ACTION PLAN FOR CONTROL OF AIR POLLUTION IN MIRA BHAYANDAR

Submitted to:

Maharashtra Pollution Control Board

Prepared by:

Mira Bhayandar Municipal Corporation

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1 Introduction

1.1 City Overview

Mira Bhayandar is historical town in the Bassien Fort with a rich cultural and historical heritage. It has grown up economically to be one of the leading townships on Maharashtra with its own governing Municipal Corporations, MBMC.

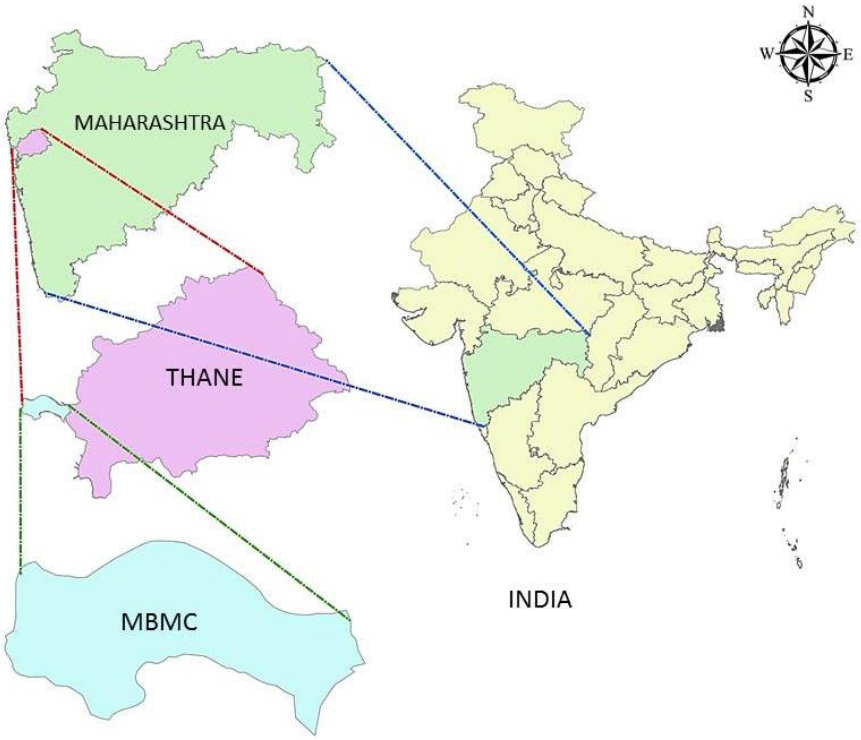
It is situated at the northern threshold of Brihan Mumbai Metropolis. It is an important residential area on the Mumbai suburbs due to lower living cost with industrial development too within the township. Under the jurisdiction of MBMC, there are nineteen villages viz. Khari, Ghoddeo, Ghodbunder, Pen-pada, Mira, Kashi, Navghar, Bhayandar, Mahajan Wadi, Chene, Varsave, Rai Murdha, Murdha, Morva, Uttan, Dongri and Tarodi Pali Chowk. Bhayandar and Mira is divided into two parts each east and west.

Bhayandar west is mainly residential area, while the east is predominantly industrial area. There is an extension of the residential population further south into the Mira Road, but restricted by salt pans and marshlands. Mira road has been only developed on the east part while on the west on the other side is covered by the government owned salt pans and mangroves.

1.2 Location Map

The location map for Mira Bhayandar is shown in Figure 1-1.

Figure 1-1: Location map of Mira Bhayandar Municipal Corporation



1.3 Topography

Mira-Bhayandar city covers an area of 79 sq. km in the district of Thane, in the western state of Maharashtra, India. It is located around 20 kms north of Mumbai-Ahmedabad highway which is between 18°42' N to 20°20' N latitude and 0°25' E to 73°44' E.

It lies to the west of the Sahyadri hills in the northern part of the Konkan hills. The town is a plain level land. Vasai creek surrounds the city from east to west, followed by Arabian Sea till the west. On the southwest lies the city of Mumbai, south is the Sanjay Gandhi national park and on the south east lies thane city. Ghod bunder and Uttan are the hilly regions while the rest of the city is plain terrain mostly water logged and marshy.

1.4 Climate

The city experiences a typical monsoon climate with three distinct seasons – summer, winter and rainy, as elsewhere in India. The average temperature is 26°C and min 15°C, max 30°C the wind direction in the city is form western side about 5 km/hr. The climate in the month of October is wet and hot followed by cool and pleasant weather from December to February and dry and hot weather from March to June. The climate of Mira-Bhayandar is typically coastal sultry and not really hot. There are virtually two distinct seasons, namely monsoon and dry season. The later covers both summer and winter.

Rainfall

The rainy season starts at the beginning of the June and ends in the last week of September. Annual rainfall of is around 3,670.4 mm. The maximum rainfall is in the month of July averaging to 800 mm.

Humidity

The relative humidity in the atmosphere is about 45% to 85% with the highest humidity in the month of July.

1.5 Demography

The population of Mira-Bhayandar, according to the latest census 2011 is 8,09,378. The division of population as per sex ratio and literacy is given below.

Table 1-1: Demography Data of Mira Bhayandar Municipal Corporation

Mira Bhayandar City	Total	Male	Female
City Population	809378	429,260	380,118
Children (0-6)	88,015	46,375	41,640
Literates	656,293	356,434	299,859
Average literacy (%)	90.98	93.09	88.59
Sex Ratio		886	
Child Sex Ratio		898	

1.6 Land Use Pattern

The area of Mira-Bhayandar Corporation is 79.40 sq.km. Only 26.88 % of the total municipal has been developed and the remaining 73.12% consists of water bodies, marshy land and salt pans, forest and hills, which cannot be developed. Out of the total developed area 54.24% (14.58% of total area) is under residential use. Area under commercial use is 2.5% of the developed area and 6.48% is under industrial use. Roads constitute 16.6% of the developed area.

The open space and recreational grounds are lungs of the town and they cater active and passive recreation needs of the city. In Mira-Bhayandar gardens and open spaces provide recreational areas. Large varieties of trees are planted on road side, in open space and gardens.

1.7 Ground Water:

Ground water is used for domestic purposes in the residential as well as industrial areas. The ground water level and quality are one of the primary concerns for the township of Mira-Bhayandar. Primarily sewage and various industrial effluents have contributed the maximum in polluting the ground water.

1.8 Lakes and Ponds

There are 3 major lakes in the city namely Murdha Ram Mandir lake, Uttan Moh lake and Raani Ram Mandir lake. These lakes are facing issues of encroachment from all sides. Indiscriminate dumping of municipal solid waste has led to deterioration of water quality of lakes. Further, the natural water streams are also obstructed due to human activities resulting in drying of these lakes.

1.9 Coastal Waters: Creek

Thane district, on the western side, is dominated by a coastline and associated coastal features such as creeks, small creek-lets, marshy land etc. Mangrove plants along the coastline reduces the impacts of coastal flooding, and hence the mangrove population should be conserved. Solid waste disposal, release of domestic and industrial wastewater in the creeks will have adverse impacts on the aquatic life of this coastal areas.

1.10 Biodiversity Study

Mira - Bhayandar is located adjacent to Sanjay Gandhi National Park thus high diversity of the species in found in the region. Around 18% of the total municipal land is used as salt pans in the region, comprising of 1390 hectare of land. Shallow man-made ponds were designed as salt pans to produce salt from sea water. The sea water is fed into large pans and water is drawn out through natural evaporation which allows the salt to be subsequently harvested.

The flora in the region mainly comprises of the following:

Southern Tropical Moist Mixed Deciduous: The land vegetation is observed as the southern tropical moist deciduous forest. The major tree species found in this area are *Tectona grandis, Salmalia*

malbaricum, Terminalia alata, Madhuca indica, Mangifera indica, etc. Bamboo is also spotted in small patches over in this region.

Western Subtropical Hill Forest is represented by the species like *Terminalia chebula, Adina cordifolia, Syzygium cumini* and *Mangifera indica* are the predominant species. Species like *Ficus hipsida, Morinda citrifolia* are also present.

Estuarine Vegetation is found along the banks of Ulhas Creek flowing adjacent to the cities of Dombilivi and Thane, consisting of mangrove species such as *Avicennia officinalis, Avicennia marina, Aegiceras corniculatum, Exoecaria agallocha, Sonneratia apetala,* etc.

1.11 Municipal Solid Waste Management

MBMC is responsible for collection, treatment and disposal of Municipal Solid Waste (MSW) generated within the municipal corporation. Approximately 500 MT of Municipal Solid Waste is generated every day within the boundaries of MBMC, which is collected and transported to the Integrated Solid Waste Management (ISWM) facility at Uttan, Mira Bhayandar. This treatment facility at Uttan, receives a total of 500 MT of mixed waste daily. After processing in front end operations of Materials Recovery Facility (MRF), it is assumed that about 80% of the waste is recovered. The rest 20%, i.e., the unrecoverable fraction of the waste is disposed on the landfill.

The project activities mainly involve MSW management in a scientific manner at Uttan treatment facility. Management activities might affect different environmental components during operation period if not scientifically managed. Contamination of surface and subsurface water sources, release of harmful landfill gases, breeding of disease spreading organisms etc. are some of the consequences of unscientific management of a landfill.

2 Air Pollution

Central Pollution Control Board (CPCB) has specified standard limits for various pollutants. Emissions from vehicles, construction work etc. are the main sources of air pollution as they emit sulphur dioxides, nitrogen dioxides, carbon monoxide, suspended particulate matter, etc.

Air pollution is the presence of one or more contaminants in the atmosphere in such quantity and for such duration as is injurious, or tends to be injurious, to human health or welfare, animal or plant life. It is the contamination of air by the discharge of harmful substances. Air pollution can cause health problems and it can also damage the environment and property. It has caused thinning of the protective ozone layer of the atmosphere, which is leading to climate change. Modernization and progress have led to air getting more and more polluted over the years. Industries, vehicles, increase in the population, and urbanization are some of the major factors responsible for air pollution.

2.1 Sources of Air Pollution

Air pollutants are primarily gaseous, liquid or solid particles dispersed in the air and deteriorating its quality. The concentration of these pollutants in and near the urban areas have raised serious concerns. The largest sources of human-created air pollution are energy generation, transportation, and industries that use a great deal of energy sources. Depending on their source and interactions with other components of the air, they can have different chemical compositions and health impacts. Since these pollutants are generally concentrated in and around urban areas, the outdoor urban pollution levels are far higher than in the rural areas. Fires are another major source of air pollution and can lead to severe problems if the smoke is inhaled for a period of time. These fires can either be forest fires, oil well fires, burning of leaves in the backyard or as in the case of rural areas, large-scale burning of agricultural waste. Other sources include industries and power plants located in these areas. The various types of sources are discussed below:

- **Point Sources:** Any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack, power plants, dry cleaners and degreasing operations.
- **Line Sources:** An air pollution line source is an idealized geometric emitter, which can be represented by an emission source consisting simply of a straight line, which may be of finite or infinite length. The utility of this model is the ability to serve as a proxy for roadway, railway or aircraft air pollution sources.
- **Area Sources:** Area sources are sources of pollution which emit a substance or radiation from a specified area. Area sources are mainly domestic sources of fuel (Coal, Wood, Kerosene, LPG) burning, trash/ MSW burning, bakeries, hotels/restaurants, markets etc.

Air pollution can be formed through both natural and man-made processes. Some examples of these are listed below:

- **Man Made Sources:**
  - **Transport - Roads and Rails:** Vehicles like cars, vans, buses and Lorries run on petrol or diesel. When these fuels are burnt in the engine, pollutants are released out through the exhaust of the vehicles. This means road traffic is one of the biggest sources of air pollution. Roads are sources of pollutants such as nitrogen oxides, sulphur dioxide, carbon monoxide and particulate matter.
  - **Trains** cause a lot less pollution than the same journey made by car. However, trains still pollute the environment. Electric trains use the electricity which is generated at power stations. When these fuels are burnt, pollutants like nitrogen oxides, sulphur dioxide and particulate matter are released into the atmosphere.
  - **Agriculture and Livestock:** Agricultural waste residues when disposed unscientifically, undergoes certain amount of anaerobic decomposition which results in the release of methane gas. Animals like cows and sheep release a massive amount of methane through belching and breaking wind. Methane is produced in their stomachs when bacteria break down the food that they eat. Across the whole world, livestock is one of the biggest sources of methane. Methane is the second most important greenhouse gas which can cause climate change.
  - **Industry :** Particulate matters (like dust, fly ash, etc.), nitrogen dioxide and sulphur dioxide are the main pollutants associated with industrial processes
  - **Waste:** Methane from waste disposal is one of the largest emitters, with agriculture and livestock coming second. Methane is released into the atmosphere when the waste that we throw away decomposes. Methane is the second most important greenhouse gas after carbon dioxide, which means that it also contributes towards climate change. Burning of old or fresh municipal solid waste also has a potential to release numerous toxic gases.
  - **Street sweeping:** Street sweeping causes resuspension of the already deposited dust particles, which results in increase of particulate matter (PM2.5 and PM10) emissions in the vicinity and ultimately causes several health impacts.
- **Natural sources:** Air pollutants are released during catastrophes such as volcanic eruptions and forest fires. Large amounts of harmful gases and smoke are released which can increase background pollution levels for years - even in areas far away from the original source. Ozone is one of the most common natural air pollutants.

2.2 Indoor air pollution

Indoor air pollution can be particularly hazardous to health as it is released in close proximity to people. It is stated that a pollutant released indoors is many times more likely to reach the lung than that released outdoors. In the developing countries a fairly large portion of the population is dependent on biomass for their energy requirements. These include wood, charcoal, agricultural

residue, and animal waste. Open fires used for cooking and heating are commonly found in the household both in the rural and the urban areas. The stove is often at floor level, adding to the risk of accident and the hygiene factor. In addition, they are often not fitted with a chimney to remove the pollutants. In such households the children and women are most likely to be affected, as they are the group that spends more time indoors. The main pollutant in this environment is the SPM. In fact, death due to indoor air pollution, mainly particulate matters, in the rural areas of India is one of the highest in the world. Many of the deaths are due to acute respiratory infections in children; others are due to cardiovascular diseases, lung cancer, and chronic respiratory diseases in adults. If emissions are high and ventilation is poor, household use of coal and biomass can severely affect the indoor air quality.

Pollutant emissions per meal are also very high compared to those of other fuels. Household use of fossil fuel is also fairly common in the developing countries, particularly coal. These are particularly damaging as they burn inefficiently and emit considerable quantities of air pollutants. If emissions are high and ventilation poor, then the exposure levels to the gases emitted are far higher. The most harmful of the gases and agents that are emitted are particulate matter, carbon dioxide, polycyclic organic matter, and formaldehyde. The indoor concentrations of these pollutants are far higher than the acceptable levels and are cause for concern in rural areas.

2.3 Health Effects

Long-term exposure to polluted air can have permanent health effects such as: Accelerated aging of the lungs. Loss of lung capacity and decreased lung function. Development of diseases such as asthma, bronchitis, emphysema, and possibly cancer. shortened life span

Even healthy people can experience health impacts from polluted air including respiratory irritation or breathing difficulties during exercise or outdoor activities. Your actual risk of adverse effects depends on your current health status, the pollutant type and concentration, and the length of your exposure to the polluted air.

- High air pollution levels can cause immediate health problems including:
  - ✓ Aggravated cardiovascular and respiratory illness.
  - ✓ Added stress to heart and lungs, which must work harder to supply the body with oxygen.
  - ✓ Damaged cells in the respiratory system.
  - ✓ Some of these gases can seriously and adversely affect the health of the population and should be given due attention by the concerned authority. The gases mentioned below are mainly outdoor air pollutants but some of them can and do occur indoor depending on the source and the circumstances.
- Those most susceptible to severe health problems from air pollution are:

- ✓ Individuals with heart disease, coronary artery disease or congestive heart failure
- ✓ Individuals with lung diseases such as asthma, emphysema or chronic obstructive pulmonary disease (COPD)
- ✓ Pregnant women
- ✓ Outdoor workers
- ✓ Older adults and the elderly
- ✓ Children under age 14
- ✓ Athletes who exercise vigorously outdoors
- ✓ People in these groups may experience health impacts at lower air pollution exposure levels, or their health effects may be of greater intensity.

❖ **Ground-level Ozone:** Ground-level ozone is formed when volatile organic compounds (VOCs) and oxides of nitrogen (NOx) react with the sun's ultraviolet rays. The primary source of VOCs and NOx is mobile sources, including cars, trucks, buses, construction equipment and agricultural equipment. Ground-level ozone reaches its highest level during the afternoon and early evening hours. High levels occur most often during the summer months. It is a strong irritant that can cause constriction of the airways, forcing the respiratory system to work harder in order to provide oxygen.

➢ It can also cause other health problems including:

- ✓ Aggravated respiratory disease such as emphysema, bronchitis and asthma
- ✓ Lung damage, even after symptoms such as coughing or a sore throat disappear
- ✓ Wheezing, chest pain, dry throat, headache or nausea
- ✓ Reduced resistance to infections
- ✓ Increased fatigue
- ✓ Weakened athletic performance

❖ **Particulate Matter (PM) and Wildfire Smoke:** Particulate Matter is a complex mixture that may contain soot, smoke, metals, nitrates, sulphates, dust, and water and tire rubber. It can be directly emitted, as in smoke from a fire, or it can form in the atmosphere from reactions of gases such as nitrogen oxides. The size of particles is directly linked to their potential for causing health problems. Small particles (known as PM2.5 or fine particulate matter) pose the greatest problems because they bypass the body's natural defences and can get deep into your lungs and potentially your bloodstream. Exposure to such particles can affect both your lungs and your heart.

- **SPM (suspended particulate matter):** Suspended matter consists of dust, fumes, mist and smoke. The main chemical component of SPM that is of major concern is lead, others being nickel, arsenic, and those present in diesel exhaust. These particles when breathed in, lodge in our lung tissues and cause lung damage and respiratory problems. The importance of SPM as a major pollutant needs special emphasis as - a) it affects more people globally than any other pollutant on a continuing basis; b) there is more monitoring data available on this than any other pollutant; and c) more epidemiological evidence has been collected on the exposure to this than to any other pollutant.
  - Long-term exposure to particulate pollution can result in significant health problems including:
    - ✓ Increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing
    - ✓ Decreased lung function
    - ✓ Aggravated asthma
    - ✓ Development of chronic respiratory disease in children
    - ✓ Development of chronic bronchitis or chronic obstructive lung disease
    - ✓ Irregular heartbeat
    - ✓ Nonfatal heart attacks
    - ✓ Premature death in people with heart or lung disease, including death from lung cancer
  - Short-term exposure to particulate pollution can:
    - ✓ Aggravate lung disease causing asthma attacks and acute bronchitis
    - ✓ Increase susceptibility to respiratory infections
    - ✓ Cause heart attacks and arrhythmias in people with heart disease
  - Even if you are healthy, you may experience temporary symptoms, such as:
    - ✓ Irritation of the eyes, nose and throat
    - ✓ Coughing
    - ✓ Chest tightness
    - ✓ Shortness of breath
- **Respirable Suspended Particulate Matter:** Particulate matter is characterized according to size - mainly because of the different health effects associated with particles of different diameters. Particulate matter (PM) is a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. It includes aerosols, smoke, fumes, dust, ash and pollen. These particles vary greatly in shape, size and chemical composition, and

can be made up of many different materials such as metals, soot, soil, and dust. Particles 10 microns or less in diameter are defined as" Respirable Suspended Particulate Matter". Respirable particulates, lodge in the lung capillaries and alveoli, causing adverse health effects. The composition of particulate matter varies with place, season and weather conditions.

- **Nitrogen oxides:** A nitrogen oxide, or NOx, is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colourless and odourless. However, one common pollutant, nitrogen dioxide (NO_2) along with particles in the air can often be seen as a reddish-brown layer in many urban areas. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NOx are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. NOx can also be formed naturally.

- **Sulphur dioxide:** Sulphur dioxide, or SO_2, belongs to the family of sulphur oxide gases (SOx). These gases dissolve easily in water. Sulphur is prevalent in all raw materials, including crude oil, coal, and ore that contains common metals like aluminium, copper, zinc, lead, and iron. SOx gases are formed when fuel containing sulphur, such as coal and oil, is burned, and when gas online is extracted from oil, or metals are extracted from ore. SO_2 dissolves in water vapor to form acid, and interacts with other gases and particles in the air to form sulphates and other products that can be harmful to people and their environment.

2.4 Ambient Air Quality Monitoring

2.4.1 Sampling Locations

Mira-Bhayandar air pollution monitoring is being done at various locations, which includes solid waste disposal site, residential, commercial & industrial area. Ambient Air Quality Monitoring (AAQM) sampling is carried out at twelve locations in a month and their details are as follow:

1. **Kashimira Chowk, Near Chhatrapati Shivaji Maharaj Statue**
2. **Near Bhayandar Police Station**
3. **Mira Road Railway station**
4. **Bhayandar west, Railway Station**
5. **S.K. stone Chowk**
6. **Near Pali, St. Andrew Chowk**
7. **Bhayandar East, Cabin Road**
8. **Bhayandar East B.P. Road**
9. **Bhayandar St. East Navghar Road**
10. **Uttan naka Bus Stop chowk**

11. Kanakia Police station Mira Road

12. Mira-Bhayandar corporation ghankachra vyavasthapan

2.4.2 Sampler

An instrument called a high-volume air sampler is used to collect total suspended particle (TSP) samples. The high-volume air sampler draws a large known volume of air through a pre-weighed filter for 24 hours. As shown in the illustration, the sampler filter traps the TSP particles as air passes through the instrument. The filter is later weighed to estimate the particulate concentration.

Absorbing solutions in impingers, enclosed in gas kits are used to sample SO_x and NO_x from the air. The air passing through the filter paper is passed through the absorbing solution and later these solutions are analysed to estimate the SO_x and NO_x concentration.

Figure 2-1: Ambient Air Quality Monitoring using High Volume Sampler

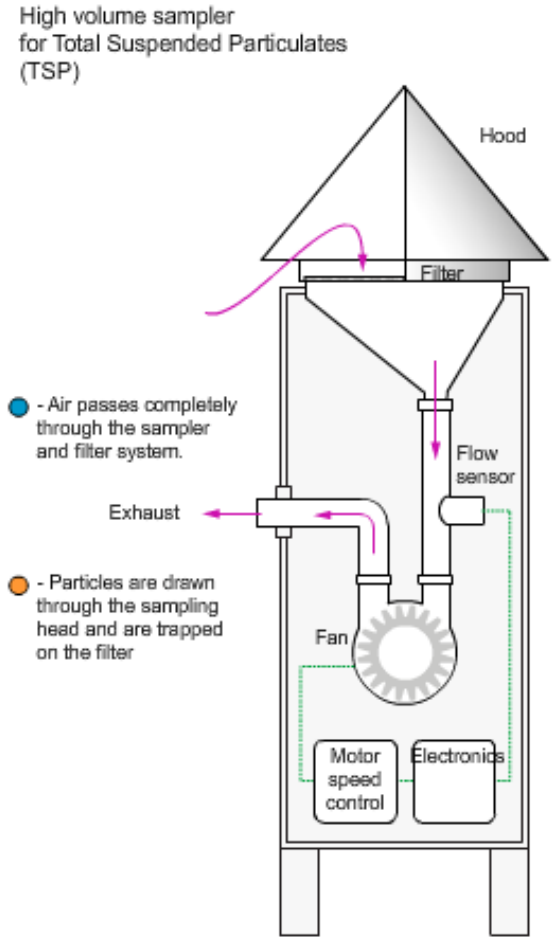
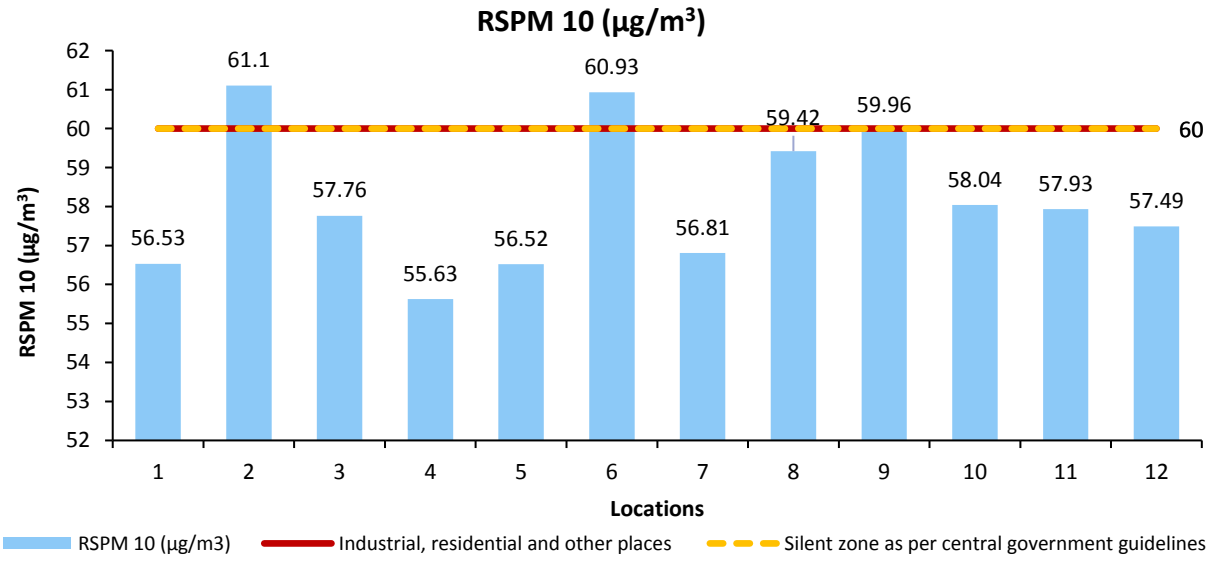


Figure 2-2: On field ambient air quality monitoring

2.4.3 Results

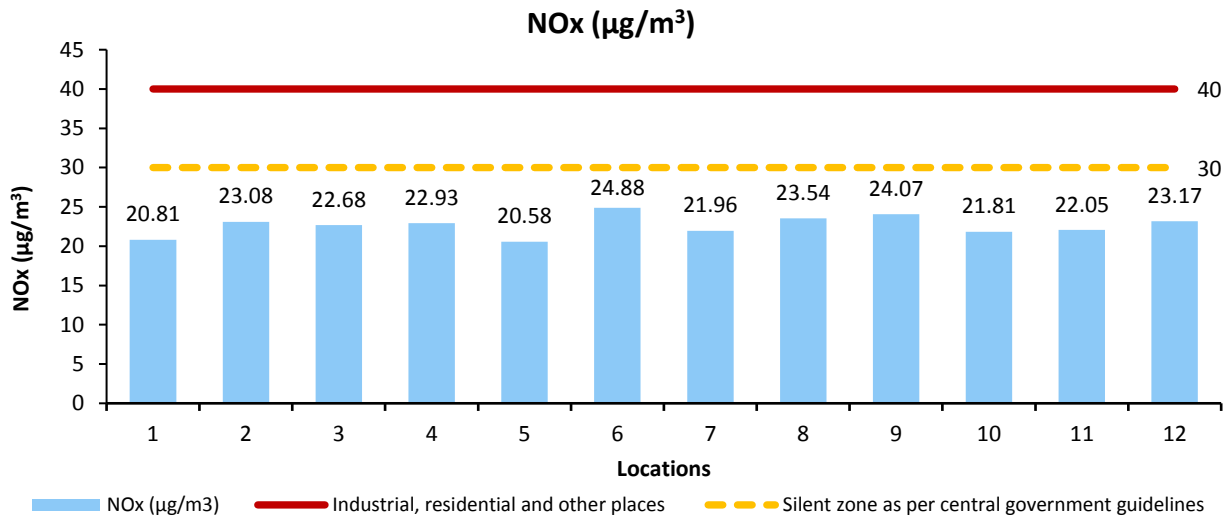
The analysis results of the ambient air quality monitoring are discussed below. The analysis has been averaged from a of period one year, which is, from July 2020 to June 2021. Respirable suspended particulate matter, NO_x and SO_2 have been monitored and analysed.

Figure 2-3: Annual average concentration of RSPM in the ambient air at 12 monitoring location



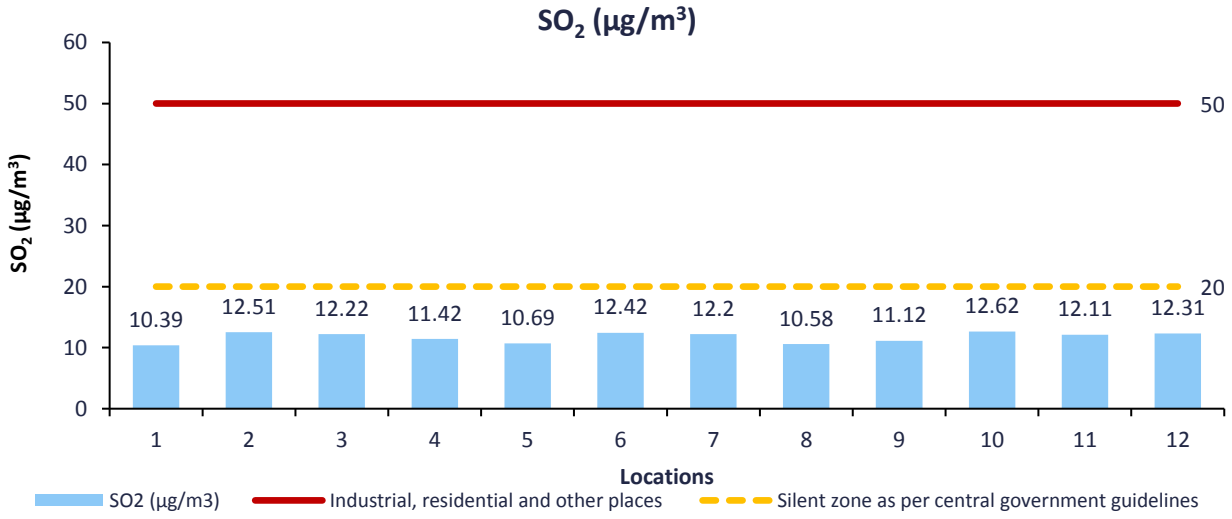
The graph above shows the variation of Respirable Suspended Particulate Matter (RSPM) at 12 different locations within Mira Bhayandar. The CPCB has suggested 60 µg/m^3 as permissible limit for both industrial and silenced zone. It was observed that the values of RSPM exceeded only at two locations whereas all the values were within the permissible standards as prescribed by CPCB.

Figure 2-4: Annual average concentration of NO_x in the ambient air at 12 monitoring location



The above graph shows the variation of NOx at 12 different locations. The CPCB has suggested 40 µg/m^3 and 30 µg/m^3 as permissible limit for industrial and silenced zone respectively. It was observed that all the values observed falls within the standards given by CPCB.

Figure 2-5: Annual average concentration of SO_2 in the ambient air at 12 monitoring location



The above graph shows the variation of SO_2 at 12 different locations. The CPCB has suggested 50 µg/m^3 and 20 µg/m^3 as permissible limit for industrial and silenced zone respectively. It was observed that all the values observed falls within the standards given by CPCB.

All the air quality analysis observations (PM_{10}, SO_2 and NO_x) recorded were mostly within CPCB limits. However, RSPM is on the boundary of crossing standard limit. Vehicular emission is major source of the air pollution. Efficient traffic management and tree plantation along the road side can curb some of the air pollutions.

3 Action Plan For Control of Air Pollution In Mira Bhayandar

Table 3-1: Action Plan for the control of air pollution in Mira Bhayandar

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
1	(i)	Vehicle emission	Launch extensive drives against polluting vehicles for ensuring strict compliance	Awareness drives about CNG & Electrical Vehicles will be benefit to impact reduction in pollution. As per GoI rules, 10 years old vehicles to be monitored extensively through traffic patrolling and traffic police check posts. This will impact to focus on buying new vehicles in CNG or Electric and help to reduce pollution	Feasible	As per requirements	Mid term	12 - 18 months	RTO & Traffic Police	RTO can help to get the data from their portal
	(ii)		Launch public awareness campaigns for air pollution control, vehicle maintenance, minimising use of personal vehicles, lane discipline etc.	Awareness drives about CNG & Electrical Vehicles will be benefit to impact reduction in pollution. Awareness on use of cycle, public transport will benefit to reduce the traffic and reduce pollution. Regular cycle marathon will keep citizen engage in cycling and awareness about pollution. All these activities will impact the reduction of pollution and impact the environment steadily.	Feasible	25.00 lakhs	Mid term	Every month	MBMC	NA
	(iii)		Prevent parking of Vehicles at non-designated areas	Reduction in traffic will impact in the reduction of pollution	Feasible	5.00 Cr	Mid term	12 - 18 months	MBMC	Smart parking best practice implement
	(iv)		Initiate steps for retrofitting of particulate filters in Diesel vehicles, when BS-V fuels are available	Will significantly reduce the emissions on the city roads, this will directly impact in the reduction of pollution	Feasible		Long term	48 - 60 months	GoI, GoM	
	(v)		Prepare action plan to check fuel adulteration and random monitoring of fuel quality data	Will reduce the city pollution periodically	Feasible	As per requirements	Long term	12 - 18 months	RTO and GoI, GoM	Establishment of adulteration dedicated team and randomly checking through anti adulteration cell. This is a continuous process
	(vi)		Prepare action plan for widening of road and improvement of Infrastructure for decongestion of roads.	Help to traffic jam, also help to implement parking policies and this will impact reduction of pollution	Feasible	8.00 Cr	Short term	12 - 18 months	MBMC	
	(vii)		Prepare Plan for the construction of expressways/ bypass to avoid congestion	NA	NA	125.00 Cr	Long term	NA	NA	This is not applicable as western express way is already passing through city and no other pace to divert that because of Sanjay Gandhi National Park / Forest on other side.

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
	(viii)		Steps for promoting battery operated vehicles	Will reduce the city pollution periodically	Feasible	10 cr	Mid term	12 - 24 months	MBMC, RTO	Will promote and implement electric or battery inbuild cycle for citizen for to and from inside the city
	(ix)		Install weigh in motion bridges at the borders of the cities/ towns and states to prevent overloading of vehicles	Will reduce the city pollution periodically	Feasible	Rs 12 Lakhs	Mid term	12 - 18 months	MBMC, RTO	Will consult with RTO for installation of weighing check post
	(x)		Synchronize traffic movements/ introduce intelligent traffic systems for lane driving	Help to traffic jam, also help to implement parking policies and this will impact reduction of pollution	Feasible	Rs 75 lakhs	Mid term	12 - 18 months	MBMC, RTO, Traffic Police	
	(xi)		Installation of Remote Sensor based PUC systems	NA	NA	NA	NA	NA	RTO	This is very helpful system to understand the polluted vehicles and can do data analysis.
	SCS-1		Sulphur reduction in diesel	Will reduce the city pollution periodically	Feasible		Long term	48 - 60 months	GoI, GoM	
	SCS-2		Introduction of new technology vehicles	Will reduce the city pollution periodically	Feasible		Long term	60 - 90 months	GoI	New technology vehicles will definitely reduce the pollution but this will take time to implement as many of the citizen are having old vehicles which very tough to replace at present
	SCS-3		Provide good public transport system	Help to prevent traffic jam and reduce the air pollution	Feasible		Mid term	12 - 18 months	MBMC	MBMC having already two local railway station which majorly helped to reduce the pollution
	SCS-4		Standards for new and In-use vehicles	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	
	SCS-5		Alternative fuels	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	Alternative fuels is the need of future India
	SCS-6		Implementation of BS – V norms	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	24 - 36 months	GoI, GoM	MBMC has purchased all BSVI waste carrying vehicles from GeM portal. The delivery is expected in few months. Work order is already given to L1 bidder.
	SCS-7		Electric/ hybrid vehicles	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible	50.00 Cr	Long term	48 - 60 months	GoI, GoM, MBMC	Need to arrange awareness activities across the city and Procurement of Electric Buses for public transport is in discussion
	SCS-8		OE-CNG for new public transport buses	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible	50.00 Cr	Long term	48 - 60 months	MBMC	Procurement of CNG public transport buses is in discussion

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
	SCS-9		Ethanol blending (E10 – 10% blend)	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	
	SCS-10		Bio-diesel (B5/B10: 5 – 10% blend)	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	
	SCS-11		Retro-fitment of Diesel Oxidation Catalyst (DOC) in 4-wheeler public transport (BS–II and BS-III)	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	
	SCS-12		Retro-fitment of Diesel Particulate Filter in 4-wheeler public transport(BS – III city buses)	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Long term	48 - 60 months	GoI	
	SCS-13		Banning of 10-year-old commercial vehicles	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Mid term	24 -48 months	GoI, RTO	Need to check the fitness of such vehicles and ban on those vehicles to reduce emission
	SCS-14		Inspection/ maintenance to all BSII & BSIII commercial vehicles	Will significantly reduce the emissions on the city roads, this will directly impact reduce pollution	Feasible		Mid term	24 - 48 months	GoM, RTO	
	SCS-15		Restrict commercial vehicles entering city by having ring roads	Will reduce the traffic which lead reduce the air pollution	Feasible	same as point no.1 (Vii)	Mid term	12 - 24 months	RTO	MBMC is having western express highway which is passing through city. This is very difficult to divert because of less space and national park / forest on other side.
2	(i)	Resuspension	Prepare plan for creation of green buffers along the Traffic corridors	This will directly impact the reduction of air pollution in the city.	Feasible	10.Cr	Short term	12 - 24 months	MBMC	MBMC has already planted many trees along the side road inside the city. MBMC is also planning to plantation in many residential area's road under the Majhi Vasundhara Abhiyan
	(ii)		Maintain pothole free roads for free flow traffic	Will reduce the traffic which lead reduce the air pollution and also help people to park vehicle in dedicated areas	Feasible	50.Cr	Long Term	12 - 24 months	MBMC	Maintenance of pothole free road is in progress. Many works have been done under Swachh Bharat Mission and Majhi Vasundhara Abhiyan. PwD, MBMC is also monitoring free pothole roads in the city.
	(iii)		Introduce water fountains at major traffic intersection, wherever feasible	This will directly impact the reduction of air pollution in the city.	Feasible	1.00 Cr	Mid term	12 - 24 months	MBMC	Newly construction and repairing of old water fountains is in the progress. MBMC is using treated waste water generated from STP for this water fountains which will help to reuse of treated water

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	(iv)		Greening of open areas, garden, community places, schools and housing societies	This will directly impact the reduction of air pollution in the city.	Feasible	50.00 Cr	Mid term	12 - 24 months	MBMC	Greening of many areas are been already done in many wards of MBMC. Under the Majhi Vasundhara, MBMC is planning to implement 10 green zone areas to reduce the city pollutions
	(v)		Blacktopping of metaled Roads including pavement of Road shoulders	This will reduce the city pollution	Feasible	10.00 Cr	Long term	12 - 24 months	MBMC	
	SCS-1		Wall to wall paving (brick)	This will reduce the city pollution	Feasible	Rs. 100 / sq. ft.	Long term	12 - 24 months	MBMC	
	SCS-2		Road design improvement	This will reduce the city pollution	Feasible	As per requirements	Long term	12 - 24 months	MBMC	
3	(i)	Biomass/ trash burning, landfill waste burning	Launch extensive drive against open burning of biomass, crop residue, garbage, leaves etc.	Awareness activity will help to educate citizen of Mira Bhayandar. And this will help to reduce the city pollution	Feasible	5.00 Cr	Mid term	12 - 24 months	MBMC	MBMC is already imposing fines on open burning of waste in many areas as per guidelines of MPCB.
	(ii)		Regular check and control, of burning of Municipal Solid waste	This will reduce the emission of methane	Feasible	As per requirement	Mid term	12 - 18 months	MBMC	MBMC is already imposing fines on open burning of waste in many areas as per guidelines of MPCB.
	(iii)		Proper collection of Horticulture waste and its disposal following composting –cum – gardening approach	This will reduce the air emission	Feasible		Short term	12 - 18 months	MBMC	Installed bio composting bed in gardens of all 24 wards
	(iv)		Ensure ban on burning of agricultural waste and crop residues and its implementation	NA	NA	NA	NA	NA	NA	No agriculture waste
	SCS-1		Strict compliance of ban on open burning	This will reduce the air emission	Feasible		Short term	12 - 18 months	MBMC	MBMC is already imposing fines on open burning of waste in many areas as per guidelines of MPCB.
4	(i)	Industry	Identification of brick kiln and their regular monitoring including use of designated fuel and closure of unauthorized units	This will reduce the air emissions	Feasible	MPCB to undertake	Short term	12 - 24 months	MBMC, MPCB	
	(ii)		Conversion of natural draft brick kilns to induced draft	This will significantly reduce the air emission	Feasible		Long term	36 - 48 months	MBMC, MPCB	

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
	(iii)		Action against non-complying industrial units	This will significantly reduce the air emission	Feasible	MPCB to undertake	Short term	12 - 24 months	MPCB	
	SCS-1		Sulphur reduction in fuel	This will significantly reduce the SO2 emission			Short term	12 - 18 months	MPCB	
	SCS-2		Improved Combustion technology	This will significantly reduce the air emission			Short term	12 - 18 months	GoM	
	SCS-3		Alternate fuel	This will significantly reduce the air emission	Feasible	As per requirement	Short term	12 - 18 months	GoM	Alternate fuel such as solar panel on industries
	SCS-4		Promoting cleaner industries	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	
	SCS-5		Location specific emission reduction	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	Will asked 3rd party to audit on this
	SCS-6		Fugitive emission control	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	
	SCS-7		Banning of new industries in existing city limit	This will significantly reduce the emission	Feasible	MPCB to undertake	Short term	12 - 18 months	MBMC, MPCB	MBMC already monitor such activity
	SCS-8		Source wise cause analysis of Air pollution	This will generate the data which help to monitor and control air pollution	Feasible	2.50Cr	Mid term	15 - 18 months	MBMC	MBMC is in discussion to implement air pollution control system at various location in city
	SCS-9		Use of high-grade coal	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	GoM	
	SCS-10		Regular audit of stack emissions for QA/QC	This will significantly reduce the emission	Feasible	Rs. 10 - 20 lac per industry	Short term	12 - 18 months	MBMC, MPCB	
5	(i)	Construction and Demolition Activities	Enforcement of construction & demolition rules	This will significantly reduce the emission	Feasible	5.00 Cr	Short term	12 - 18 months	MBMC	Already having public notification on the same, 5000 is the penalty amount
	(ii)		Control measures for fugitive emissions from material handling, conveying and screening operations through water sprinkling, curtains, barriers and suppression units	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	MPCB HQ issued direction on 12/03/2018 for implementation and compliance of Construction and Demolition Waste Management Rules 2016.
	SCS-1		Better construction practices with PM reduction of 50%	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
	SCS-2		Banning of operation of brick kilns in city area	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC	
	SCS-3		Ensure carriage of construction material in closed /covered Vessels	This will significantly reduce the emission	Feasible		Short term	12 - 18 months	MBMC, RTO	MPCB HQ issued direction on 12/03/2018 for implementation and compliance of Construction and Demolition Waste Management Rules 2016.
6	SCS-1	Domestic fuel burning	Shift to LPG from solid fuel &kerosene for domestic applications	This will significantly reduce the emission	Feasible	Ujjawala scheme (Rs. 500/ cyl. refilling)	Short term	12 - 18 months	GoM	
	SCS-2		Better cook-stove designs	This will significantly reduce the emission	Feasible	Rs. 2000/stove for residential only	Short term	12 - 18 months	GoM	
7	SCS-1	Mining	Effort for good mining practices	NA	NA	NA	NA	NA	NA	NA
	SCS-2		Greenbelt for activity zone and the buffer zone for each mining area	NA	NA	NA	NA	NA	NA	NA
	SCS-3		Maintenance of mine area roads	NA	NA	NA	NA	NA	NA	NA
8	(i)	DG sets	Monitoring of DG sets and action against violations	This will significantly reduce the emission	Feasible	Rs. 5 Lacs	Short term	12 - 18 months	MBMC, MPCB	Need to identify DG set and monitor the same. Also need to engaged 3rd party to audit and check
	SCS-1		Reduction in DG set operation/ Un-interrupted power supply	This will significantly reduce the emission	Feasible	15 KVA (NG based)-3.7 lakhs, 100 KVA (NG based)- 14 lakhs	Short term	12 - 18 months	GoM	
9	SCS-1	Bakeries/ crematoria	Use of LPG in Hotels and “dhabas”	This will significantly reduce the emission	Feasible	Cyl. (commercial) cost per unit-Rs. 1000 approx.	Short term	12 - 18 months	MBMC	Need to monitor hotels and dhabas and issue notice regarding the same
10	(i)	Others	Installation of solar panels on all government buildings and commercial centres	This will significantly reduce the dependence on electricity produced from fossil fuels and reduce the associated air pollution	Feasible	As per requirement	Mid term	12 – 18 months	MBMC, GoM	

Sl. No		Source group	Control option	Expected reduction and impacts	Technical feasibility	Requirement of financial resources	Implementation period (short/mid/long-term)	Time target for implementation	Responsible agency(ies)	Any other information
	(ii)		Electric vehicle charging station	This will encourage the citizens to adopt EVs over the conventional fossil fuel burning vehicles	Feasible	2 charging station of Rs 15 lacs each	Mid term	12-18 months	MBMC	
	(iii)		Source wise cause analysis will be carried out: • Air profiling of the city • Hotspot identification of the city • Source apportionment of the corporation area • Emission inventory – IT based • Long-term Mitigation Plan	This will provide a long-term mitigation plan and action plan for improvement in air quality.	Feasible	Rs. 2.5 Cr	Long term	12 – 15 months	MBMC	