

**ACTION PLAN FOR CONTROL OF AIR
POLLUTION IN NON-ATTAINMENT CITIES OF
MAHARASHTRA**

VASAI – VIRAR CITY

Prepared By:

**VASAI – VIRAR CITY MUNICIPAL
CORPORATION**

Submitted To:

**MAHARASHTRA POLLUTION
CONTROL BOARD**



**Maharashtra Pollution Control Board
महाराष्ट्र प्रदूषण नियंत्रण मंडळ**

Date: 15th December, 2020

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Date: 09th September, 2020

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COMMISSIONER

VASAI-VIRAR CITY MUNICIPAL CORPORATION
Virar (East), Pin. No. 401 306, Dist. Palghar



1. Introduction

1.1. Location of Vasai – Virar Region

Vasai Virar Municipal Corporation is part of Palghar district, which is located at the north of greater Mumbai. Vasai - Virar Sub-Region is situated in the north-west corner of the Mumbai Metropolitan Region (MMR) and covers 380 Sq. Km. (About 9.5% of the area of Mumbai Metropolitan Region) and includes 4 Municipal Councils (Virar, Vasai, Nallasopara & Navghar - Manikpur) and 67 villages. Out of these 67 villages 2 are covered in the Virar Municipal area, 8 are covered in the Nallasopara Municipal area, 6 are covered in Navghar – Manikpur Municipal area and 4 are covered in the Vasai Municipal area. However, of the 4 villages situated in Vasai Municipal area two villages are included partially. The total area of these four municipal towns is nearly 10.76% of the sub-region area.

The Vasai-Virar Sub-region is separated from Greater Mumbai and Mira-Bhayandar by the Vasai Creek. However, due to development of road and rail network, it is strategically linked to Mumbai. It is also linked by road and rail to other major centres in the Mumbai Metropolitan Region, such as, Navi Mumbai (via Vasai-Diva Railway Line), Panvel, Thane, Bhiwandi and Kalyan. This area which has been identified as one of the growth centres around Mumbai is well connected with the metropolis by suburban commuter rail and Mumbai Ahmadabad National Highway.

Vasai-Virar area is located on the north-western periphery of Mumbai under Palghar district and is located between 19°28'N – 19°47'N latitude and 72°48'E – 72°8'E longitude Vasai Virar Municipal Corporation with an area of 380 sq. km served by Western Railway suburban service has a significant growth potential. Due to close proximity to Brihan Mumbai, the Vasai Virar Municipal Corporation is experiencing very rapid urban growth. With prohibitive land prices in Mumbai, low and middle income households are shifting to Vasai Virar. Thus, it is presently serves as a growing dormitory town to the Mumbai city. (Figure 1) shows the location of MMR and Vasai – Virar City Municipal Corporation (VCCMC).

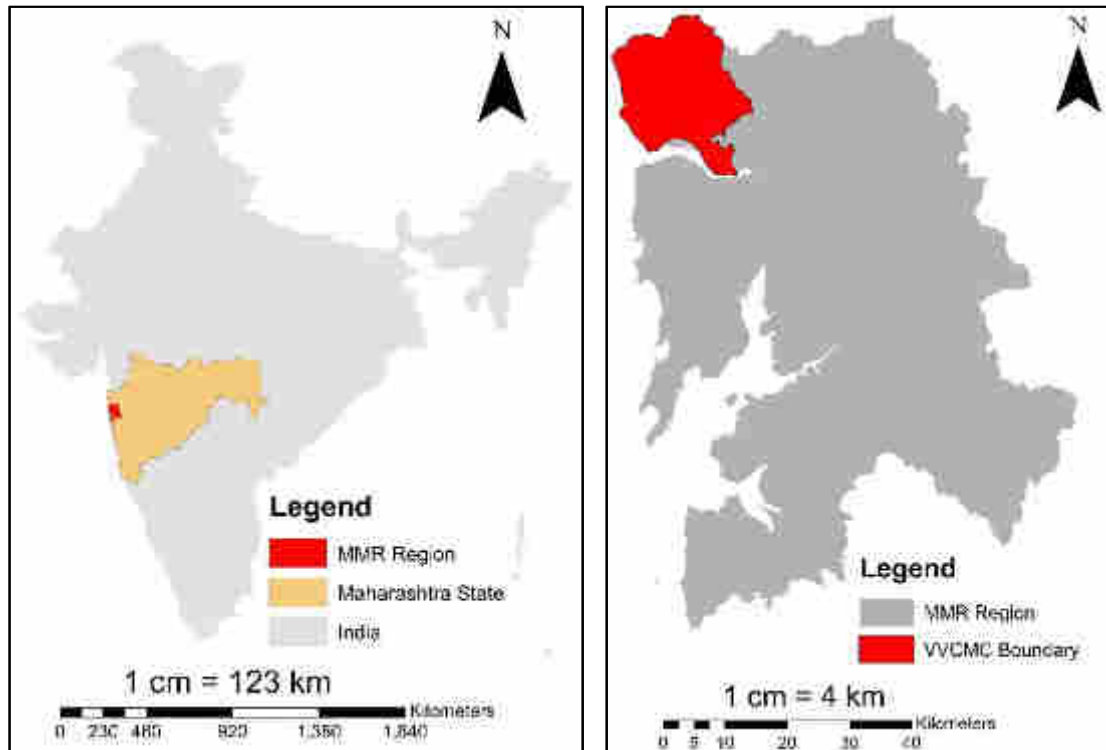


Figure 1 Location of MMR Region & VVCMC

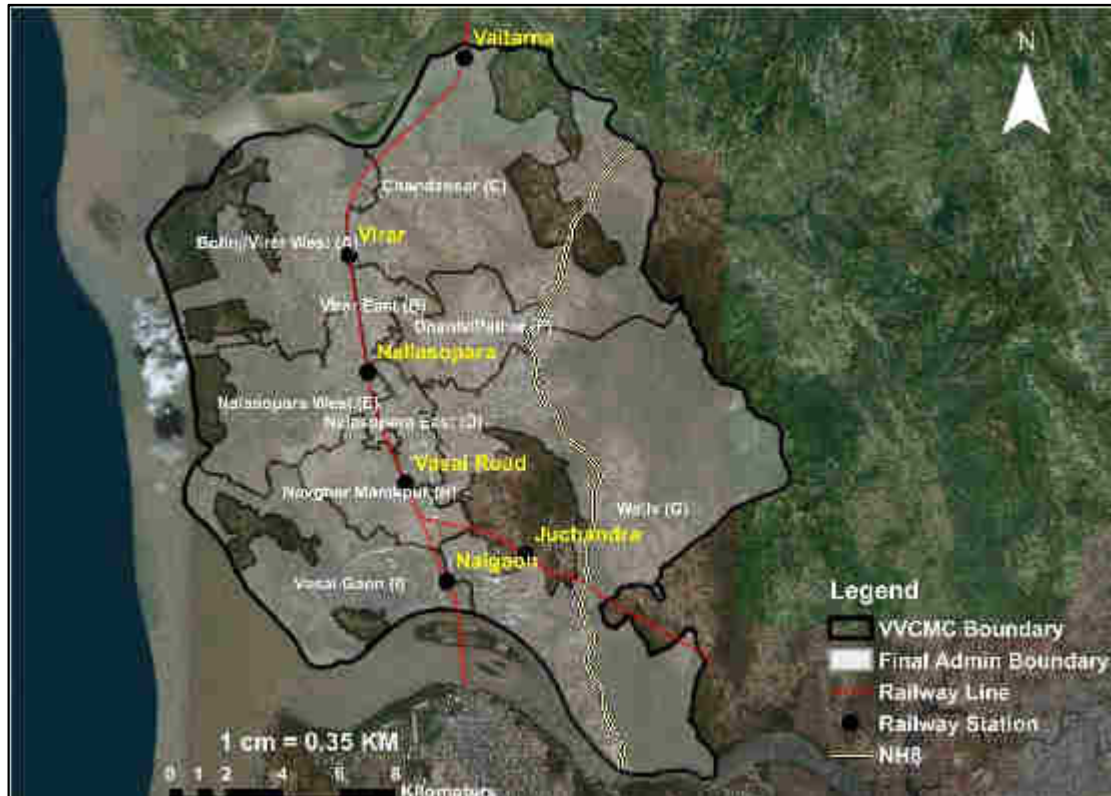


Figure 2 Admin Boundary Map of VVCMC with Major Connectivity



Figure 2 shows the Administrative Boundary of VVCMC along with the Railway line & NH 8 Passing through the region. VVCMC has 6 railway stations named Virar, Nallasopara, Vasai Road, Naigaon, Vaitarna and Juchandra.

1.2. Physical Features

The Vasai-Virar Sub-region (VVSr) is bounded on the north by the Vaitarna River, on the south by the Vasai creek and on the west by the Arabian Sea. The eastern boundary is the hill ranges of Tungar full of forest extending from village Sasunavghar up to village Chandip. A number of hillocks and isolated peaks dot the region in the east.

The region on the whole, is low-lying mainly in the southern part along both sides of Western Railway line. The old village settlements in the coastal belt are slightly on higher level and moderately plain. The average elevation of the area above sea level is 1.5 to 2 m. There are many local variations caused by small hillocks scattered in the eastern and north-eastern part of the region. The area lying to the east of the National Highway is hilly and covered mostly by thick forests. The hill ranges of the Tungar and the above two creeks create a natural barrier separating the sub-region from the rest of the Mumbai Metropolitan Region. The Chinchoti fall, Tungareshwar Temple and thick forest offer good tourism potential to this eastern part. The low-lying lands along the coast and along two creeks are marshy, khazan lands and some of them mainly to the south of Nallasopara Railway Station are still used for salt cultivation.

Vaitarna and Vasai Creeks are the most important creeks passing through the northern and southern edges of the sub-region. Along the coast there are many small creek-lets. The coastal belt of the Sub-region is full of plantation with traditional villages maintaining peculiar Konkan-type character and offers beauty to the Sub-Region.

Geologically, the sub-region falls in the Deccan Lava plateau. Traces of Bauxite have been found in the Tungar Hill ranges over an area of 80 sq.km and have a mineral content of 30-35%. There are few stone quarries in Rajawali area. The sand is also extracted through the Vaitarna Creek as building material by dredging which helps the creek to remain desilted every year.



1.3. Climate

The climate of the Vasai Virar Sub-region can be described as hot-humid with moderate seasonal fluctuations of temperature. Due to a long coast-line and high relative humidity the variations are not significant. There are basically three seasons, with a transitional period of about 15 days between each season.

a) Winter:-

This extends from October to January with the mean maximum temperature of about 28 deg. C. and the mean minimum temperature of about 16 deg. C. with relative humidity of about 77-85%.

b) Summer:-

This extends from February to May with the mean maximum temperature of about 34 deg. C. and the mean minimum temperature of about 26 deg. C. with relative humidity of about 60%.

c) Monsoon:-

This extends from June to September. The south-west monsoon begins in the first week of June. 95% of the annual rainfall is recorded during this period. The annual average rainfall is about 2200 mm. During this season, the mean maximum temperature is about 30 deg. C. and the mean minimum temperature is about 24 deg. C. with relative humidity hovering around 80-85%.

The wind direction and speed are determined by temperature and pressure conditions over land and sea. Predominant wind direction is north-west or west. During the monsoon season, the wind direction is north-east or east with a high velocity. The wind velocity is about 13 Kmph in monsoon and about 8 Kmph during the remaining part of the year.

1.4. Demography and Economic Base

Long range comprehensive planning cannot be undertaken in rational and realistic manner unless it bases itself upon the fundamental facts of population growth. The Vasai Virar city has been considered as one of the growth centres in the regional plan for Mumbai metropolitan region. Earlier Vasai Virar sub region was non municipal towns under the



functional category of industry as per census of 1971. The population was 1,94,262 during 1971. The population growth with a decadal growth rate is shown in Table 1 below.

Table 1 Population Projection

Year	Population in Lakhs	Decadal Growth Rate
2001	7.03	-
2011	12.21	74%
2021	22.23	82%
2031	33.34	50%
2041	41.79	25%

Such urbanization process seems to be inevitable and rather desirable because it is a positive factor in the urban development, however, it is to be carefully channelized to minimize its negative effects. As Vasai Virar is advantageously situated in proximity to the Greater Mumbai, it is growing faster. Due to these factors and its demographic characteristics are required to be studied before any population estimation.

Population of Vasai Virar according to 1991 census was 405718. The decadal growth rate of 1971-81 and 1981-91 are 32 and 58 % respectively. It can be seen from above that there was 70% growth in the decade of 1991 – 2001. This trend is likely to continue in the light of developmental infrastructural projects like Metro rail, Low cost housing project coming up in the region. The Vasai-Virar City Municipal Corporation (VVCMC) is proposing to develop the Heritage installations and also to create recreational hubs in the area for tourism development. This area has good shoreline suitable for water sports development. Taking this into consideration growth rate is proposed for next decades till 2041.

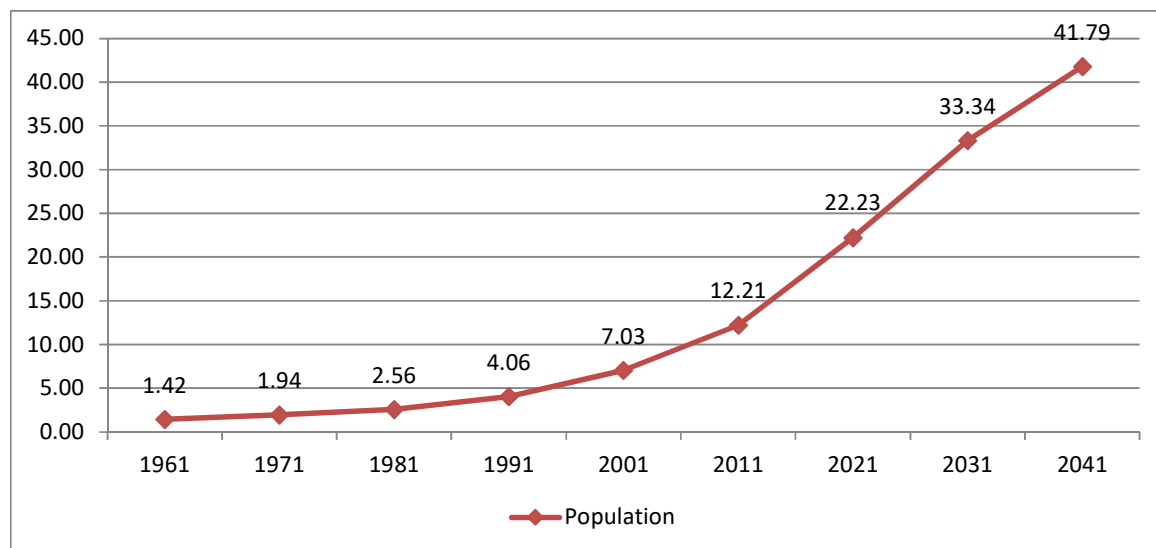


Figure 3 Year wise Population Growth in VVCMC Area



Due to the industrial location policy for the MMR, there are few small scale industries located in this sub-region mainly in Waliv-Gokhivare area. Vasai Municipal Council has also developed its own small -scale industrial estate. In addition to this, few small-scale industries have come up to the east of Vasai-Road Railway Station and on Shirsat Road in Virar Town. The MMRDA had prepared a plan for Waliv - Gokhivare - Sativali Industrial Complex. The industrial activities at Waliv - Gokhivare are coming up for many small scale and medium scale industries which provide some employment to the sub-region.



2. Ambient Air Quality Monitoring

Sulphur Dioxide (SO₂), Oxides of Nitrogen as NO₂, Respirable Particulate Matter (PM₁₀) was identified for regular monitoring at selected locations of Vasai - Virar. It also included other important meteorological parameters such as wind speed and wind direction, relative humidity and temperature. Every year, the monitoring is carried out by Central Pollution Control Board, State Pollution Control Boards and Pollution Control Committees. The monitoring of pollutants is carried out for 48 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have 104 observations in a year. In the year 2017-18, under NAMP, there were around 703 operating stations for generating air quality database covering 307 cities in 29 States and 6 union territories. Further, CPCB under the Air (Prevention and Control) Act has set the NAAQS (National Ambient Air Quality Standards), revised on 18 November 2009 (Appendix A), with objectives of

- i. To indicate the levels of air quality necessary with an adequate margin of safety to protect public health, vegetation and property,
- ii. To assist in establishing priorities for abatement and control of pollutant level,
- iii. To provide a uniform yardstick for assessing air quality at national level and
- iv. To indicate the need and extent of the monitoring programme.

The quality of air was monitored across city to assess the air polluting parameters and Following were the observations recorded during the process.

Table 2 Monthly observation of SO₂, NO₂, PM 2.5 & PM 10 Parameters across the Vasai - Virar

Month	SO ₂	NO ₂	PM ₁₀	PM _{2.5}
Jun-19	4.12	8.26	48.72	13.05
Jul-19	6.88	5.86	33.75	9.02
Aug-19	NA	NA	NA	NA
Sep-19	15.66	11.51	35.38	11.04
Oct-19	11.18	18.83	67.65	31.8
Nov-19	17.49	24.82	107.25	62.52
Dec-19	13.3	25.44	140.8	85.43
Jan-20	3.94	20.32	132.11	77.34
Feb-20	3.25	23.58	127.89	65.3
Mar-20	3.68	17.02	118.99	34.39



Month	SO ₂	NO ₂	PM10	PM2.5
Apr-20	3.27	16.93	52.38	13.49
May-20	4.25	14.68	43.15	5.54
Jun-20	6.2	11.84	28.92	7.42

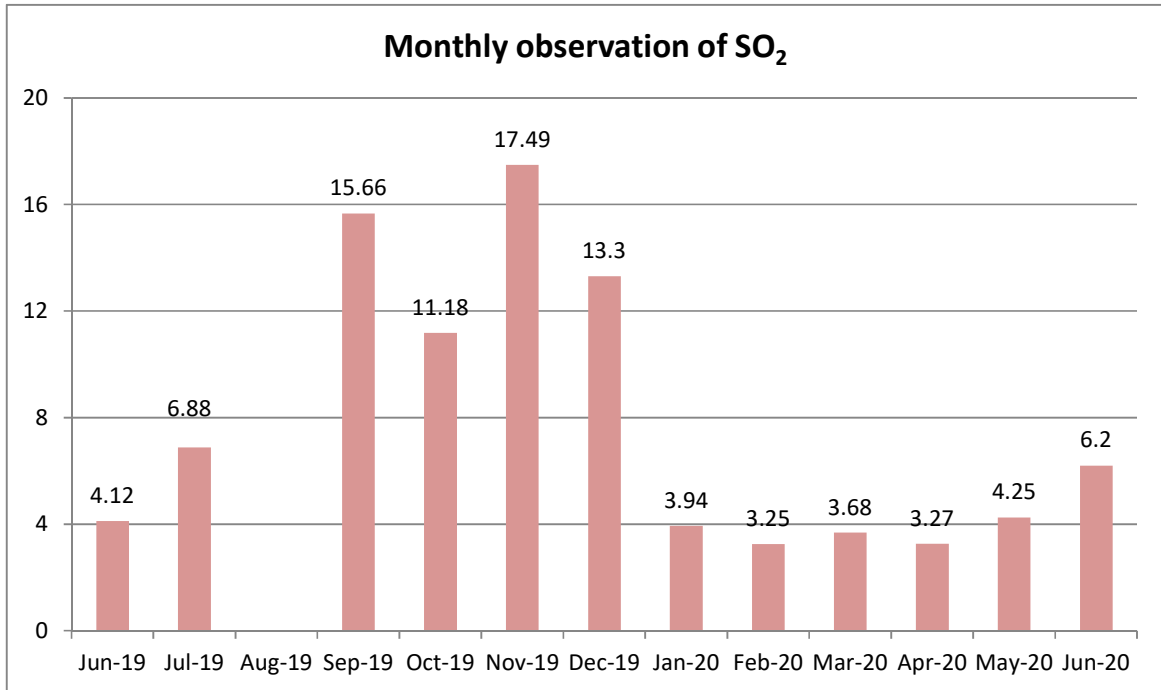


Figure 4 Monthly Observation of SO₂

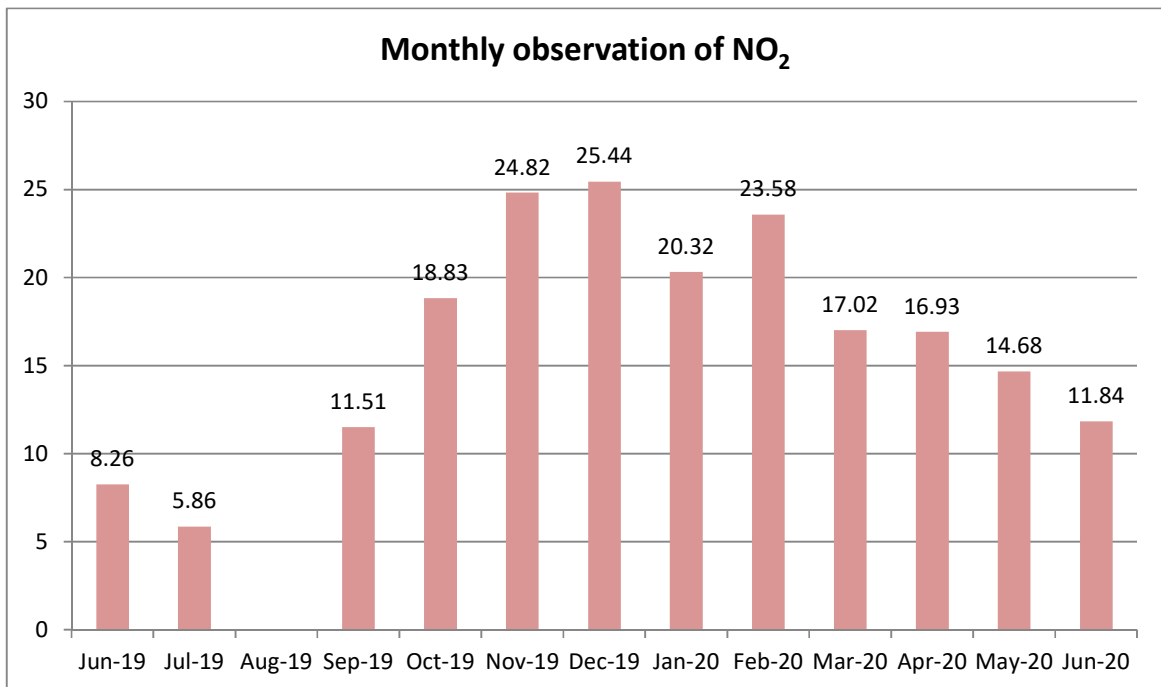


Figure 5 Monthly Observation of NO₂

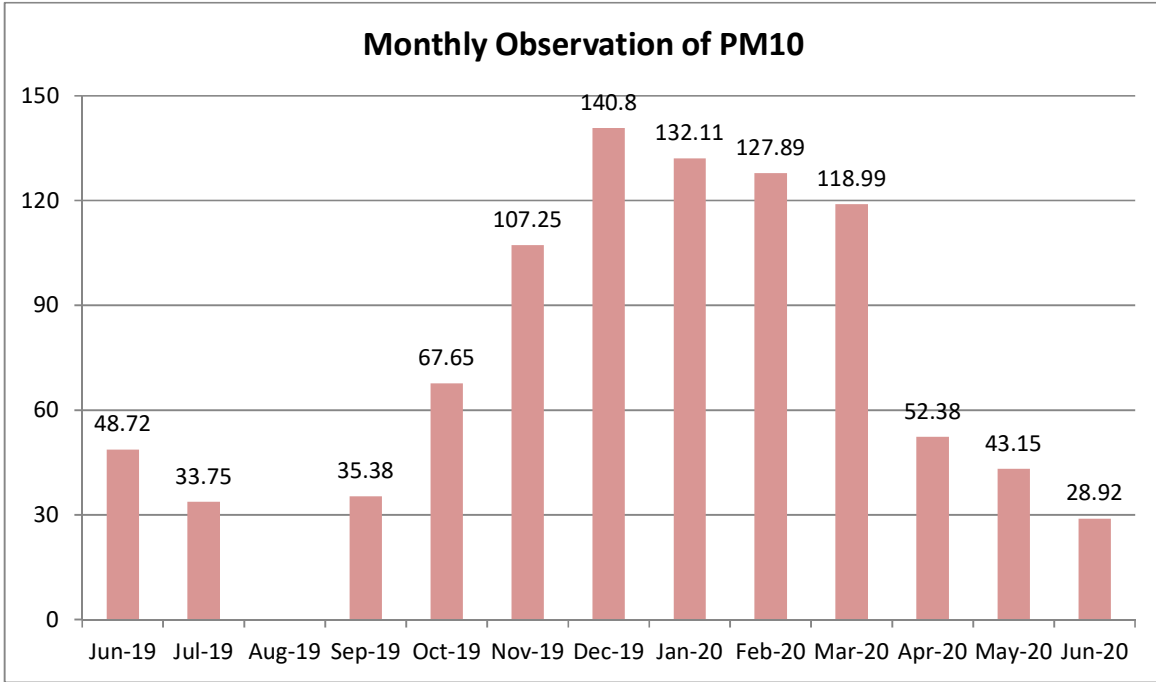


Figure 6 Monthly Observation of PM10 Particles

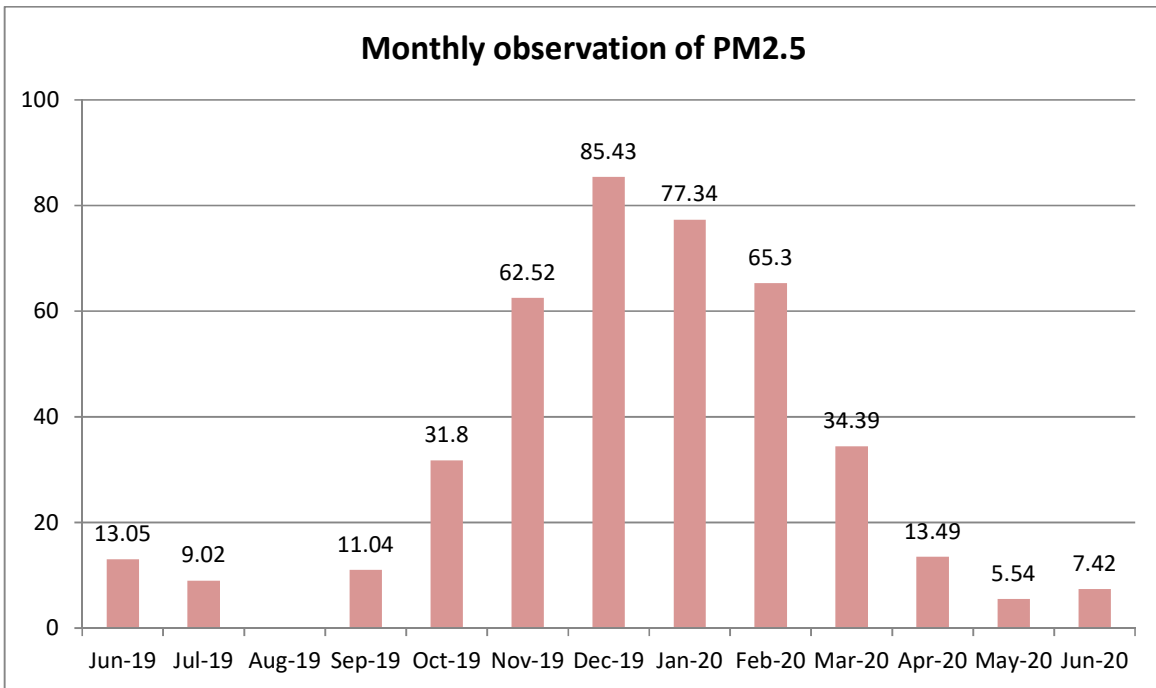


Figure 7 Monthly Observation of PM2.5 Particles



Table 3 Monthly Observation of Various Air Parameters across the Vasai - Virar

Month	Wind Speed (m/s)	Ambient Temperature (°C)	Wind Direction (°)	Relative Humidity (%)	Barometric Pressure (mbar)	Rain (mm)	Solar Radiation (W/m ²)
Jun-19	2.09	29.07	215.48	79.26	1,003.54	440.75	181.44
Jul-19	2.22	26.5	196.33	92.2	1,001.5	321.25	74.42
Aug-19	NA	NA	NA	NA	NA	NA	NA
Sep-19	1.79	27.13	191.65	87.47	1,007.14	1175	134.16
Oct-19	1.49	28.11	158.14	83.67	1,010.29	94.25	150.78
Nov-19	1.16	28.13	144.83	71.59	1,010.41	38.75	108.48
Dec-19	1.35	26.44	141.79	69.33	1,011.49	2.5	87.91
Jan-20	1.62	23.75	159.16	67.05	1,012.64	0	98.87
Feb-20	1.72	26.25	165.02	56.53	1,011.98	0	133.45
Mar-20	1.87	26.81	184.52	65.23	1,010.16	0	214.66
Apr-20	1.77	29.65	202.72	75.07	1,008.18	0	255.42
May-20	1.87	31.21	223.47	77.6	1,008.19	0	247.6
Jun-20	1.66	28.97	172.48	83.49	1,003.31	104.75	174.19



3. Sources of Air Pollution

There are many sources of particulate matter emission impacting the ambient air quality of the city of Vasai - Virar; however the major ones are re-suspended dusts and industries. The impact of the industrial sector is reducing due to various reasons such as closure of industries, shift to clean fuel, better compliances and discharge of emission at higher elevations.

Vehicle activity in the city has shown tremendous increase over a period of last 10 years. The mobile (line) source emissions are not only dependent upon the number of vehicles registered but also on the actual number plying on the roads, speed of movement and the conditions of vehicles besides many other factors. Vehicle kilometre travelled (VKT) for the city has been showing consistent increase; however, at some junctions the traffic congestion is so high that VKT rise is ironically not so high but emission is high. Saturation traffic situation where average speed goes on decreasing, the VKT may not increase as vehicles are not crossing a point for a long time. Increased levels of vehicular activity and resulting high levels of air pollution have led to active anti air pollution campaign by the nongovernmental organization (NGO) and judiciary.

The area sources which emit at ground level also have significant impact on the PM levels in the atmosphere; however it could be more localized, particularly from the sources such as bakeries, crematories, construction, garbage burning etc. Some of these sources can have significant local impact on the ambient air quality for a shorter duration. Overall a city growth pattern indicates that domestic fuel has become cleaner, bakeries /crematoria situation have not changed so much. Construction/ demolition related emission has gone up; refuse burning has increased and road dust related emissions have also shown increase.

Industrial emission has been consistently declining as many industries have closed down. Even small-scale industrial units are changing into commercial offices. Large industries are mainly located in limited areas and their compliances have improved.

The action plan presented later therefore, makes an attempt to delineate strategies on the basis of understanding of the PM, NO_x and SO₂ sources and their possible contribution to the ambient and kerb side air quality. Each of the strategies will have to be looked at from the point of view of its impact level in terms of reduction in PM, NO_x and SO₂ emissions



(low, medium, high); its feasibility from implementation and administrative point of view (easy, moderately difficult and difficult); financial viability (low, medium and high costs) besides issues relating to their long and short term impacts.

3.1. Area Source

As per emission inventory percent contribution from area source emissions are high particularly for PM when compared with emissions from vehicular emissions. Other area sources though called area sources, are limited to small regions (viz. Open eat outs, bakeries, crematoria and hotels) and therefore, their impact does not seem to be wide ranging and across the city. For example, open burning can be common all through the city with some variation based on locality; however landfill open burning is limited to Gokhivare. With the implementation of the short and long term scenarios, the total reduction in particulate matter from area sources would be more than 80%.

Measures Required

- Open refuse burning and landfill site burning are the most important issues for the degradation of ambient air quality. VVCMC shall install Bio-methanation plant in vicinity of landfill site to control burning of waste.
- Setting up of Material Recovery Facility (MRF) to segregate the waste at the landfill site for better management and to utilise segregated waste into Waste to Energy Plant.
- Road dust from paved and unpaved roads in the city is largely responsible for high PM. On the roads STP treated water shall be sprinkled twice a day before peak traffic hours to control the Road dust. And Roads shall be cleaned using Vacuum based mechanical sweeper.
- Large scale construction and demolition of buildings in the city give high local dust contribution leading to health impacts. For controlling such practices C&D Rules, 2016 shall be implemented stringently in the area to reduce emissions.
- Installation of Air pollution Control System “Wind Augmentation Purifying Unit (WAYU) ” developed by NEERI at major traffic Junctions to reduce the pollutants such as PM 2.5 & 10, carbon monoxide etc.



- Bakeries and crematoria emissions can be reduced through implementation of fuel shift combined with awareness programmes. In crematoria's LPG/PNG process shall be used in place of conventional process.

3.2. Point Source

The industrial sector has been steadily declining in the city due to shifting development priorities and market forces. The major industrial units are located in Nalasopara East area. As per emission inventory the percent emission contribution is around 33% from industrial sector to the whole of Vasai - Virar.

Measures Required

- Industries decline in the city has led to large decrease in air pollution; however, fuel shift in existing industries will further improve the ambient air quality. With fuel change, it will be decisive to study the feasibility of adopting the new technology. The MSI and SSI also need to get larger share of the natural gas for combustion processes to shift from FO and LSHS.
- Industries should adopt stack emission norms beyond those prescribed by CPCB Industries with QA/QC, the increase of most of the stack by large emitters can affect the air quality substantially as the prominent wind direction of the city to eastern part of Vasai - Virar will disperse the pollution load.
- The data for small scale and unauthorized industries is scanty and at this stage to suggest the levels of contribution from these are difficult. The source apportionment study and the data indicate large part of the PM from other sources, which also need further investigations. These investigations of sources should be undertaken by MPCB/ GoM.

3.3. Line Source

One of the major contributors to Particulate Matter (PM) and NO_x emissions in Vasai - Virar region is vehicular exhaust. Particulates present in vehicular emissions are especially harmful due to their small size (under PM₁₀) and even larger number below PM_{2.5}. The fine particles are also important due to their harmful chemical composition. The most prominent sources of vehicle particulate emissions are diesel driven and two-stroke petrol driven vehicles. Reduction strategies addressing both technical and non-technical issues presented



here take into consideration the current ambient air quality standards; exhaust emission standards, emission inventory, vehicular population composition, infrastructure availability and the techno-economic feasibility in Vasai - Virar Region.

The discussion has been presented in following order:

- Improvement in fuel quality and alternate fuels
- Introduction of new technology vehicles for Public transport such as Electric/CNG/Hybrid Vehicles.
- Improvement in vehicle related components/technologies (After-exhaust treatment techniques and retro fitment)
- Synchronization of traffic signals
- Inspection & Maintenance programme
- Transport planning and traffic management
- Other options including phasing out old vehicles, revision of emission standards
- Road Design Improvement such as decongest pathways, road widening & improvement of Infrastructure for decongestion of Road.
- Green Buffers shall be planned along the major traffic corridors to reduce the pollution due to vehicular emission.
- Provision of dedicated parking facilities nearby public transit stops such as Railway Station, Bus Depot etc.
- Encourage Public Transport, encourage non-motorized transport and
- Reduce dust resuspension

Many potential emission reduction options have been considered based on viability in the city and the major issues are pertaining to the overall vehicular sector emission reduction have been discussed here.



**Action Plan for Vasai – Virar City Municipal Corporation
prepared as per CPCB Standard Template**



**Action Plan for Vasai – Virar City Municipal Corporation
prepared as per CPCB Standard Template**

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COMMISSIONER
MUNICIPAL CORPORATION
Vasai (East), Vasai District, Maharashtra



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information	
1. Source Group – Vehicle Emission									
1	(i)	Launch extensive drives against polluting vehicles for ensuring strict compliance	Medium	Feasible	NA	Short Term	Monthly / Quarterly process	R.T.O	Monthly special drive at Major junction for random checking of PUC for vehicles in city area as well as at Highways.
	(ii)	Launch public awareness campaigns for air pollution control, vehicle maintenance, minimising use of personal vehicles, lane discipline etc.	Medium	Feasible	0.25 Cr.	Long Term	Continuous & Regular Activity	R.T.O, VVCMC, Traffic Police	Conducting workshops under the SWACHH BHARAT Abhiyaan in schools, colleges & road shows and Street Plays for awareness of air pollution control. Various awareness programs are organized time to time especially during Road Safety Week.
	(iii)	Prevent parking of vehicles at Non designated areas	High	Feasible	6.60 Cr.	Long Term	December - 2023	VVCMC	Development of dedicated Multilevel Parking facilities nearby Station & Market Area is Planned and Location map is included in Annexure – 1. And this facility shall be converted into Pay & Park facility.
	(iv)	Initiate steps for retrofitting of particulate filters in Diesel vehicles, when BS-VI fuels are available	High	Feasible	1.80 Cr.	Long term	December - 2023	VVMT	To VVMT will Phase out the BS III to BIS IV buses and Bio-diesel/CNG retrofitment shall be carried out for all VVCMC deployed vehicles.
			High	Feasible	-	Long term	December - 2023	R.T.O	RTO will control private vehicles by 2020
	(v)	Prepare action plan to check fuel adulteration and monitoring of fuel quality data	Medium	Feasible	-	Mid term	Continuous	Petro chemical Authority - PCRA	Vigilance & checking is done by Petroleum company.
	(vi)	Prepare action plan for widening of road and improvement of infrastructure for decongestion of Roads	High	Feasible	-	Long Term	June - 2023	VVCMC	
	(vii)	Prepare plan for construction of expressways/ bypass to avoid congestion	High	Feasible	-	Long Term	September - 2023	VVCMC / MMRDA / MSRDC	
	SCS-15	Restrict commercial vehicles entering city by having ring	Moderate	Feasible	-	Long Term	More than 7 years	VVCMC/ MMRDA	



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information
	roads							
(viii)	Steps for Promoting Battery operated vehicles	Medium	Feasible	-	Long Term	December - 2023	VVCMC	
		Medium	Feasible		Long Term	December - 2023	VVCMC	
(ix)	Install weigh in Motion bridges at the borders of the cities/ Towns and states to prevent overloading of vehicles	Low	Feasible	NA	Mid term	June - 2022	R.T.O / Transport Ministry	There are 24 Check post with weigh bridges in Maharashtra. The eighteen (18) numbers are modernized & automated. The work of modernization of three is in process. Out of 24 only one is in Mumbai at the border of Mumbai & Gujarat, located at Achad. It is automated & fully modernized.
(x)	Synchronize Traffic Movements/ Introduce Intelligent Traffic Systems for Lane Driving	Medium	Feasible	40 Cr.	Long Term	January - 2024	R.T.O / VVCMC	Automatic traffic Signal shall be proposed
		Medium	Feasible		Long Term	January - 2024	VVCMC	Making some roads one-way during pick hours.
(xi)	Installation of Remote Sensor based PUC systems	Medium	Feasible	-	Short Term	-	R.T.O	Computerised PUC check stations to avoid fake certificate.
SCS-7	Electric/ Hybrid Vehicles	Medium	Feasible	100 Cr.	Long Term	May - 2024	VVCMC	Electric / Hybrid buses are proposed in VVCMC Area Public Transport Fleet in 2 nd phase.
SCS-2	Introduction of new technology vehicles	Medium	Feasible		Long Term	-	R.T.O, VVCMC	VVCMC has its own transport undertaking. VVMT has a fleet size of 100 buses. The City Bus system operates mainly two type of buses: Standard buses (Non AC) and Standard mini buses. The buses operate at a frequency of about 10 minutes. Existing 149 buses shall be replaced in staggered manner and as per the utilisation of useful life of buses.
SCS-3	Provide good public transport system	Medium	Feasible	6.8 Cr.	Long Term	May - 2024	VVCMC	
SCS-4	Standards for new and in-use vehicles	Medium	Feasible	-	Long Term	January - 2024	GoI, GoM	Central Government has mandated that vehicle makers must manufacture sell & register only BS VI vehicle from April 2020. And VVCMC shall adhere to these norms for registering any new vehicles.
SCS-6	Implementation of BS-VI norms	Medium	Feasible	-	Long Term	January - 2024	R.T.O.	



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information	
SCS-5	Alternative fuels	Medium	Feasible	12 Cr.	Long Term	-	VVCMC	DPR Prepared for Bio-Methanation Plant. And soon Tenders shall be floated for the Project	
SCS-8	OE-CNG for new public transport buses	Medium	Feasible	6.80 Cr.	Long Term	January – 2024	VVCMC	17 Nos. of CNG buses are proposed in VVCMC Area Public Transport Fleet.	
SCS-9	Ethanol blending (E10 - 10% blend)	Low	Other alternative fuel proposed	-	-	-	VVMT	In first phase VVMT shall adopt Bio-diesel as preferred fuel in next 3 years. And purchase new CNG buses confirming to the BS-VI norms. New natural gas network is being laid by the Ministry of Natural Resources.	
SCS-10	Bio-diesel (B5/B10: 5-10 %)	Low	Feasible	-	-	-	VVMT		
SCS-11	Retro-fitment of Diesel Oxidation Catalyst (DOC) in 4-wheeler public transport (BS - II and BS - III city buses)	Low	Feasible	-	Long Term	September – 2023	VVMT		
SCS-12	Retro-fitment of Diesel Particulate Filter in 4-wheeler public transport (BS - III city buses)	Low	Feasible	-	Long Term	September – 2023	R.T.O	VVMT to replace the diesel filter in public transport which has BS-III engine system.	
SCS-13	Banning of 10 year old commercial vehicles	Low	Feasible	-	-	-	R.T.O	VVCMC not Operating vehicle with more than 10 year	
SCS-14	Inspection/ maintenance to all BSII and BSIII commercial vehicles	Low	Feasible	NA	Long Term	Continuous & Regular Activity	R.T.O	No BS II vehicles are operating in the VVCMC Area.	
2. Source Group – Re-suspension									
2	I	Prepare plan for creation of green buffers along the Traffic corridors	High	Feasible	3 Cr.	Long Term	January – 2024	Tree Authority	<p>Already in practice Green plantation / vegetation in divider & Rotary, island is already done.</p> <p>VVCMC Will plan for Green Zones near following corridors and map of the same id attached as Annexure – 1</p> <p>1) NH – 8 to Ring Route at Virar, 2) NH – 8 to Ring Route at Vasai, 3) NH – 8 to Ring Route at Nallasopara</p> <p>VVCMC Will planned such practise for new road infrastructure being implemented. And Map of the same is attached in Annexure - 2</p>



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information
II	Maintain Potholes Free Roads for new flow Traffic	High	Feasible	80 Cr.	Continuous	Continuous	VVCMC	Action required before & after every monsoon. Efforts are being made to maintain existing roads pothole free.
III	Introduce water fountains for major traffic intersections, wherever feasible	Moderate	Feasible	2.5 Cr.	Long Term	January – 2024	VVCMC	As a part of our proposal, we have already proposed 10 locations for Water fountains in the VVCMC Area And wastewater shall be used in the water fountains in the priority proposed 6 locations from the nearest STPs. Fountain based on Automiser technology at following 10 identified locations. 1) Rustomjee Global City 2) MHADA Ground Bus Stop 3) In front of Bus Depot 4) Near Chedda Complex 5) Near Patankar Park Busstop 6) Near Agrawal Bus stop 7) Near Vasant Nagri 8) Near Range Office 9) Panchvati Junction 10) Near Papdy Market Bus Stop And the Map of the same is attached as Annexure – 3.
IV	Greening of open areas, garden, community places, school and housing societies	High	Feasible	2 Cr.	Long Term	January – 2024	Tree Authority	VVCMC shall undertake tree plantation using Miyawaki Plantation technique on the open spaces/area.
V	Blacktopping of metaled Roads including pavements of Roads shoulders	Low	Feasible	58 Cr.	Long Term	Continuous Process	VVCMC	Already Existing. And Action required before & after every monsoon.
SCS-1	Wall to wall paving (brick)	Low	Feasible	28 Cr.	Long Term	Continuous Process	VVCMC	The new roads are constructed as per the Urban Street design guidelines in which wall to wall paving is provided.
SCS-2	Road design improvement	Low	Feasible	60 Cr.	Long Term	Continuous Process	VVCMC	-



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information	
3. Source Group – Biomass/ trash burning, landfill waste burning									
3	(i)	Launch extensive drive against open burning of biomass crop residue, garbage, leaves, etc.	Moderate	Feasible	4 Cr.	Long term	Continuous Process	VVCMC – SWM Dept.	VVCMC has proposed new landfill site for segregated solid waste. Composting will be done.
	(ii)	Regular check and control, of burning of municipal solid waste	Moderate	Feasible	2 Cr.	Continuous	Continuous Process	VVCMC – SWM Dept.	Nuisance detection squad Appointed.
	SCS-1	Strict compliance of ban on open burning	Moderate	Feasible		Short Term	Continuous Process	VVCMC – SWM Dept.	
	(iii)	Proper collection of horticulture waste and its disposal following composting-cum-gardening approach	Moderate	Feasible	12.5 Cr.	Continuous	Continuous Process	VVCMC – SWM Dept.	Procurement of 15 number of Dry –wet Waste segregation unit to purchase for the Proper collection of green waste and further establishment of composting plant of the same will be implemented by the appointed Agency in VVCMC.
	(iv)	Ensure ban on burning of agricultural waste and crop residues and its implementation	Moderate	Feasible	NA	Long Term	Continuous Process	Palghar District Authority	Authority shall check and assure strict implementation on ban on burning of agricultural waste and crop residues
4. Source Group – Industry									
4	(i)	Identification of Brick Kiln and their regular monitoring including use of designated fuel and closure of unauthorized units	High	Feasible	Not Required	Medium Term	March - 2022	District Administration – Revenue Department	-
	(ii)	Conversion of natural draft brick kilns to induced draft	Moderate	Feasible	Not Required	Long Term	January - 2024	District Administration – Revenue Department	District Administration Shall identify authorise / Unauthorised units and shall discuss with Kiln owners
	(iii)	Action against non-complying industrial units	High	Feasible	NA	Continuous	Continuous	MPCB	Regular compliance monitored during randomised visit.
	SCS-10	Regular audit of stack emissions for QA/ QC	High	Feasible	-	Continuous	Continuous	MPCB	
	SCS-1	Sulphur reduction in fuel	Medium	Feasible	NA	Short Term	Continuous	Oil Companies	Change in fuel pattern
	SCS-2	Improved combustion technology	Medium	Feasible	NA	Long Term	Continuous	Industry / MPCB	Adapt modern Technology



Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information	
SCS-3	Alternate Fuel	High	Feasible	NA	Long Term	January - 2024	Industry / MPCB	Promote PNG use as a fuel for various process	
SCS-4	Promoting cleaner industries	Medium	Feasible	NA	Long Term	Continuous	Industry / MPCB	Recovery of Solvent by solvent using units. Installation of VOC analyser.	
SCS-5	Locating specific Emission reduction	High	Feasible	NA	Short Term	Continuous	Industry / MPCB	improvement in Air pollution control system in Stone crushers	
SCS-6	Fugitive Emission Control	High	Feasible	NA	NA	NA	Industry / MPCB	There are no oil refineries & Chemical plant located in vicinity of City. The Stone Quarries shall be instructed to use Dust Suppression methods by using water sprinklers to control & reduce the emission.	
SCS-7	Banning of new industries in existing city limits	High	Feasible	-	Long Term	Continuous	Industry / MPCB	No NoC /consent grant in corporation area	
SCS-8	Installation/ Up gradation of air pollution control systems	Medium	Feasible	0.48 Cr.	Short Term	June - 21	Industry / VVCMC	"Wind Augmentation Purifying Unit (WAYU)" Technology developed by NEERI shall be installed to control Air Pollution at 12 locations to reduce the pollutants such as PM 2.5 & 10, carbon monoxide etc.	
5. Source Group – Construction & Demolition Activities									
5	(i)	Enforcement of Construction and Demolition Rules	High	Feasible	7.5 Cr.	Long Term	January - 2024	VVCMC – SWM Dept.	DPR Prepared for C&D Waste Plant. Grant under SBM has been received. Bid process can be underway and Action initiated by VVCMC for identification of site for C&D Plant.
	(ii)	Control measures for fugitive emissions from material handling, conveying and screening operations through water sprinkling, curtains, barriers and suppression units	High	Feasible	5 Cr.	Long Term	Continuous	VVCMC – SWM Dept.	Already implemented under Development Control Rules of corporation. And Builders are being asked to implement C&D waste Rules. And VVCMC shall procure 2 Vacuum based Mechanical Sweeper to sweep the streets and to sprinkle the water on to the major roads twice in a day.

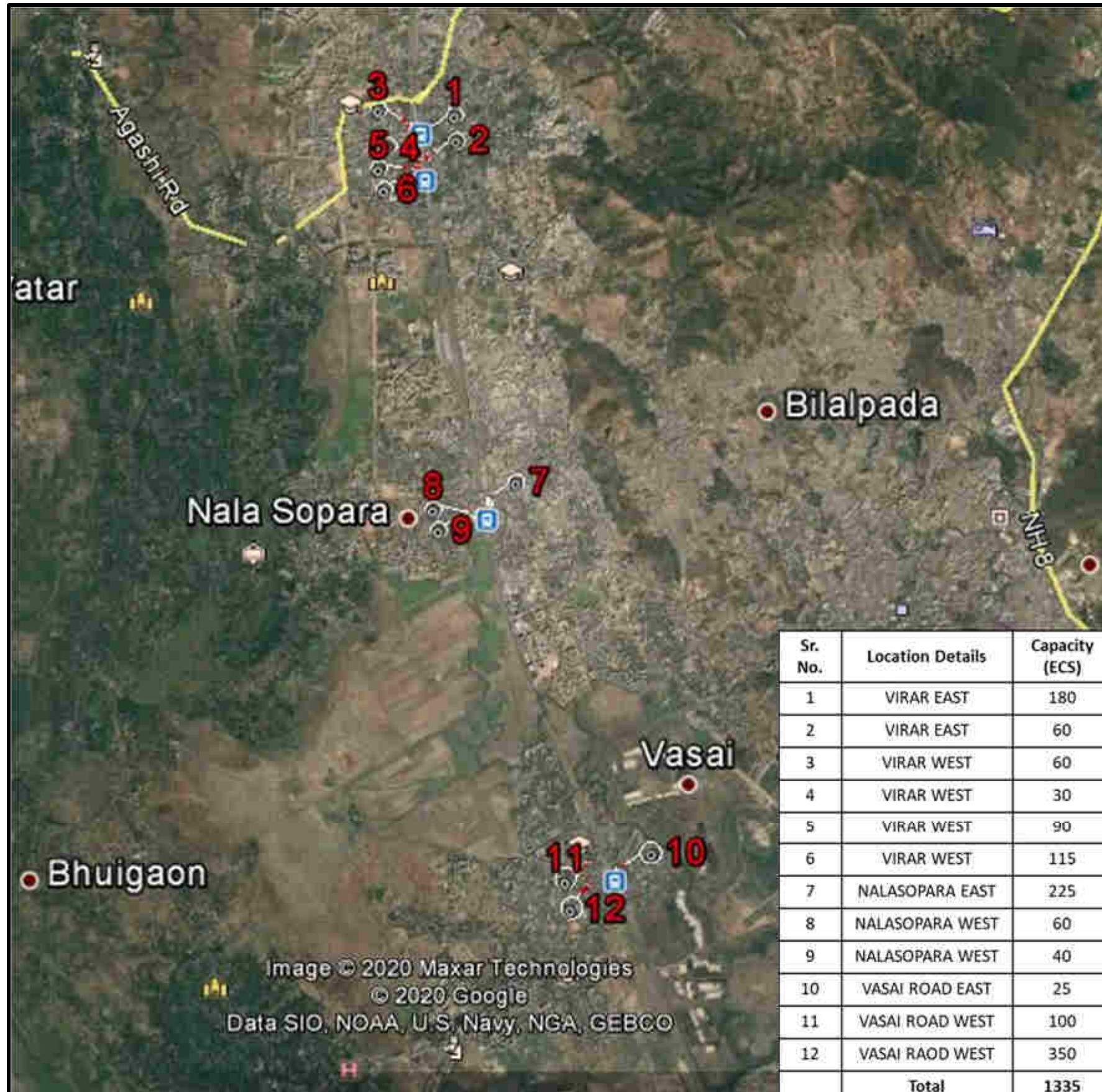


Sr. No.	Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information	
SCS-1	Better construction practices with PM reduction of 50%	Moderate	Feasible	Not Required	Medium Term	Continuous	VVCMC – SWM Dept.	Builders are being asked to follow better construction practices	
SCS-2	Banning of operation of brick kilns in city areas	Moderate	Feasible	Not Required	Medium Term	December - 2023	District Administration – Revenue Department	District Administration Shall stop operations of authorise / Unauthorised units.	
SCS-3	Ensure carriage of construction material in closed/ covered vessels	High	Feasible	5 Cr.	Medium Term	Continuous	VVCMC – SWM Dept.	Builders are being instructed to transport construction material in closed / covered vehicles under MSW 2016 rules. And if not being implemented than fine is levied from builders/developers.	
6. Source Group – Domestic Fuel Burning									
6	SCS-1	Shift to LPG from solid fuel and kerosene for domestic applications	High	Feasible	-	Long Term	-	Mahanagar Gas Ltd	Maximum population have LPG connections and PNG line development is in process.
	SCS-2	Better cooking stoves	Moderate	Feasible	Not Required	Long Term	Continuous	MNRE	VVCMC shall encourage citizens to avail MNRE grants for better Cooking stoves.
7. Source Group – Mining									
7	SCS-1	Effort for good mining practices	High	Feasible	-	Long Term	Continuous	District Collector/ MPCB	Issued circular for obtaining EC for mining activity. Committee form under district collector.
	SCS-2	Greenbelt for the activity zone and the buffer zone from each mining area	High	Feasible	-	Long Term	Continuous	District Collector	Issued circular for obtaining EC for mining activity. Committee form under district collector.
	SCS-3	Maintenance of mine area roads	High	Feasible	-	Long Term	Continuous	District Collector	Provide metallic/concrete road
8. Source Group – DG Sets									
8	(i)	Monitoring of DG sets and action against violations	Medium	Feasible	-	Medium Term	June - 2022	MSEDCL / MPCB	Regular Monitoring Squad shall be appointed for checking of DG set operations.
	SCS-1	Reduction of DG set operation / Uninterrupted power supply	Medium	Feasible	-	Medium Term	June - 2022	MSEDCL	MSEDCL to plan power supply in such a way that they have to take minimal shutdown and DG set operation can be reduced.
9. Source Group – Bakeries/Crematoria									
9	SCS-1	Use of LPG in hotels and "dhabas"	High	Feasible	6.25 Cr.	Long Term	December - 2023	VVCMC	Crematoria's LPG/PNG process shall be used in place of conventional process. Total 8 locations have been identified for construction of latest technology in crematorium.

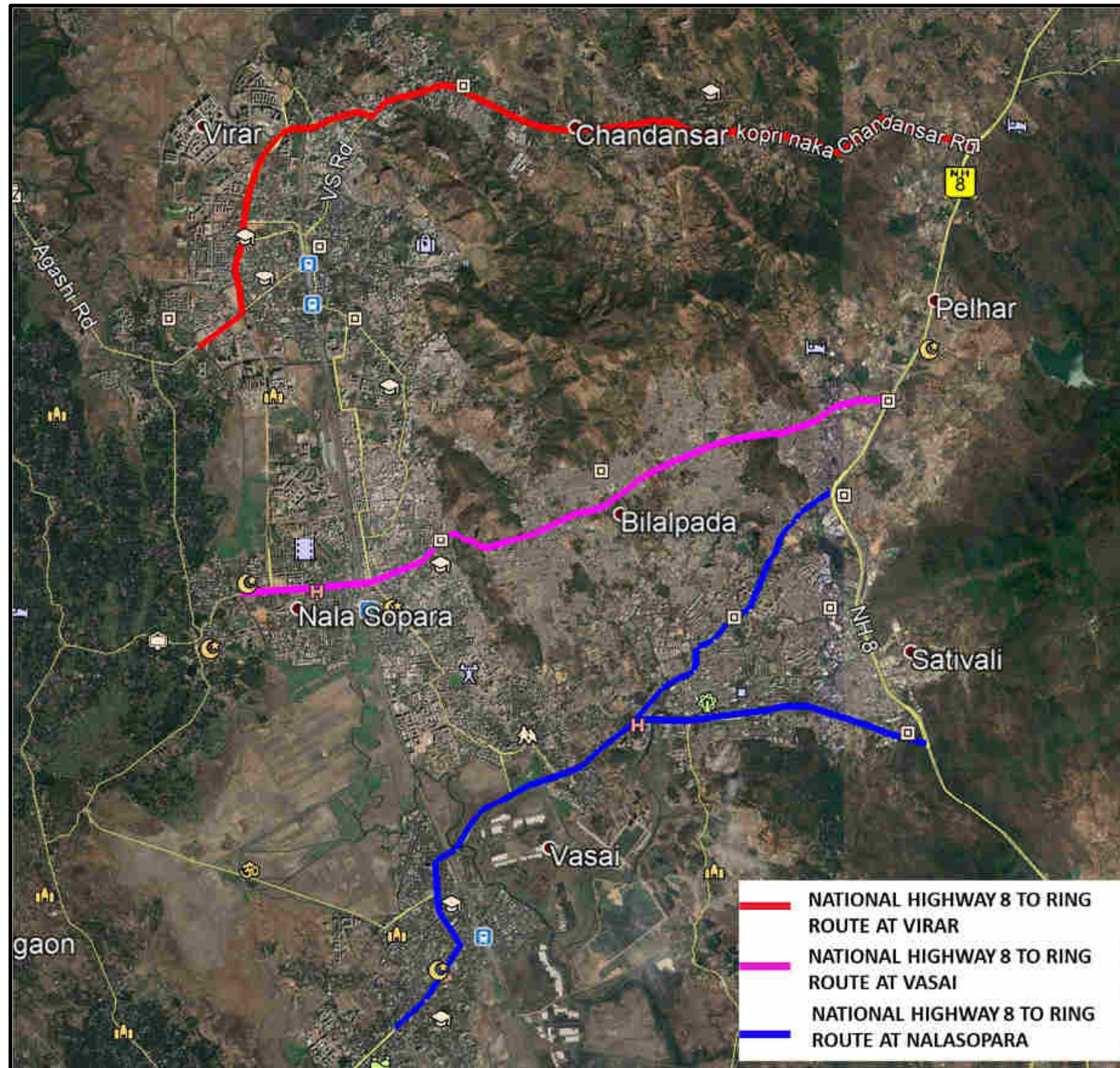


Sr. No.		Control Option	Expected Reductions and Impact	Technical Feasibility	Requirement of Financial Resources	Implementation Period (Short/Mid/Long-term)	Time target for implementation	Responsible Agency(ies)	Any other information
10. Source Group – Other (City Specific)									
10	(i)	Air Quality Monitoring Network	High	Feasible	1.75 Cr.	Medium Term	June - 2022	VVCMC / MPCB	3 manual and 4 automatic locations have been identified to install the Air Quality Monitoring Systems across the VVCMC Area. And the collected data shall be published on the VVCMC & MPCB website regularly.

Annexure – 1 – Map of Pay & Park Facility Locations across the VVCMC



Annexure – 2 – Map of Green Corridor in VVCMC Area



Annexure – 3 – Map of Water Fountain in VVCMC Area

