing fugitive emissions from the open pyre systems. The rectangular and canopy hood needs to be used. The gases emitted from the platform, needs to be sucked at a sufficient height in order to accommodate the plume width at the height of the hood. Since the open pyre combustion is an intermittent emission source, it is necessary to establish the maximum or peak plume flow rate conditions that can be expected during the course of process operations.

The canopy hood volume is expressed by the following equation:

$$\text{Hood Volume} = T_d (Q_p - Q_s) \text{ Where,}$$

$T_d$  = duration of plume surge (s)

$Q_p$  = peak plume flow rate ( $\text{m}^3/\text{s}$ )

$Q_s$  = hood exhaust flow rate ( $\text{m}^3/\text{s}$ )

Equation used to find Dimensions.  $D_c = 0.5 * X_c^{0.88}$

Where:

$D_c$  = column diameter at hood face.

$X_c = y + z$  = the distance from the hypothetical point source to the hood face, ft

$Y$  = distance from the process surface to the hood face, ft

$Z$  = distance from the process surface to the hypothetical point source, ft

$$Z = (2 * D_s)^{1.138}$$

Where:

$D_s$  = diameter of hot source, ft

## Emission control system

The emission control system is proposed to be attached to the emission capture system. This reactive wet scrubbing system is used for emission control. The necessary liquid to gas ratio,

$$Q_L/Q_G = [1.09(d_d - 0.0050/\mu_g)]^{2/3}$$

$Q_L$  = liquid volumetric flow rate ( $\text{m}^3\text{sec}^{-1}$ )

$Q_G$  = gas volumetric flow rate ( $\text{m}^3\text{sec}^{-1}$ )

$d_d$  = droplet diameter, m

$\mu_g$  = gas viscosity, ( $\text{msec}^{-1}$ )

After scrubbing, the outlet gas contains few percentage of moisture which can be further eliminated by demister. Generally, Souder's equation as used for phase separator or for knocks out drums. That is,

$$V_d = k * [(L/G)/G]^{0.5}$$

$L$  &  $G$  are liquid & gas densities.

Where  $k$  is the important part & is called the capacity design factor. It depends on type of demister pad. Selection of a too low or too high  $k$  is always having a negative impact in case of demisters as the efficiency greatly depends on velocities.

In case of lower velocities, droplets have low momentum to get path impingement & coalescence & therefore avoid capture into bigger drops & thus escape from the pad. At higher velocities the vapors have sufficient kinetic energy to re-entrain them. Therefore, correct range of  $k$  selection is necessary.

Based on past experiences & designs a value of  $k = 0.42$  is most suitable for many applications. So after choosing  $k$  get the design velocity & then find out the diameter of separator.

Many of the Municipal Corporation is taking initiatives for shifting from traditional way of cremation to Green Crematoria. Ingenuity will be coming through public awareness and extensive efforts will require from all stake holders and NGOs for change in mindset.

*Draft Interim Submission*

**Annexure – III**

**Design of Passive Gas Venting System  
for Landfill Sites**

---

## **Design of Passive Gas Venting System for Landfill Sites**

In developing countries, such as India, inventory estimation of methane (CH<sub>4</sub>) emission from landfills has large uncertainties due to inadequate data availability on MSW management and emissions. During the cradle to grave process, MSW management process passes through various stages, such as sorting of recyclable and compostable materials before final disposal to landfills. These stages may change the quantity and properties of waste ultimately reaching the landfill sites, thereby influencing GHG emissions. Therefore, in-situ measurements of GHG emission fluxes from the landfill are important to reduce uncertainties in inventory estimates from this important GHG source. Many researchers have earlier reported about CH<sub>4</sub> emission estimates from MSW handling at national and city levels.

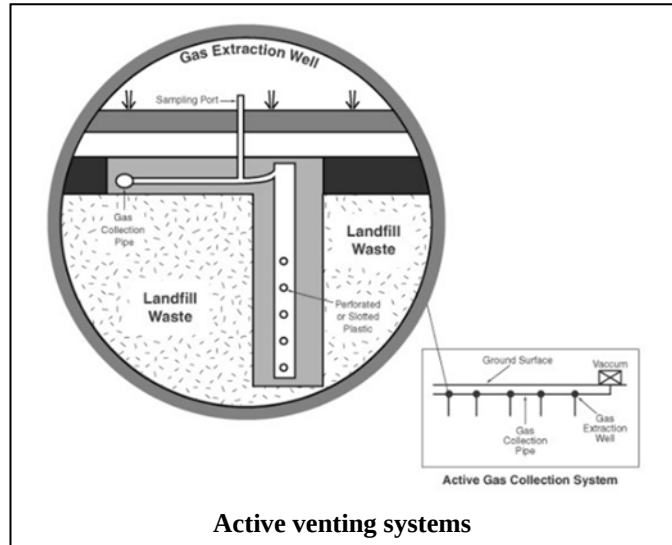
Most of the MSW generated is disposed of non-scientifically in open dumps, which causes a serious threat of landfill gas (LFG) emissions. The present note will focus on the landfill sites for the LFG emissions and designing the appropriate gas venting for the landfill sites.

### **Landfill Gas Collection System**

Landfill gas can be collected by either a passive or an active collection system. A typical collection system, either passive or active, is composed of a series of gas collection wells placed throughout the landfill. The number and spacing of the wells depends on landfill specific characteristics, such as waste volume, density, depth, and area. As gas is generated in the landfill, the collection wells offer preferred pathways for gas migration. Most collection systems are designed with a degree of redundancy to ensure continued operation and protect against environmental hazards.

### ***Active Gas Collection System***

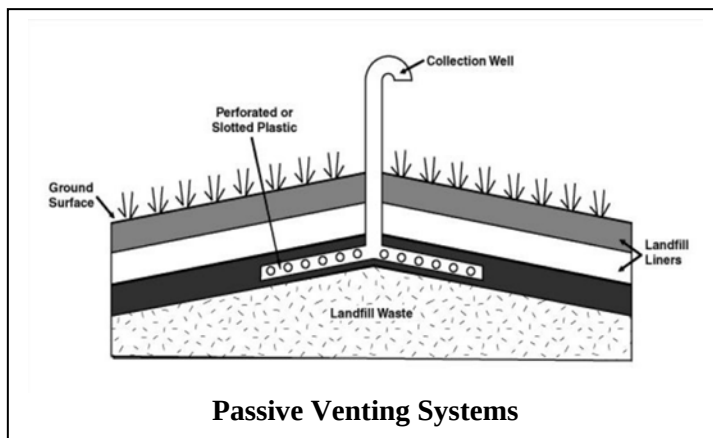
Well-designed active collection systems are considered the most effective means of landfill gas collection (EPA 1991). Active gas collection systems include vertical and horizontal gas collection wells similar to passive collection systems. Unlike the gas collection wells in a passive system, however, wells in the active system should have valves to regulate gas flow and to serve as a sampling port. Sampling allows the system operator to measure gas generation, composition, and pressure. Active gas collection systems include



vacuums or pumps to move gas out of the landfill and piping that connects the collection wells to the vacuum. Vacuums or pumps pull gas from the landfill by creating low pressure within the gas collection wells. The low pressure in the wells creates a preferred migration pathway for the landfill gas. The size, type, and number of vacuums required in an active system to pull the gas from the landfill depend on the amount of gas being produced. With information about landfill gas generation, composition, and pressure, a landfill operator can assess gas production and distribution changes and modify the pumping system and collection well valves to most efficiently run an active gas collection system. The system design should account for future gas management needs, such as those associated with landfill expansion.

### ***Passive Gas Collection System***

Passive gas collection systems use existing variations in landfill pressure and gas concentrations to vent landfill gas into the atmosphere or a control system. Passive collection systems can be



installed during active operation of a landfill or after closure. Passive systems use collection wells, also referred to as extraction wells, to collect landfill gas. The collection wells are typically constructed of perforated or slotted plastic and are installed vertically throughout the landfill to depths ranging from 50% to

90% of the waste thickness. If groundwater is encountered within the waste, wells end at the

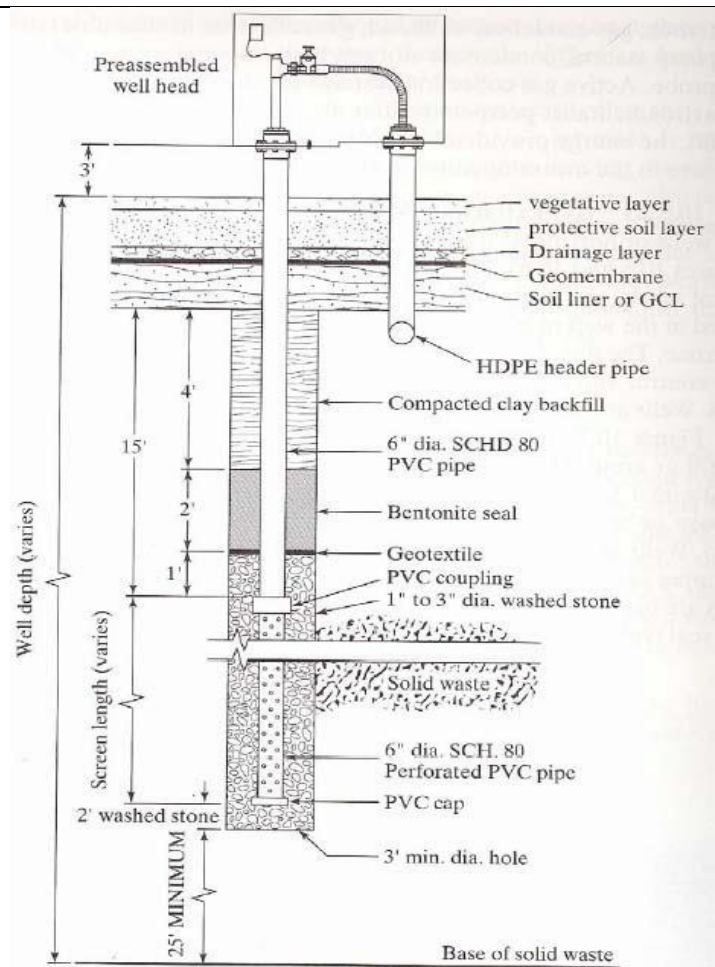
groundwater table. Vertical wells are typically installed after the landfill, or a portion of a landfill, has been closed. A passive collection system may also include horizontal wells located below the ground surface to serve as conduits for gas movement within the landfill as shown below. Horizontal wells may be appropriate for landfills that need to recover gas promptly (e. g., landfills with subsurface gas migration problems), for deep landfills, or for active landfills. Sometimes, the collection wells vent directly to the atmosphere. Often, the collection wells convey the gas to treatment or control systems (e.g., flares).

### ***Criteria and Process Diagram of Passive Vents***

Passive venting of low quality landfill gas or other CH<sub>4</sub> gas sources can be effectively controlled by the installation of passive venting systems. They consist of a horizontal network of slotted HDPE pipes connected together and fed to vertical venting columns. The columns are normally fitted with a rotating aspiromatic cowl to provide a small vacuum and increase the efficiency of the extraction. Other static type cowls are also available. The typical design of passive gas venting system is shown below :

The typical components of passive gas collection system are as follows:

- Vertical HDPE vent pipe
- Protective steel vent stack
- Rotating Aspiromatic cowl
- Static vent cowl
- 'Chinaman's Hat' cowl
- Bird protection cage
- High strength embedment lugs
- Anti flash-back gauze
- Bentonite seal
- Horizontal HDPE slotted pipe
- Vertical HDPE slotted pipe
- HDPE tee
- HDPE couplers
- Stone filled trench
- HDPE capping membrane



**Typical Design of Passive Vent System**

## **Data Requirement and Design of Passive Vent System for Landfill Sites**

### **✓ *Data Requirement***

The data required to estimate LFG generation in a landfill includes the following:

- Design capacity of the landfill
- Quantity of waste in landfill or the annual waste acceptance rate the landfill
- Rate of decay of organic matter
- Efficiency of gas collection systems (if any)
- Duration of operation

**LandGem model** can be used as an estimation tool for quantifying LFG generation and recovery from landfill sites. The model requires historical data for landfill opening and closing years, waste disposal rate, average annual precipitation and collection efficiency.

### **✓ *Proposed Design of Passive Gas Venting System***

Depending on the potential impacts of LFG and local regulatory criteria, gases are either dispersed into atmosphere or collected and treated. Before designing the gas venting system, following should be taken into consideration:

- Size and depth of landfill
- Nature of waste and potential of producing CH<sub>4</sub> and other gases
- Age of dumped waste
- Existing gas collection and monitoring system
- Hydro-geologic conditions surrounding the landfill

After evaluating the above points by collecting information from concerned authority and also through experimental studies, the appropriate design of passive venting will be proposed for the landfill sites of Mumbai.

## **Methods to Treat Landfill Gas**

Some passive gas collection systems simply vent landfill gas to the atmosphere without any treatment before release. This may be appropriate if only a small quantity of gas is produced and no people live or work nearby. More commonly, however, the collected landfill gas is controlled and treated to reduce potential safety and health hazards. Common methods to treat landfill gas include combustion and non-combustion technologies, as well as odor control technologies.

## **Combustion Methods**

Combustion is the most common technique for controlling and treating landfill gas. Combustion technologies such as flares, incinerators, boilers, gas turbines, and internal combustion engines thermally destroy the compounds in landfill gas. Over 98% destruction of organic compounds is typically achieved. Methane is converted to carbon dioxide, resulting in a large greenhouse gas impact reduction. Combustion or flaring is most efficient when the landfill gas contains at least 20% methane by volume. At this methane concentration, the landfill gas will readily form a combustible mixture with ambient air, so that only an ignition source is needed for operation. At landfills with less than 20% methane by volume, supplemental fuel (e. g., natural gas) is required to operate flares, greatly increasing operating costs. When combustion is used, two different types of flares can be chosen: open or enclosed flares. Some public concerns have been raised about whether the combustion of landfill gas may create toxic chemicals. Combustion can create acid gases such as SO<sub>2</sub> and NO<sub>x</sub>. The generation of dioxins has also been questioned. Because of the potential imminent health threat from other components of landfill gas, landfill gas destruction in a properly designed and operated control device, such as a flare or energy recovery unit, is preferable to uncontrolled release of landfill gas.

## **Non-combustion Methods**

Non-combustion technologies were developed in the year 1990 as an alternative to combustion, which produces compounds that contribute to smog, including nitrogen oxides, sulphur oxides, carbon monoxide, and particulate matter. Non-combustion technologies fall into two groups: energy recovery technologies and gas-to-product conversion technologies. Regardless of which non-combustion technology is used, the landfill gas must first undergo pre-treatment to remove impurities such as water, NMOCs, and carbon dioxide. Numerous pre-treatment methods are available to address the impurities of concern for a specific landfill. After pre-treatment, the purified landfill gas is treated by non-combustion technology options.

It is feasible to go for comprehensive primary data collection at all the landfill sites in Mumbai to develop more realistic venting systems required to be installed at landfill sites.



*Draft Interim Submission*

**Annexure – IV**

**Dust Control Measures**

---

## **Dust Control Measures**

The environmental impacts of dust emissions can cause widespread public concern about environmental degradation and/or a decline in amenity. The nature and extent of the problem and significance of the effects usually depend on the nature of the source, sensitivity of the receiving environment and on individual perceptions. For example, the level of tolerance to dust deposition can vary enormously between individuals. However, individual responses can also be affected by the perceived value of the activity producing the dust. For example, people living in rural areas may have a high level of tolerance for the dust produced by activities such as ploughing or top-dressing, but a much lower tolerance level for dust from unsealed roads.

Many forms of dust are considered to be biologically inert, and hence the primary effects on people relate to our sense of aesthetics. Dust directly causes eye irritation, lung disorders, health issues etc. Dust may also contain toxic metals like mercury and lead which can be carcinogenic in nature. Dust could settle on the window glass, ledges, flowers, fruits and vegetables, leaves etc. thereby reducing the aesthetic value. In New South Wales maintenance of dust deposited houses were estimated about ranging from \$500–\$1000 with an average value of \$90 per annum. This really affects the property value. Dust also affects the visibility, thereby affecting the air quality level. Dust can also affect the growth of plants through:

- Reducing photosynthesis due to reduced light penetration through the leaves. This can cause reduced growth rates and plant vigour. It can be especially important for horticultural crops, through reductions in fruit setting, fruit size and sugar levels.
- Increased incidence of plant pests and diseases. Dust deposits can act as a medium for the growth of fungal diseases. In addition, it appears that sucking and chewing insects are not affected by dust deposits to any great extent, whereas their natural predators are affected.
- Reduced effectiveness of pesticide sprays due to reduced penetration.
- Rejection and downgrading of produce

## **Dust Control Agents**

Water is one of the most primitive agents which are used as dust control measure. But it is less effective as compare with other chemical agents. Foam based system are also used to reduce dust. Lastly, one can reduce dust emission by reducing the production. Variety of chemical dust suppressant is available to suppress fugitive dust emissions. But they are being more expensive that of water. Comparing to water, they are more effective in suppressing dust and are applied much less frequently. Examples of dust suppressants include the following:

- liquid polymer emulsions
- agglomerating chemicals (e.g., lignosulfonates, polyacrylamides);
- cementitious products (e.g., lime-based products, calcium sulphate);
- petroleum based products (e.g., petroleum emulsions); and
- chloride salts (e.g., calcium chloride and magnesium chloride).

While the application of water and chemical dust suppressants are proven and effective options for mitigating dust, they have to be applied judiciously. Their usage, while mitigating dust, can trigger hazardous environmental consequences. It is important to keep these environmental consequences in mind when deciding on the extent to which water and chemical dust suppressants are to be utilized.

#### Selecting dust control agents

When selecting materials for dust control consider these basic requirements:

- environmentally compatible
- easily applied with common road
- maintenance equipment
- workable and responsive to maintenance
- reasonably effective at controlling dust
- not degrading to ride quality
- relatively harmless to vehicles using road
- posing little hazard or inconvenience to adjacent residents
- cost competitive

The most common dust control agents are chlorides, asphalt products, and lignin. Calcium- Magnesium Acetate (CMA) and  $MgCl_2$  has been proposed as dust binder and its application on paved roads in Sweden, Austria, Germany and UK in order to mitigate road dust emissions (*Norman and Johansson, 2006; Barratt et al., 2012*). These previous studies showed that in most cases a reduction of kerbside  $PM_{10}$  concentrations was reached. The effectiveness of CMA in binding deposited particles seems to be closely related to the degree of road moisture (*Gustafsson et al., 2010*). This is a crucial aspect, mostly when evaluating the potential effectiveness in South European environments, where the higher solar radiation might further reduce the life-time of the air quality benefit.  $MgCl_2$  has been also proposed and tested in Norway as a possible dust suppressant due its high hygroscopic and deliquescent properties. CMA and  $MgCl_2$  were used in combination in a South European city, characterized by a relatively dry climate. In this scenario, emissions of road dust were estimated to reduce  $PM_{10}$  and  $PM_{2.5}$  background levels by 16-17% and 6-8% respectively, as annual average between 2003-2009. Road cleaning activities (using  $MgCl_2$ ) have been recently tested in one of the commercial district of Barcelona, resulting in a daily reduction of  $PM_{10}$  measured at traffic site by 7-10% and larger decrease for specific tracers of mineral and brake dust. Application rate for CMA and  $MgCl_2$  has been given in **Table 1**.

**Table 1: Application rates of dust control chemicals**

| Chemical | Applications                     | Where to used          | Reference                       |
|----------|----------------------------------|------------------------|---------------------------------|
| $MgCl_2$ | 20 g/m <sup>2</sup>              | Barcelona, Spain       | Querol (2013)                   |
|          | 30% solution at 0.5 gal./sq. yd. | Madison, Wisconsin, US | Wisconsin Transportation (1997) |
| CMA      | 20 g/m <sup>2</sup>              | Barcelona, Spain       | Querol (2013)                   |
|          | 10 g/m <sup>2</sup>              | Klagenfurt, Austria    | Gustafsson (2012)               |

## Methods of Application

Dust control agent can be applied through vehicles and sprinkling on the road side (**Figure 1**). Also while transferring the materials (either via trains or trucks), they should be covered with tarpaulin. At the same time, dust control agent must be sprayed to reduce the emission of dust. This should be the responsibility of the owner rather than transportation agencies.



**Figure 1 : Road side sprinkling of dust control agents**

Covered vehicles must be used for transportation of coal and materials. One could use covered vehicles like dumpers for transportation of materials (**Figure 2**). This would aid in reduction of fugitive dusts



**Figure 2 : Covered transportation vehicles**

## Other references

- Gustafsson, M. (2012). PM10 reduction by the application of liquid Calcium-Magnesium Acetate (CMA) in the Austrian and Italian cities Klagenfurt, Bruneck and Lienz, presented at *Redust seminar, Helsinki*.
- Normana, M., Johanssona, C. 2006. Studies of some measures to reduce road dust emissions from paved roads in Scandinavia, *Atmospheric Environment* 40, 6154–6164.
- Querol, X. (2013). Methods used in Barcelona to evaluate the effectiveness of CMA and  $MgCl_2$  in reducing road dust emissions, *AIRUSE, LIFE11 ENV/ES/584*.
- Wisconsin Transportation Bulletin. (1997). Dust Control on Unpaved Roads. Annexure

In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; CSIR -NEERI has developed dust suppressant. It has been validated through laboratory studies and field trials under Indian conditions and scenarios.

#### Specifications/ Application

- CSIR - NEERI's dust suppressant need to be mixed with water with proportionate amount (10 - 15% depending on source of pollution; i.e., for road side dust 10% is enough while for coal mines, 15% is preferred).
- Application rate is 2 litre per unit area
- It is white (solid) and can be used as mist as well
- This chemical is based on hygroscopic salts like Magnesium Chloride and Calcium carbonate along with bio additive (name undisclosed, under stage of patenting).

#### Advantages

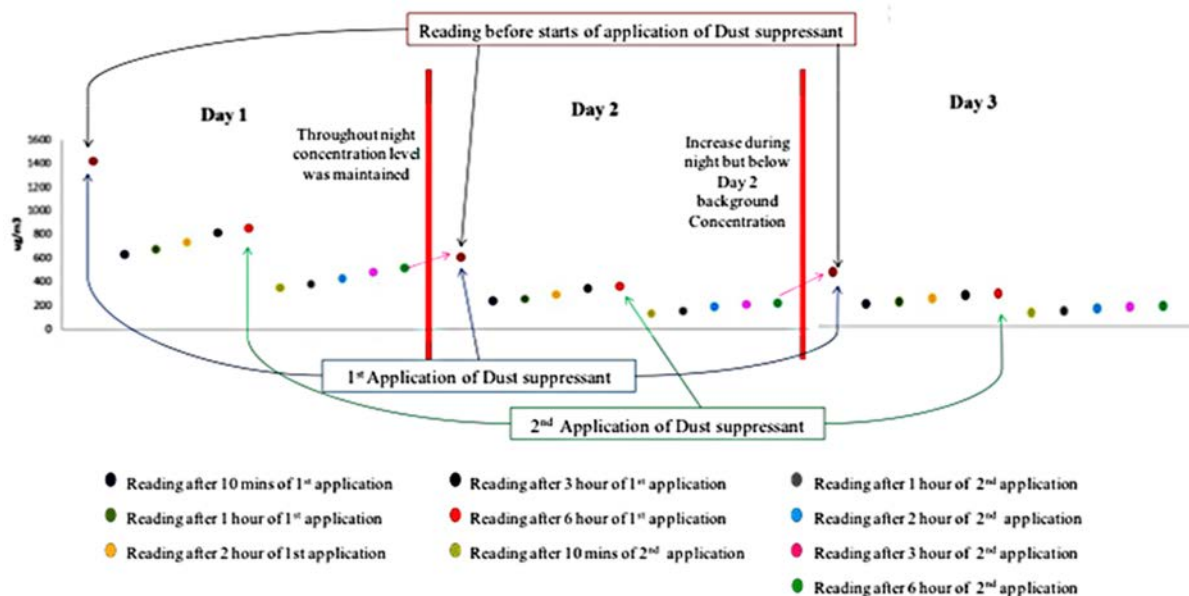
- It is prepared, tested and applied as per Indian climatic conditions
- Treated water can be used for this purpose
- It is 40 to 60 times more effective than water
- While comparing with other dust suppressant, NEERI's suppressant showed better results
- No harmful byproduct is produced (tested and field trials conducted)

It has been tested by Enviro Policy Research India Pvt Ltd (EPRI) at three different construction site of Delhi.



**Application of Dust Suppressant using Tanker at Delhi**

**The Effectiveness of Dust Suppressant: It showed 60 – 65% reduction from base concentration.**



## Bioswale : System for Storm Water and Dust Suppression Road Side

A biological filtration canal is a shallow depression created in the earth to accept and convey storm water runoff. A biological filtration canal uses natural means, including herbaceous vegetation and soil, to treat storm water by filtering out contaminants being conveyed in the water. Canals require shallow slopes that drain well, and function best under light to moderate runoff conditions.

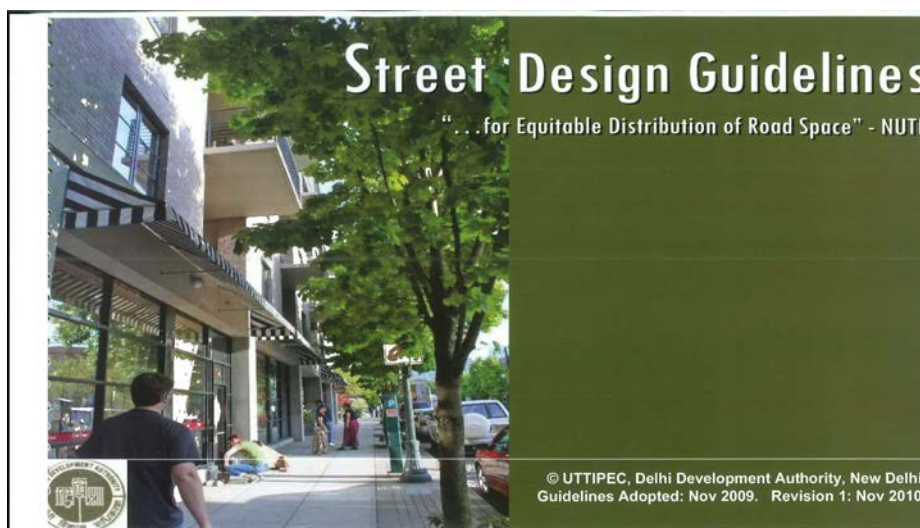
Purpose: Storm water treatment and management, road side pollutant removal (SPM, suspended solids, nitrogen, phosphorus) by vegetation uptake, vegetation slows flow down and encourages sedimentation, cleans water and air by biota consumption, encourages infiltration into the subsurface zone, which reduces flow volume. Optimum design of channel dimensions, longitudinal slope, type of vegetation, and use of check dams will improve pollutant removal rates.



---

Building construction/demolition codes need to be used with specific reference to PM control. **UTTIPEC design manual has been recently created by Delhi Development authority for uniform roadside, drains, footpath and related design.** The same should be adopted for all future design for roads and pathways. Road construction/repair uses wood for melting tar, this technology needs to be abolished as over a large period of time, emissions are high.

Water spraying on the tires of trucks at the entry/exit point through construction of water pit. Appropriate barricading of the under construction site to avoid dispersion of the dust and particulate matter in the ambient air.



The Construction and Demolition (C&D) Waste Management Rules, 2016 was notified vide G.S.R. 317(E) 29th March, 2016 by the Ministry of Environment, Forest and Climate Change (MoEF&CC). building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure which delineated specific guidelines for waste generator, Service Provider and their Contractors, Local Authority, State Pollution Control Board or Pollution Control Committee, State Government or Union Territory Administration, Central Pollution Control Board and Criteria for Site Selection for Storage and Processing or Recycling Facilities for Construction and demolition Waste.

### **A) National Clean Air Programme (NCAP)**

A time-bound national level strategy, National Clean Air Programme, was launched by Government to tackle increasing air pollution. The NCAP is envisaged to be dynamic and will continue to evolve based on the additional scientific and technical information as they emerge. Some of the measure and technologies developed for control of air pollution under NCAP are as follows.

#### **Dust management**

- Road dust and dust arising from construction and demolition are the major contributors to the pollution in Indian cities. City specific Plans need to evaluate the options of mechanical sweeping, greening and landscaping of the major arterial roads, identification of major impact roads including national high ways etc. Spraying of water twice per day (before peak hours of traffic) is very effective in reducing air borne dust load. Grassing of open spaces with native grasses also prevent dust pollution and clean air.

The mechanical sweepers were introduced in Delhi as manual sweeping by brooms blow more dust particles in air than it cleans off the ground. There is no proper mechanism or standard operating procedure (SOP) on how to dump the dust collected so that they don't return to the city after disposal.

- The Government has notified Construction & Demolition Waste Management Rules, 2016 which had been an initiative towards effectively tackling the issues of pollution and waste management. Basis of these Rules is to recover, recycle and reuse the waste generated through construction and demolition. Segregating construction and demolition waste and depositing it to the collection centres for processing is now be the responsibility of every waste generator. Local bodies are to utilize 10-20% material from construction and demolition waste in municipal and government contracts.
- It was noted that there was no regulation prescribing preventive measures to be taken for management of dust including road dust and C&D dust that arises during construction. Taking note of increasing air pollution and to keep dust material under control in towns and cities, the Ministry of Environment, Forest and Climate Change has issued a Dust Mitigation notification in January 2018 under EPA, 1986; making mandatory dust mitigation measures in infrastructural projects and demolition activities in the country. This would help to keep dust under control to reduce air pollution in metros and cities. The notified rules inserted 11-point



measures in the existing Act, empowering the ministry to issue notices against local authorities and state agencies for non-implementation of those actions.

### **Way Forward**

- Introducing mechanical sweepers on the basis of feasibility study in cities;
- Evolve SOP for addressing the specific issue of disposal of collected dust from mechanical sweeping, taking into consideration all the above cited factors;
- Stringent implementation of C&D Rules, 2016 and Dust Mitigation notification, 2018 of Government of India;
- Wall to wall paving of roads to be mandated.
- Control of dust from construction activities using enclosures, fogging machines, and barriers-stringent implementation.
- Greening and landscaping of all the major arterial roads and national highways after identification of major polluting stretches.
- Maintenance and repair of roads on priority.
- Sewage Treatment Plant (STP) treated water sprinkling system having PVC (Polyvinyl Chloride) pipe line along the roads and at intersecting road junctions and spraying of water twice a day before peak traffic hours.

### **B) Dust Mitigation Notification by MoEF-CC**

Ministry of Environment, Forest and Climate Change vide notification dated January 25, 2018 has amended the Environment (Protection) Rules, 1986. Vide this amendment in Schedule-I –New serial number ‘106’ has been inserted which relates to Mandatory Implementation of Dust Mitigation Measures for Construction and Demolition Activities for projects requiring Environmental Clearance:

- No building or infrastructure project requiring Environmental Clearance shall be implemented without approved Environmental Management Plan inclusive of dust mitigation measures.
- Roads leading to or at construction sites must be paved and blacktopped (i.e. metallic roads).
- No excavation of soil shall be carried out without adequate dust mitigation measures in place.
- No loose soil or sand or Construction & Demolition Waste or any other construction material that causes dust shall be left uncovered.
- Wind-breaker of appropriate height i.e.  $\frac{1}{3}^{\text{rd}}$  of the building height and maximum up to 10 meters shall be provided.
- Water sprinkling system shall be put in place.
- Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.

New serial number ‘107’ has been inserted which relates to Mandatory Implementation of Dust Mitigation Measures for all Construction and Demolition Activities:

- Grinding and cutting of building materials in open area shall be prohibited.
- Construction material and waste should be stored only within earmarked area and road side storage of construction material and waste shall be prohibited.



- No uncovered vehicles carrying construction material and waste shall be permitted.
- Construction and Demolition Waste processing and disposal site shall be identified and required dust mitigation measures be notified at the site.

The serial numbers 106 and 107 above shall apply to cities and towns where value of particulate matter 10/ particulate matter 2.5 exceeds the prescribed limits in National Ambient Air Quality Standards

### **Use of Ready Mix Concrete**

The Ready Mix Concrete (RMC) industry in India is still in its early stages with cement consumption of just 8-9 per cent of total production. This is evident from the fact that in the West, the RMC consumes 60 per cent of total cement production. However, over a period of time the demand for RMC is expected to grow exponentially. Godrej is a part of the Ready Mix Concrete Manufacturers Association (RMCMA) and actively participates in preparing guidelines for helping penetrate the use of RMC through forums and discussions. Use of RMC leads to time and cost efficiency since the construction does not need additional space to store the concrete. Since only the right amount of concrete mix is delivered hence it results in no wastage and reduces dust, dirt emissions. Godrej supplies range of ready mix concrete and sold under the brand name of TUFF. This mainly includes products like Enviro TUFF eco-friendly concrete, Recycled concrete blocks, Solid recycled concrete, Poro TUFF pervious concrete. These blocks are mainly made from industrial byproducts.

Autoclaved Aerated Blocks have also been introduced in Indian Market. These are manufactured by using fly ash mixed with cement, lime, water and an aeration agent placed in an autoclaved chamber. Godrej has introduced Autoclaved Aerated Blocks under the brand name of TUFF blocks AAC. As per the company's claim, TUFFBLOCKS AAC decreases over 50% greenhouse radiation & integrated energy and utilizes at least 70% environmental waste.

*Draft Interim Submission*

**Annexure – V**

**Wind Augmentation and purifying Unit (WAYU)**

---

### **‘Wind Augmentation and purifYing Unit (WAYU)’**

The air quality at traffic intersections is one of the worst as vehicles typically undergo long idling, acceleration and deceleration there. This increases the quantity of air pollutants emitted by the vehicles at intersection. A numerical emission model run by Margarida et al. (2005) estimate an increase of 34%, 105% and 131% in NO, HC and CO emissions, respectively due to traffic signals at vehicular intersections.

India has experienced substantial increases in vehicle miles traveled (VMT) in recent years. The increased traffic has resulted in increased pollutant emissions and the deterioration of environmental quality and human health in several major cities in India. Pollutant concentrations near major intersections and roadways in the city are exceeding the Indian national ambient air quality standards (NAAQS). Thus, users (motorists, pedestrians, residents, etc.) in these corridors are exposed to unhealthy pollution levels. Exposure to vehicular air pollution directly affects respiratory, nervous and cardiovascular systems of humans, resulting in impaired pulmonary functions, sickness, and even death.

People standing stagnantly at a position, or moving slowly than usual average walking speed is more exposed than people passing by, because the time spent in a polluted microclimatic environment is much more, which increases the cumulative exposure to pollutants. As pedestrians pass by several types of human activities present on or beside sidewalks, they are affected by the pollution emitted by those activities. The breathing rate becomes factual in calculation the dose from exposure, and adds to the cumulative intake of air pollutants.

IIT Bombay, National Environmental Engineering Research Institute (NEERI) and Maharashtra Pollution Control Board (MPCB) have come together to address the issue of air pollution at traffic junctions. A device known as ‘Wind Augmentation and purifYing Unit (WAYU)’ to improve the air quality at urban intersections has been developed and integrated in a way that it can work with solar power. This device works basically on two principles:

- Wind generation for dilution of air pollutants
- Active Pollutants removal



Air pollution is a local problem and its solution can be derived from technologies coupled with local conditions and requirements. Creating change in meteorological parameters like wind with the help of devices such as fans and also removal of the pollutant near to the source may help in reducing ambient air pollutant concentrations. Creating turbulence in the air with the help of turbo machines will disperse and dilute the pollutants. Trapping the pollutants with the help of suction units installed near to the source and purifying it will also have a sizable amount of impact. This can be done where the population density is high which is typically found in India near the traffic junctions.

The device uses low speed wind generators, appropriate size filters for long operation cycle with reasonable efficiency. It also has an oxidizer unit for removal of Carbon-monoxide and Hydrocarbons including VOCs. The air is passed through the filters where the particulates are removed. The air generators without filter can help in augmenting wind turbulence in near zone so that dilution takes place (like in nature).

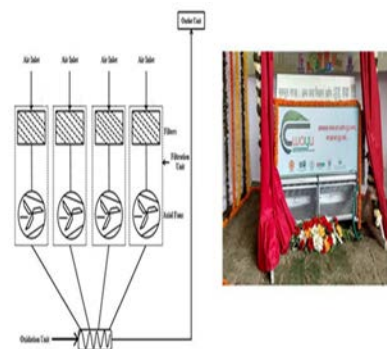
In the next level where active pollutants are removed, filters and thermal system are used. The air is heated inside the specially designed with appropriate surface and retention time, within the thermal oxidisers where the carbon monoxide, hydrocarbons, VOCs get converted to carbon dioxide. At the outlet of the device, the discharged air has some exit velocity. This velocity of air creates air mixing and turbulence in the atmosphere which thereby helps bringing down the pollutant concentrations by the method of dispersion.

The WAYU device has a potential to lower the ambient concentrations of PM and VOCs by 50-70%. The effectiveness and influence zone of the WAYU device can be affected by the prevailing wind conditions. During the various experiments conducted was conducted inside closed boxes of various sizes, it was observed that the pollutant concentrations decreased rapidly by 90-95% within 15 minutes. The device can be powered with the help of solar power very efficiently. In this way the device becomes self-sustainable in its operation.

The primary treatment consists of filters of 10 microns and which is followed by oxidation systems. The oxidation systems consist of specially designed UV-  $\text{TiO}_2$  adsorption, photo catalytic oxidation technology. In brief this technology can be explained as follows. Small particles of titanium dioxide ( $\text{TiO}_2$ ) act to catalyze oxidation of adsorbed molecules in the presence of above-bandgap ultraviolet light (UV, wavelengths smaller than 390 nanometers). The particle size is usually in the range of 5 to 50 nm. The absorption of UV light produces electron-hole pairs in the titanium dioxide particles. The hole reaches the particle's surface to react with hydroxyl ( $\text{OH}^-$ ) ions from adsorbed surface water and

form highly reactive hydroxyl radicals. These radicals form when an OH- group loses its electron during an encounter with a hole. They are electrically neutral but highly reactive chemically. Airborne pollutant molecules can be adsorbed on the TiO<sub>2</sub> particle surface, at which time they react with adsorbed hydroxyl radicals. Ideally, reaction products remain on the surface until they are fully oxidized. The process just described represents the essence of catalytic photo-oxidation, but it should be understood that variations on this theme are encountered.

UV- TiO<sub>2</sub> adsorption-photocatalytic oxidation has a lot of advantages. They are very efficient in removal of VOCs. Pichat et al. (2000) have shown that ozone can be directly eliminated by TiO<sub>2</sub> nanoparticles in a process that is promoted by both heat (in the ambient temperature range of 0° to 50°C) and by UV light. The catalytic activity of present-day TiO<sub>2</sub> anatase nanoparticle materials is sufficient to remove some VOCs from the air. Both the components of smog (ozone and particulate matter) are the result of emission of VOCs that can potentially be reduced by the active photocatalytic oxidation technology under consideration.

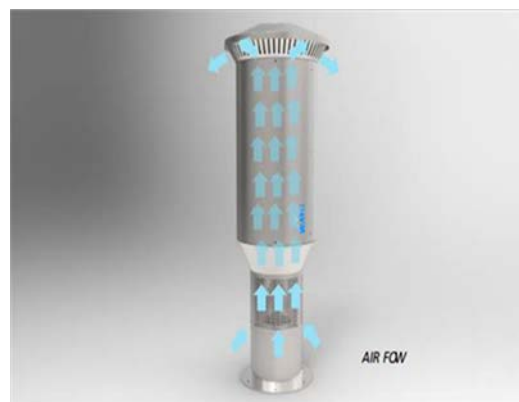


The unique design of the arrangement of the various components of the UV-TiO<sub>2</sub> activated carbon gives WAYU the edge for performing complete oxidation and satisfactory reduction in VOC concentrations.

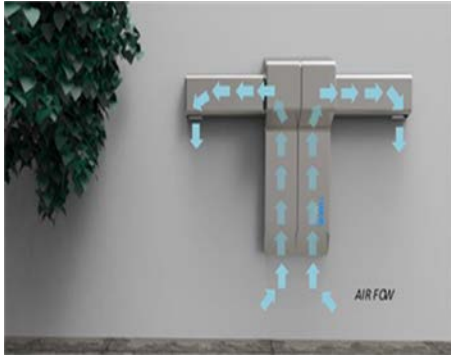
WAYU is a device jointly developed by IIT-CSIR-NEERI focused on controlling pollution in ambient air. WAYU has been successfully tested in a pilot project of 25 devices in Mumbai in collaboration with Maharashtra Pollution Control Board (MPCB). With an aim to solve the ever rising menace of air pollution in the national capital and other parts of India, CSIR-NEERI believes WAYU would be a vital cog in the armory to combat this menace.

### Different Models

WAYU comes in various shapes and sizes. Various designs have been incorporated to suit according to different scenarios. These include improved design for traffic junctions, Bus shelters, traffic roundabouts, wall mounted models for flyover pillars, pedestrian pathways. In the scenario of Flyover pillars play a vital role. So a



**WAYU device improved design**

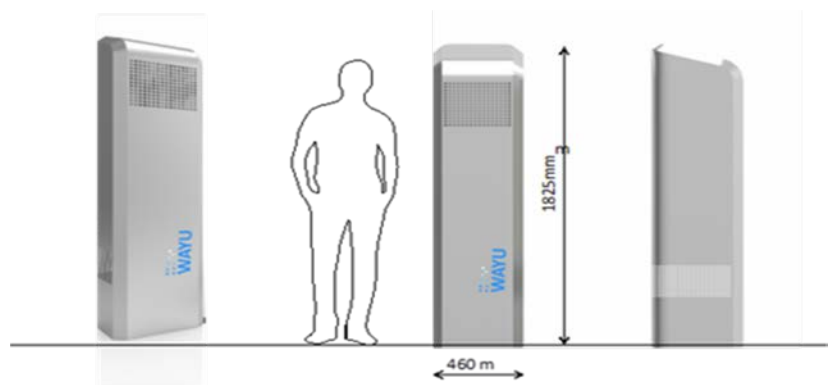


**Wall mounted/ Flyover Design**

design which could be wall mounted was ideated. The design basically consists of a blower fan at the main extrusion where the air is sucked at the bottom of the extrusion and thrown to the right or left of the outlet which consists of linear activated carbon trays. These trays could be easily accessed from the front and could be changed once in a month. Here there are two UV tube lights which are basically of one feet and has been placed vertically in particular intervals to attain maximum level of treatment.

The air is sucked from the bottom at 625mm height and the purified air is pushed out at 1825mm. The modularity of this concept leads to a futuristic look with stainless steel as its material used. Here the form could be easily manufactured because of its minimal bending profiles.

The design initiation started with the scenario of pedestrian was there is a constant flux of people moving around the environment. The design was finalized at a space that is closer to the road & the pedestrian paths were the Unit would be placed. The standalone device is of approximate 1825mm. The overall design is made in a very similar minimal approach with small



**Bus shelter design**



**Traffic Roundabouts design**

continues chamfers which could be manufactured easily with stainless steel and laser cut technologies. There are three two- feet UV tube lights, which is been attached to the phases of the unit.

At Bus shelters stand-alone modules should be vital phase. Since each bus shelter has different design of the shelter we arrived at a very minimal

half T -Section stand-alone module which could be fixed and two or one end of the bus stop. The air is sucked from a particular height and released from the top as shown in Figure 18. The overall dimensions were optimized for the easy accessibility of activated carbon filters and UV Tube light. This is a purifier, which could be a public installation. The roundabouts are spaces where the vehicle – people ratio is very high. The design added in new features like an additional solar panel, which could make the standalone device run itself.

A polygon was taken in consideration, the octagon was chosen initially for the design as the bottom inlet could capture all the polluted particles and let out clean air through the top. An extruded octagon was considered which could gradually reduce at the bottom to look like a tree. The inner details of this purifier are mainly three phases as the air purifier which is prototyped with cassettes at each side. These trays would be filled with activated carbon and there are four feet tube lights at the center. The polluted air is sucked from the bottom and released at the top. This is a self-sustainable standalone device which requires no Power.

### **Why WAYU?**

WAYU has the following advantages:

- Relatively cheaper than most devices in market for similar purpose
- Low power consumption facilitating the use of solar power
- Easy operation and maintenance
- Removes gaseous pollutants along with particulate matter unlike most of the devices which focus only on particulate matter
- Can be easily modified to suit any scenario and volume of air
- A range of designs in its portfolio makes it an attractive option for solving air pollution in spaces of all kinds
- An indigenously developed technology that propels MAKE IN INDIA initiative

Though commercial data for similar devices are not available, it is quite confidently estimated that the cost of per unit of WAYU is one of the cheapest devices for ambient air pollution control. The basic advantages besides the ones listed above include simplicity in construction and operation. The ability to couple with different energy sources such as solar make WAYU commercially a very viable option. With thoroughly tested technology WAYU is one of the most robust air purifiers that can be installed in both indoor and outdoor spaces. Aesthetically designed WAYU blends into the ambient environment and thus is not an eye-sore unlike other devices.



# MAHARASHTRA POLLUTION CONTROL BOARD

Phone : 4010437/4020781  
/4037124/4035273  
Fax : 24044532/4024068  
/4023516  
Website: http://mpcb.gov.in  
E-mail: jdair@mpcb.gov.in



Kalpataru Point, 3<sup>rd</sup> & 4<sup>th</sup> floor,  
Sion-Matunga Scheme Road No. 8, Opp.  
Sion Circle, Sion (East),  
Mumbai - 400 022

No: MPCB/JD (APC)/NCAP/B-1537

Date: 03.05.2019

To,  
Dean,  
Sir JJ Group of Hospitals &  
Government Grant Medical College, GoM  
Mumbai : 400 008.

(Kind Attn: Dr. Shrinivas Chavan, Prof & HOD Dept. Of ENT)

**Sub: Sanction of funds for conducting study "An open label phase IV clinical trial to assess the safety and tolereberality of Ebastine (10mg) and phenylephrine (10 mg) FDC as short duration therapy, in patients with allergic rhinitis"**

- Ref: 1. Implementation of NCAP in the State of Maharashtra.  
2. Letter from JJ Hospital dtd : 31/03/2019.  
3. Letter from JJ Hospital dtd: 01/04/2019.  
4. Letter from JJ Hospital (Dept. of ENT) dtd : 04/04/2019.  
5. Office Note approval dtd : 05/04/2019 and 03/05/2019  
6. MPCB Letter no: MPCB/JD (APC)/NCAP/B-1375; dated 11/04/2019

Sir,

MPC Board has issued sanction letter vide reference 6 above, for project proposal titled "An open label phase IV clinical trial to assess the safety and tolereberality of Ebastine (10mg) and phenylephrine (10 mg) FDC as short duration therapy, in patients with allergic rhinitis" and related instruments/equipment's required for setting up of ENT workstation along with accessories with the budget estimation of **Rs. 92 Lacs (Rupees Ninety Two Lacs Only)**.

As per your discussions with Hon'ble Chainman, it was decided to do the procurement by constituting the committee. The amount shall be kept in separate account of J.J. Hospital. Any Procurement / expenditure shall be done by following the due procedure with the approval of the committee comprising of 1) Dean J.J. Hospital, 2) Joint Director (APC), MPC Board and 3) Dr. Shrinivas S. Chavan, Professor and HOD (Dept. of ENT). Also the committee can nominate other suitable officials/experts as and when needed.

In view of the above, MPC Board is releasing payment of Rs. 92 Lakhs in favour of "Dean, GGMC" and "Sir J.J. Group of Hospitals, Mumbai". You shall submit status report of the project along with Statement of Expenditure (SoE) and audited utilization certificate (UC), to this office. All other terms and conditions of sanction letter dated 11.04.2019 remains same.

This is issued with the approval of competent authority of MPC Board.

Yours Faithfully,

(Dr. V. M. Motghare) 31/5/19  
Joint Director, APC

Copy submitted for information to:

1. Hon'ble Chairman, MPC Board, Sion, Mumbai.
2. Member Secretary, MPC Board, Sion, Mumbai.

Copy to : Chief Account Officer, MPC Board, Sion, Mumbai – It is requested to release / transfer the amount of Rs. 92 Lacs to Grand Medical College and Sir JJ Group of Hospitals, Mumbai as stated above.

DA: 1. MPCB/JD (APC)/NCAP/B-1375; dtd: 11/04/2019  
dated 03.05.2019



राष्ट्रीय शुध्द हवा कार्यक्रमाच्या प्रभावी  
अंमलबजावणीसाठी नागरी स्तरावर समिती  
गठीत करणेबाबत...

महाराष्ट्र शासन  
पर्यावरण विभाग

शासन निर्णय क्र. एनसीए २०१८/प्र.क्र.१९६(२)/ता.क.२,  
१५ वा मजला, नवीन प्रशासकीय भवन, हुतात्मा राजगुरु मार्ग,  
मादाम कामा मार्ग, मंत्रालय, मुंबई-४०० ०३२  
दिनांक : १८ सप्टेंबर, २०१९

**वाचा-**

१. पर्यावरण (संरक्षण) अधिनियम, १९८६ आजपर्यंत दुरुस्ती केल्याप्रमाणे
२. हवा (प्रदूषण, प्रतिबंध व नियंत्रण) अधिनियम, १९८१ आजपर्यंत दुरुस्ती केल्याप्रमाणे
३. मा.राष्ट्रीय हरीत लवाद, मुख्य खंडपीठ, नवी दिल्ली यांनी अर्ज क्र.६८१/२०१८ मध्ये पारित केलेले  
दिनांक ८/१०/२०१८ रोजीचे आदेश
४. केंद्रीय प्रदूषण नियंत्रण मंडळाचे दिनांक २४/०४/२०१९ रोजीचे पत्र

**प्रस्तावना-**

मा.राष्ट्रीय हरीत लवाद, मुख्य खंडपीठ, नवी दिल्ली यांनी अर्ज क्र.६८१/२०१८ मध्ये दिनांक ०८/१०/२०१८ अन्वये पारित केलेल्या आदेशानुसार, सर्व राज्ये आणि केंद्रशासित प्रदेश with non-attainment cities यांनी, हवेच्या गुणवत्तेची मानके विहित मर्यादेत आणण्यासाठी, कारवाई करावयाच्या अंतीम तारखेपासून सहा महिन्यांच्या आत योग्य ती कृती आराखडा दोन महिन्यांच्या आत तयार करावा. मा.राष्ट्रीय हरीत लवादाने पुढे असेही आदेश दिले आहेत की, सहा सदस्यीय समितीने सदर कृती आराखडा तयार करावा, ज्यामध्ये पर्यावरण, वाहतूक, औद्योगिक, नगर विकास , शेती या विभागांचे संचालक आणि सदस्य सचिव, राज्य प्रदूषण नियंत्रण मंडळ किंवा संबंधित राज्यांच्या समित्या यांचा सहभाग असावा. तसेच केंद्रीय प्रदूषण नियंत्रण मंडळाने दिनांक २४/०४/२०१९ रोजीच्या पत्रानुसार राष्ट्रीय शुध्द हवा कार्यक्रमाच्या प्रभावी अंमलबजावणीसाठी समिती स्थापन करण्याबाबत आदेश दिले आहेत.

**शासन निर्णय :-**

मा.राष्ट्रीय हरीत लवादाचे दिनांक ०८/१०/२०१८ रोजीचे आदेश व केंद्रीय प्रदूषण नियंत्रण मंडळाच्या दिनांक २४/०४/२०१९ रोजीच्या पत्रास अनुसरून, खालीलप्रमाणे नागरी स्तरावर समिती गठीत करण्यात येत आहे.

| अनुक्रमांक | समितीचे सदस्य                                            | पद         |
|------------|----------------------------------------------------------|------------|
| १.         | जिल्हाधिकारी / महापालिका आयुक्त                          | अध्यक्ष    |
| २.         | पोलिस आयुक्तांचे प्रतिनिधी                               | सदस्य      |
| ३.         | प्रतिनिधी- जिल्हाधिकारी / महापालिका आयुक्त<br>/नगरपालिका | सदस्य      |
| ४.         | शैक्षणिक संस्था अथवा संशोधन संस्थेतील तज्ञ               | सदस्य      |
| ५.         | जिल्हा आरोग्य अधिकारी                                    | सदस्य      |
| ६.         | प्रादेशिक वाहतूक अधिकारी                                 | सदस्य      |
| ७.         | कारखान्यांच्या संस्थेचे प्रतिनिधी                        | सदस्य      |
| ८.         | प्रादेशिक अधिकारी, महाराष्ट्र प्रदूषण नियंत्रण मंडळ      | सदस्य सचिव |

जिल्हाधिकारी/महापालिका आयुक्त यांनी यांच्या कार्यक्षेत्रातील नामवंत शैक्षणिक संस्था व संशोधन संस्था यांच्या प्रतिनिधींची तज्ञ सदस्य म्हणून नियुक्ती करावी.

सदर समितीच कार्यकक्षा खालीलप्रमाणे राहिल.

१. IIT (B)/NEERI यांच्या तज्ज्ञ समितीने सादर केलेल्या मसुदा हस्तक्षेप आणि नागरी कृती योजनांचे पुनरावलोकन करणे आणि त्यांना राज्यस्तरीय हवा गुणवत्ता तपासणी समितीकडे पाठवणे.
२. कार्यक्रमाची काटेकोर अंमलबजावणी सुनिश्चित करण्यासाठी राष्ट्रीय शुध्द हवा कार्यक्रमा अंतर्गत घटक / उपक्रमांच्या प्रगतीची देखरेख करणे.
३. राष्ट्रीय शुध्द हवा कार्यक्रमा अंतर्गत सर्व हस्तक्षेप कार्यक्रम दस्तावेज / परिचालन मार्गदर्शक तत्वांच्या अनुषंगाने आणि शहर / घटकानुसार अंमलबजावणी करणाऱ्या एजन्सी / भागीदारांना अपेक्षित परिणाम साधण्यासाठी योग्यरित्या कार्यरत आहेत , याची देखरेख करणे.
४. त्यांना संदर्भित केलेल्या इतर कोणत्याही बाबींचे पुनरावलोकन करणे आणि आवश्यकतेनुसार या विषयांवरील शिफारसी करणे.
५. राष्ट्रीय शुध्द हवा कार्यक्रमा अंतर्गत शहरातील विशिष्ट घटक / उपक्रमांसह संघटनांमधील सहकार्यास उत्तेजन देणे.
६. उपरोक्त कारवाईच्या प्रगतीचे पुनरावलोकन करण्यासाठी नागरी स्तरावरील समिती दरमहा बैठक आयोजित करेल.
७. निरीक्षण समिती आवश्यक असेल तेव्हा दुसऱ्या कुठल्याही व्यक्तीची निवड करेल.
८. नागरी स्तरावरील समिती दररोजच्या देखरेखीसाठी आणि अंमलबजावणीसाठी जबाबदार राहिल.
९. नागरी स्तरावरील समिती मासिक प्रगती अहवाल राज्य पातळीवरील वायु गुणवत्ता नियंत्रण समितीस (एक्यूएमसी) सादर करेल.

सदर शासन निर्णय महाराष्ट्र शासनाच्या [www.maharashtra.gov.in](http://www.maharashtra.gov.in) या संकेतस्थळावर उपलब्ध करण्यात आला असून त्याचा सांकेतांक २०१९०९१८१७४०३३६१०४ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करुन काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने

Shuddhodhan D Aher

Digitally signed by Shuddhodhan D Aher  
DN: cn=Shuddhodhan D Aher, o=Government of Maharashtra, ou=Environment Department,  
2.5.4.20=19193a3058273a0c781430c09f6d94c47c2406a9ccadab677af1844,  
serialNumber=dad3a978d74c807997e551ed02a0b11c3495f5de48838762773  
315c, cn=Shuddhodhan D Aher  
Date: 2019.09.18 18:04:06 +05'30'

(शु. द. आहेर)

उप सचिव, महाराष्ट्र शासन

प्रति,

- १) मा. मुख्यमंत्री यांचे प्रधान सचिव, मंत्रालय, मुंबई ३२
- २) मा. मंत्री (पर्यावरण) यांचे स्वीय सचिव, मंत्रालय, मुंबई ३२
- ३) मा. राज्य मंत्री (पर्यावरण) यांचे स्वीय सचिव, मंत्रालय, मुंबई ३२
- ४) मुख्य सचिव, महाराष्ट्र शासन, मंत्रालय, मुंबई ३२
- ५) अपर मुख्य सचिव, उद्योग विभाग, महाराष्ट्र शासन, मंत्रालय मुंबई
- ६) प्रधान सचिव, नगर विकास विभाग, महाराष्ट्र शासन, मंत्रालय मुंबई
- ७) प्रधान सचिव, कृषी विभाग, महाराष्ट्र शासन, मंत्रालय, मुंबई
- ८) सचिव, गृह विभाग (परीवहन) महाराष्ट्र शासन, मंत्रालय, मुंबई
- ९) संचालक, (पर्यावरण), मुंबई
- १०) संदस्य सचिव, महाराष्ट्र प्रदुषण नियंत्रण मंडळ, मुंबई
- ११) सर्व जिल्हाधिकारी
- १२) पोलीस आयुक्तांचे प्रतिनीधी

- १३) सर्व महापालिका आयुक्त
- १४) सर्व मुख्याधिकारी, नगरपालिका
- १५) सर्व जिल्हा आरोग्य अधिकारी
- १६) सर्व प्रादेशिक वाहतूक अधिकारी,
- १७) सर्व प्रादेशिक अधिकारी, महाराष्ट्र प्रदूषण नियंत्रण मंडळ.

**Constitution of City Level Committee  
for effective implementation of  
National Clean Air Program (NCAP).**

**GOVERNMENT OF MAHARASHTRA**

**Environment Department**

**Government Resolution No. NCA 2018/CR.196(2)/T.C.2**

15<sup>th</sup> Floor, New Administrative Building, Hutatma Rajguru Marg,

Madam Cama Marg, Mantralaya, Mumbai-400 032.

Dated 18<sup>th</sup> September, 2019

**Read :-**

1. Environment (Protection) Act, 1986 (Amendment from time to time).
2. Air (Prevention & Control of Pollution) Act, 1981 (Amendment from time to time)
3. Order dated 08/10/2018 passed by the Hon'ble National Green Tribunal, Principal Bench New Delhi in Application No.681/2018
4. Letter dated 24/04/2019 received from the Central Pollution Control Board.

**Preamble:**

The Hon'ble National Green Tribunal, Principal Bench, New Delhi vide order dated 8/10/2018 passed in Application No.681/2018 directed that all the States and Union Territories with non-attainment cities must prepare appropriate Action Plans within two months aimed at bringing the standards of air quality within the prescribed norms within six months from the date of finalization of the actions. The Hon'ble NGT further directed that the Action Plans may be prepared by six member committee, comprising of Directors of Environment, Transport, Industries, Urban Development, Agriculture and Member Secretary, State Pollution Control Board or Committee of concerned State. The Central Pollution Control Board vide letter dated 24/04/2019 directed to constitute a Committee to ensure effective implementation of NCAP.

**Government Resolution-**

In compliance of the Hon'ble NGT Order dtd.8/10/2018 and CPCB's letter dated 24/04/2019, the following City Level Air Quality Monitoring Committee is hereby constituted.

| <b>Sr.No.</b> | <b>Committee Member</b>                                                | <b>Designation</b> |
|---------------|------------------------------------------------------------------------|--------------------|
| 1.            | District Collector/ Municipal Commissioner                             | Chairman           |
| 2.            | Representative of Commissioner of Police                               | Member             |
| 3.            | Representative of District Collector / Municipal Corporation / Council | Member             |
| 4.            | Expert member from academics or research institutes                    | Member             |
| 5.            | District Health Officer                                                | Member             |
| 6.            | Regional Transport Officer                                             | Member             |
| 7.            | Industry Association Representative                                    | Member             |
| 8.            | Regional Officer, Maharashtra Pollution Control Board                  | Member Secretary   |

District Collector/ Commissioner of Municipal Corporation shall appoint the Expert Member from esteemed academic and research institutes.



As per the instructions received from the Member Secretary, MPCB Mumbai vide letter No. MPCB/NCAP/Dir-2020/B-201208-FTS-0252 dated 08/12/2020 an Air Pollution Mitigation Cell (APMC) has to be set up under the authority of the Chief Executive Officer, Aurangabad. This dedicated cell will monitor the implementation of the Action Plan approved under the National Clean Air Program (NCAP) and will submit regular progress reports to the Maharashtra Pollution Control Board.

Considering the above the following staff is hereby deputed to form a City Level committee for implementation of the recommendations on Urban Local Grants for ambient air quality component - (air quality improvement) under 15<sup>th</sup> Finance Commission.

**City Level Committee**

- |                                                                 |                      |
|-----------------------------------------------------------------|----------------------|
| 1) Shri. Vikrant Sahadeo More, CEO                              | - Presiding officer. |
| 2) Shri. Umesh N. Waghmare, SE -I.                              | - Nodal Officer.     |
| 3) Shri. Nilesh M. Tanpure, SE - II.                            | - Member             |
| 4) Shri. Santoshkumar Bansile, S.I.                             | - Member             |
| 5) Dr. Geetanjali Kaushik, Consultant.                          | - Member             |
| 6) Representative of Regional Office, MPCB, Aurangabad.         | - Member             |
| 7) Representative of Aurangabad Municipal Corporation.          | - Member             |
| 8) Shri. Sumit Pagare, Junior Clerk                             | - Member             |
| 9) Smt. Priyanka Targe, Administrator, Cantt. Eng. Med. School. | - Member             |

The duties / role and responsibilities of each member is annexed herewith.

| Sr. No. | Name                             | Roles / Duties                                                                                                                                                                                                                                                                                                                                                 |
|---------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Shri. Umesh N. Waghmare, SE - I. | To prepare the detailed report on road works to be undertaken viz planning, estimation etc required for implementation and utilization of funds under NCAP and keeping the records of work done. Conducting of monthly meeting of committee members and noting and reporting the minutes of the meetings to the MPCB/ Concerned authority as and when required |
| 2       | Shri. Nilesh M. Tanpure, SE - II | To prepare the detailed report on tree plantation, garden development and maintenance work to be undertaken viz planning, design, estimation etc required for implementation and utilization of funds under NCAP and keeping the records of work done                                                                                                          |
| 3       | Shri. Santoshkumar Bansile, S.I. | To prepare the detailed report on Municipal Solid Waste Management and Sanitation and allied work of purchasing the machineries and equipments for the same required for implementation and utilization of funds under NCAP and keeping the records of work done.                                                                                              |
| 4       | Dr. Geetanjali Kaushik,          | Will be working as Project Consultant and she will coordinate with the MPCB and concerned authorities /                                                                                                                                                                                                                                                        |

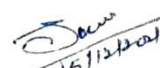


|   |                                                              |                                                                                                                                                                                                                                                                                                                                                                       |
|---|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Consultant                                                   | departments under NCAP. To guide and advice the committee members for preparation of detail project report of all the works as per Govt. rules and regulations. Submitting and getting approval of consolidated project report of Cantonment Board Aurangabad from the concerned authorities. Preparation and submitting the other allied details required under NCAP |
| 5 | Shri. Sumit Pagare, Junior Clerk                             | For maintaining the records of grants received from Government and keeping the accounts / bills and payments done under the ambient air quality grants                                                                                                                                                                                                                |
| 6 | Smt. Priyanka Targe, Administrator, Cantt. Eng. Med. School. | To arrange awareness camp among the school students of Cantonment area with respect to air quality improvement and Municipal Solid Waste management and handling as and when required / asked by the city level committee.                                                                                                                                            |

The aforesaid committee members will work under presiding officer and shall submit their respective work details for planning, implementation and utilization for the funds under NCAP.

  
(Vikrant Sahadeo More)  
Chief Executive Officer,  
Aurangabad Cantonment Board.

Copy to :-

- 1) Individuals 
- 2) Office order book
- 3) Concerned file
- 4) Personal files 

**MINUTES OF THE CITY LEVEL COMMITTEE MONTHLY MEETING UNDER  
NATIONAL CLEAN AIR PROGRAMME (NCAP) FOR CANTONMENT BOARD  
AURANGABAD HELD ON 08/12/2021 IN THE CEO's CABIN**

- 1) As per the instructions received from the Member Secretary, MPCB Mumbai vide letter No. MPCB/NCAP/Dir-2020/B-201208-FTS-0252 dated 08/12/2020 an Air Pollution Mitigation Cell (APMC), city level committee has to be formed under the authority of the Chief Executive Officer, Aurangabad. The city level committee thus formed will monitor the implementation of the Action Plan approved under the National Clean Air Program (NCAP) and will submit regular progress reports to the Maharashtra Pollution Control Board.
- 2) During the meeting emphasis was given to implement and utilize the funds received under ambient air programme within the restricted time limit.
- 3) Tentative allotment of funds to different works was finalized in the meeting viz.
  - a) Cantonment Board road improvement - Rs. 24 Lakhs
  - b) Municipal Solid Waste Management - Rs. 12 Lakhs
  - c) Garden improvements in Cantonment area - Rs. 10 Lakhs
  - d) Public awareness, preparation and implementation - Rs. 2 Lakhof Action plan and reporting to Dr. Geetanjali Kaushik
- 4) Awareness camp conducted in front of students in Cantonment English Medium School regarding Solid Waste Management and Air pollution.
- 5) Next committee level meeting in the 1<sup>st</sup> week of January 2022 has been finalized.
- 6) Following staff were present during the meeting
  - i) Shri. Umesh N. Waghmare, Sectional Engineer – I
  - ii) Shri. Nilesh M. Tanpure, Sectional Engineer – II
  - iii) Shri. Santoshkumar Bansile, Sanitary Inspector,
  - iv) Dr. Geetanjali Kaushik, Consultant

The attendance sheet chart is attached herewith.



Nodal officer,  
City Level Committee  
Cantonment Board, Aurangabad.

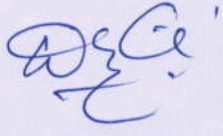


(Vikrant Sahadeo More)  
CEO & Presiding Officer,  
City Level Committee  
Cantonment Board, Aurangabad.



CITY LEVEL IMPLEMENTATION  
COMMITTEE MEETING

8th Dec 2021, CEO Cabin  
Attendance

1. DR. GEETANJALI Consultant Gedajali
- 2) Vikrant S. More 
- 3) Mr. Umesh N. Waghmare 
- 4) Sanjay K. Borasile 
- 5) Vilas H. Gite 
- 6) Nilesh M. Tampur 



औरंगाबाद छावनी परिषद  
बंगला नं. १०, नगर रोड, औरंगाबाद छावनी,  
औरंगाबाद, महाराष्ट्र-४३१००२

दूरभाष : ०२४०-२३७०८०६ | ई-मेल: [aurangabadcantonment@gmail.com](mailto:aurangabadcantonment@gmail.com)

**Letter No:** ०२/CBA/SWM/२०२१

**Date** १५ December, २०२१

**DECLARATION**

Aurangabad Cantonment Board hereby declared that around ०.३ TPD of municipal Construction and Demoliation waste generated in the Cantonment is used for landfilling in low laying area in the Cantonment.

(Vikrant S. More)  
Chief Executive Officer,  
Aurangabad Cantonment Board



औरंगाबाद छावनी परिषद  
बंगला नं. १०, नगर रोड, औरंगाबाद छावनी,  
औरंगाबाद, महाराष्ट्र-431002

दूरभाष : 0240-2370806 | ई-मेल: [aurangabadcantonment@gmail.com](mailto:aurangabadcantonment@gmail.com)

**Letter No:** 02/CBA/SWM/2021

**Date** 15 December, 2021

**DECLARATION**

Aurangabad Cantonment Board hereby declared that around 06 TPD of municipal solid waste generated in the Cantonment is treated daily by the Cantonment Board with help of decentralized solid waste management plant and one MRF facility.

(Vikrant S. More)  
Chief Executive Officer,  
Aurangabad Cantonment Board





औरंगाबाद छावनी परिषद  
बंगला नं. १०, नगर रोड, औरंगाबाद छावनी,  
औरंगाबाद, महाराष्ट्र-४३१००२

दूरभाष : ०२४०-२३७०८०६ | ई-मेल: [aurangabadcantonment@gmail.com](mailto:aurangabadcantonment@gmail.com)

**Letter No:** ०२/CBA/SWM/२०२१

**Date** १५ December, २०२१

**DECLARATION**

Aurangabad Cantonment Board hereby declared that there is no legacy waste in  
Cantonment Board

(Vikrant S. More)  
Chief Executive Officer,  
Aurangabad Cantonment Board



औरंगाबाद छावनी परिषद  
बंगला नं. १०, नगर रोड, औरंगाबाद छावनी,  
औरंगाबाद, महाराष्ट्र-४३१००२

दूरभाष : ०२४०-२३७०८०६ | ई-मेल: [aurangabadcantonment@gmail.com](mailto:aurangabadcantonment@gmail.com)

Letter No: 02/CBA/SWM/2021

Date 15 December, 2021

**DECLARATION**

Aurangabad Cantonment Board hereby declared that around 0.5 TPD of plastic waste generated in the Cantonment is treated daily by the Cantonment Board with help of decentralized solid waste management plant and one MRF facility.

(Vikrant S. More)  
Chief Executive Officer,  
Aurangabad Cantonment Board



## CI (ii) ROAD LENGTH

[illegible]



C1 (ii) ROAD LENGTH

| Sr. no                        | Location of Road                                                                    | Type of Road | Length of road (2017-18) | Location of Road                                  | Type of Road | Length of road (2017-18) |
|-------------------------------|-------------------------------------------------------------------------------------|--------------|--------------------------|---------------------------------------------------|--------------|--------------------------|
| 1                             | <b>from group latrine to Ajanta Bhavan</b>                                          | concrete     | 125                      | from old cantt to mutton market chowk             | Tar          | 130                      |
| 2                             | from Corporation main road - group latrine in front of H. No. 1147/51 in ward No. 1 | concrete     | 7                        | from Disuzas house to Maulana Azad garden         | Tar          | 160                      |
| 3                             | in Ward No. 03 near H. No. 208, 165, 61, 45, 179, 180 etc & nearby area             | concrete     | 160                      | from DS more house to Cantt hospital              | Tar          | 177                      |
| 4                             | in Ward No. 05 near H. No. 822, 824 at the end of lane no. 7                        | concrete     | 95                       | from flag staff house - CEO residence - Dass park | Tar          | 550                      |
| 5                             | ward no. 6 near H. No. 653, 650B, 658, 678 & Near Masjid                            | concrete     | 130                      | Paul Studio to patel chowk                        | Tar          | 240                      |
| 6                             | near Kshirsagar house to Vitthal Rukmai Mandir ward No. 7                           | concrete     | 120                      | Patel Chowk to Subhash Peth Ganesh Mandir         | Tar          | 145                      |
| 7                             | near H. No. 64, 59, 54, 37, 34 in ward no. 3                                        | concrete     | 68                       | from Subhash Peth ganesh mandir to beef market    | Tar          | 60                       |
| 8                             | ward no. 6 near H. No. 653, 650B, 658, 678 & Near Masjid                            | concrete     | 75                       | Nagar Naka to Flag staff house                    | Tar          | 502                      |
| 11                            | <b>behind ellora lawns om way towards More's house</b>                              | concrete     | 67                       | Flag Staff house to DOI                           | Tar          | 405                      |
| 16                            | Jain Mandir upto Mata Mandir                                                        | concrete     | 130                      | Daspark to CEO residence to MES AGE office        | tar          | 595                      |
| 21                            | near group latrine compound wall & nearby area ward no. 01                          | concrete     | 170                      | Brigade Mess to Paul studio                       | Tar          | 80                       |
| 22                            | near H. No. 1168, 1177 ward No. 01                                                  | concrete     | 120                      | Brigade Mess to MSEB corner                       | Tar          | 380                      |
| 23                            | near Vitthal Rikhmai Mandir in ward no. 7                                           | concrete     | 143                      | Paul Studio to Miliind chowk                      | Tar          | 323                      |
| 24                            | near H. No. 574, 572, 543 ward no. 6                                                | concrete     | 65                       | MSEB office to Nehru Chowk                        | Tar          | 238                      |
| 25                            | in lane no. 11, H. No. 909 to 923 main road ward no. 5                              | concrete     | 251                      | Paul Studio to Miliind chowk                      | Tar          | 75                       |
| 29                            | Near Baba petrol pump / inspection bungalow vet booth                               | concrete     | 75                       | DOI B. No. 33 to flag staff house                 | Tar          | 310                      |
| 30                            | VET booth road Padegaon                                                             | concrete     | 65                       | Old nagar naka to flag staff house                | Tar          | 252                      |
| 31                            | Padegaon Tol Naka                                                                   | concrete     | 10                       | Flag staff house to Gun house                     | Tar          | 240                      |
| 32                            | Subhash Peth lane no. 2 and 3                                                       | concrete     | 168                      | Income Tax office to Holy cross end corner        | Tar          | 174                      |
| 33                            | Karnapura VET booth road                                                            | concrete     | 93                       | ZP School to sump house                           | Tar          | 474                      |
| 35                            | Ahmednagar Golwadi VET booth                                                        | concrete     | 95                       |                                                   |              |                          |
| 36                            | Karnapura Devi Road                                                                 | concrete     | 43                       |                                                   |              |                          |
| 37                            | inside weekly market                                                                | concrete     | 40                       |                                                   |              |                          |
| 40                            | in front of ACP office                                                              | concrete     | 28                       |                                                   |              |                          |
| 41                            | Old cantt. office to sump house                                                     | concrete     | 248                      |                                                   |              |                          |
| 47                            | inside weekly market                                                                | concrete     | 85                       |                                                   |              |                          |
| 48                            | Near Cantt School opposite ellora lawns                                             | concrete     | 60                       |                                                   |              |                          |
| 49                            | weekly market to south west corner on garampani road                                | concrete     | 56                       |                                                   |              |                          |
| <b>Total Length in Meters</b> |                                                                                     |              | <b>2792</b>              |                                                   |              | <b>6192</b>              |

  
 (Vikrant Sahadeo More)  
 Chief Executive Officer  
 Cantonment Board, Aurangabad



## C1 (ii) ROAD LENGTH

| Sr. no | Location of Road                                                          | Type of Road | Length of road<br>(2018-19) | Location of Road                                 | Type of Road | Length of road<br>(2018-19) |
|--------|---------------------------------------------------------------------------|--------------|-----------------------------|--------------------------------------------------|--------------|-----------------------------|
| 1      | from weekly market south west corner on Garampani road near compound wall | concrete     | 56                          | from ZP Girls school to Cantt water sump house   | Tar road     | 340                         |
| 2      | Near Cantt school (Old ZP school) opposite ellora lawns                   | concrete     | 60                          | From Income Tax office to Holly Cross end corner | Tar road     | 174                         |
| 3      | Besides Animal shed inside weekly market                                  | concrete     | 85                          | from flag staff house square to gun house        | Tar road     | 234                         |
| 4      | Old Cantt Board Office front to sunp house, Tophkhana area                | concrete     | 248                         | from Old nagar naka upto flag staff house square | Tar road     | 252                         |
| 5      | lane infront of ACP office                                                | concrete     | 28                          | from DOI B. No. 33 to flag staff house           | Tar road     | 310                         |
|        |                                                                           |              |                             | from MSEB (GTL Sub station) to Nehru Chowk       | Tar road     | 237                         |
|        |                                                                           |              |                             | Paul studio to Milind Chowk                      | Tar road     | 322                         |
|        |                                                                           |              |                             | from Brigade Mess to MSEB corner                 | Tar road     | 379                         |
|        |                                                                           |              |                             |                                                  |              |                             |
|        |                                                                           |              |                             |                                                  |              |                             |
|        |                                                                           |              |                             |                                                  |              |                             |
|        |                                                                           |              |                             |                                                  |              |                             |
|        |                                                                           |              |                             |                                                  |              |                             |
|        |                                                                           |              |                             |                                                  |              |                             |
|        | Total Length in Meters                                                    |              | 477                         |                                                  |              | 2248                        |

(Vikrant Sahadeo More)  
Chief Executive Officer  
Cantonment Board, Aurangabad

