

Vasai Virar City Municipal Corporation

# ENVIRONMENTAL STATUS REPORT 2023-2024

Submitted by:

Indian Institute of Technology Bombay Powai, Mumbai 400076











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The status of the environment in the city is the key document that is required to prepare policies that will help to protect and conserve the environment. I am glad and feel gratified to offer Vasai-Virar City Municipal Corporation's Environmental Status Report for the years 2023–2024. The ESR showcases the efforts of the members of VVCMC, striving for improvements and driving the city to make it

sustainable with respect to the environmental factors. The Report is developed by analyzing quantitative data, vast level of monitoring across all the environmental matrices, publicly available information, suggestions, and policy documents as noted to be applicable.

VVCMC takes every effort to periodically monitor environmental matrices, dispose the generated waste, maintain roads, drainage, and sewerage systems, and enhance the all-necessary green cover by planting more trees to make the system more environmentally friendly and making the city inhabitable by the ever-growing population.

In the VVCMC region there are numerous industries that strive to maintain environmental balance while manufacturing their products. Environmental protection and conservation have always been a collective as well as individual responsibility therefore; VVCMC makes all the efforts to make the city cleaner and safer not only through collective efforts but also educating individuals to make all important impacts.

The ESR is the result of a thorough investigation conducted by the Professors and Associates of Indian Institute of Technology, Bombay. Hence, I am confident that the Environmental Status Report would assist VVCMC in making the city clean, beautiful, livable and healthy.

> **Shri. Anilkumar Pawar** Hon'ble Municipal Commissioner Vasai Virar City Municipal Corporation







"Environment Protection", "Global warming" are the buzzwords in the current world scenario. To prevent adverse impacts of Global warming protection and conservation of environment is the most important task before any government. And preparing Environment Status Report of city would definitely work as mirror to show the lacunas & would also help to suggest measures to improve the state of environment. VVCMC in Co-ordination with IIT, Bombay has prepared the Environmental

Status Report for the year of 2023-2024 and I am happy to present the same.

The Vasai-Virar City Municipal Corporation takes every effort to periodically monitor environmental matrices with or without the assistance of an external expert, dispose the generated waste in a systematic and compliant manner, maintain roads, manage and maintain the drainage and sewerage systems, enhance the all-necessary green cover by planting trees to make the system more environmentally friendly and making the city inhabitable by the ever-growing population.

Numerous businesses in the Vasai-Virar City Municipal Corporation area make an effort to produce their goods while preserving the environment. Both community duty and individual responsibility have been a part of environmental protection and conservation. The Indian Institute of Technology, Bombay, conducted a comprehensive examination that led to the creation of the Vasai-Virar Environmental Status Report.

The Environmental Status Report will undoubtedly help the Vasai-Virar City Municipal Corporation make their city a cleaner, more attractive, environment friendly and healthier place to live in. Simultaneously, it will strive to fulfill its responsibilities towards reducing the ill effects of Global warming.

> Shri. Ramesh Manale Additional Municipal Commissioner (VVCMC)







The Environmental Status Report (ESR) is not just about the fulfillment of the need for a report; rather, it is a continuous process of measurement of environmental indicators and assessment of the environmental parameters. The results are not just compiled but are analyzed with deep study and discussion, on the basis of which the Vasai-Virar City Municipal Corporation will take steps for the mitigation of identified environmental issues

and strive towards better environmental management.

We consider this as one of our most important duties, and for these reasons, we conduct a very detailed and comprehensive exercise to develop this report annually. It is a matter of immense pride to be part of a team trying to develop the city in an eco-friendly manner. Through our combined efforts, we are striving to constantly improve the status of Vasai-Virar City at all levels social, environmental, or economic.

Finally, I would also like to express my appreciation and thanks to all individuals and departments for their valuable inputs to this report.

**Shri. Ajinkya Bagade** Additional Municipal Commissioner Vasai Virar City Municipal Corporation







I'm pleased to present the Vasai-Virar City Municipal Corporation's Environmental Status Report for the years 2023–2024. The Environmental Status Report is the result of fantastic reforms that make the city more environmentally friendly and sustainable. It is constructed utilizing facts, information, useful advice, and suggested laws.

The Vasai-Virar City Municipal Corporation works arduously to

maintain the city's roadways, collect and dispose of solid waste, manage the drainage and sewerage systems, encourage tree cover through annual plantings, maintain the chowk's aesthetic appeal, and plan the city to accommodate a growing population.

The Majhi Vasundhara and Mission Life programme are being carried out by the government in our city with the message of environmental preservation and protection. Participating citizens should adopt the 75 environment friendly habits.

The second environmental status report which is prepared by a reputed institute IIT will definitely be beneficial to our city in a number of ways. This report will provide valuable guidance to provide clean air, clean water, beautiful and green city to the citizens.

**Smt.Vishakha Motghare** Deputy Municipal Commissioner Vasai Virar City Municipal Corporation





# Acknowledgement

The development of the "Environmental Status Report for "Vasai-Virar City Municipal Corporation" was a wonderful experience, which the Indian Institute of Technology, Bombay (IIT Bombay) credits to Vasai-Virar City Municipal Corporation (VVCMC) officials' for their cooperation and support.

To begin, IIT Bombay wishes to express gratitude to Shree. Anilkumar Pawar, Shree. Ajinkya Bagade, Shree. Ramesh Manale and Smt. Vishakha Motghare, all Municipal Administrator officers of Vasai-Virar City Municipal Corporation, for their continuous support and encouragement.

While formulating the Environmental Stats Report, IIT Bombay would like to express its gratitude to the City Engineer and all the officials of VVCMC, who assisted us during site visits and personal interactions to collate primary as well as secondary information.

The team would also like to thank all of the Executive Engineers of the respective departments and their team members for their assistance, as well as the Hon'ble Committee Members of the VVCMC for their continued cooperation.

IIT Bombay by heart acknowledges the efforts put forward by all the additional officials from various government ministries, their secretarial staff, and participants in stakeholder meetings, and persons who supplied data, timely assistance, and great cooperation.

Finally, the authors express their gratitude to everyone who helped them compile this study.

March, 2024





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### Abbreviation

AAQ	Ambient Air Quality
AAQMS	Ambient Air Quality Monitoring System
VVCMC	Vasai Virar City Municipal Corporation
AQI	Air Quality Index
BDL	Below Detectable Limit
BOD	Biological Oxygen Demand
ВРМС	Bombay Provisional Municipal Corporation
CAAQM	Continuous Ambient Air Monitoring Station
СЕТР	Common Effluent Treatment Plant
CGWB	Central Ground Water Board
СО	Carbon Monoxide
COD	Chemical Oxygen Demand
COPD	Chronic Obstructive Pulmonary Disease
СРСВ	Central Pollution Control Board
CSR	Corporate Social Responsibility
dBA	Weighted Decibels
DL	Detectable Limit
DMP	Disaster Management Plan
DO	Dissolved Oxygen
DPR	Detailed Project Report
DPSIR	Driving Force Pressure State Impact Response
EC	Electrical Conductivity
ENE	East- northeast
EPIP	Export Promotion Industries Park
ESR	Environmental Status Report
GBD	Global Burden of Disease





GC- FIS	Gas Chromatography- Flame Ionization Detection
GC-FID	Gas Chromatography- Flame Ionization Detector
GIS	Geographical Information System
GOM	Government of Maharashtra
IMD	India Meteorology Department
KLD	Kilo- liters per Day
LPCD	Liters per Capita per Day
LRI	Lower Respiratory Tract Infection
LULC	Land Use Land Cover
МСМ	Million Cubic Meters
MIDC	Maharashtra Industrial Development Corporation
MJP	Maharashtra Jeevan Pradhikaran
MLD	Million Liters Per Day
ММС	Maharashtra Municipal Corporation
MMR	Mumbai Metropolitan Region
MMRDA	Mumbai Metropolitan Region Development Authority
MoEF&CC	Ministry of Environment, Forest and Climate Change
MoHFW	Ministry of Health and Family Welfare
МРСВ	Maharashtra Pollution Control Board
MPN	Most Probable Ground
MSEB	Maharashtra State Electricity Board
MSL	Mean Sea Level
MSRDC	Maharashtra State Road Development Corporation
MSRTC	Maharashtra State Road Transport Corporation
MSW	Municipal Solid Waste
МТ	Metric Tons
NAAQS	National Ambient Air Quality Standards
NABL	National Accreditation Board for Test & Calibration Laboratories





NAMP	National Air Quality Monitoring Programme
NDMA	National Disaster Management Authority
NE	Northeast
NGO	Non- Government Organization
NNE	North- northeast
NOx	Oxides of Nitrogen
NRW	Non- Revenue Water
NWMP	National Water Monitoring Programme
ODF	Open Defecation Free
OECD	Organization of Economic Co-corporation and Development
PM <sub>10</sub>	Particulate Matter Below 10 micrometers Diameter
PM <sub>2.5</sub>	Particulate Matter Below 2.5 micrometers Diameter
РРР	Public Private Partnership
PWD	Public Works Department
RDS	Respirable Dust Sampler
RSPM	Respirable Suspended Particulate Matter
RTO	Regional Transport Office
SAR	Sodium Absorption Rate
SHG	Self- Help Group
SMB	Swachh Bharat Mission
SO	Sulphur Monoxide
SoE	State of Environment Report
SPM	Suspended Particulate Matter
SSW	South- southwest
STP	Sewage Treatment Plant
SW	Southwest
SWD	Social Welfare Department
TDS	Total Dissolved Solids





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ited Nation Conference on Environment and Development
orld Health Organization
estern Indian Match Company
iter Quality Index
iter Quality Monitoring Station
est- southwest
iter Treatment Plant





### **Executive Summary**

As per the Maharashtra Municipal Corporation (MMC) Act 1949, section 67(A), it is mandatory for all Urban Local Bodies (ULBs) of the state of Maharashtra to submit an annual Environmental Status Report (ESR) to General body on or before 31st July.

The 74<sup>th</sup> Amendment to the constitution has enlarged the roles and responsibilities of municipalities, specifically citing protection of the environment and promotion of ecological aspects. Preparation of Annual ESR is mandated in the state level legislation (the BPMC Act) following the 74<sup>th</sup> Constitutional Amendment Act and the 12<sup>th</sup> Schedule of constitution.

Environmental Reporting finds its roots in the Local Agenda 21 mandate passed at Earth Summit of 1990 in Rio. Under this mandate, Urban Local Bodies (ULBs) are required to prepare and publish an annual State of Environment Report (SoE) or equivalent.

The ESR indicates the city's environmental concerns, growth factors and its impacts and provides information on the environmental infrastructure including water supply, sewage management, traffic & transportation, solid waste management, biodiversity, overall environmental pollution and degradation and possible mitigation measures required, information for investment and management decisions for the ULB (Urban Local Body), assessment of various natural resources, level of pollution & its direct or indirect impact on human beings and other life forms and annual budgeting and planning exercises etc.

As per the guidelines published in June 2009 by the Department of Environment, Government of Maharashtra, the ESR has to be developed based on the DPSIR (Driving Force Pressure State Impact Response) framework. This frame-work focuses on dynamic relationship between human activities and their impact on physical and biological processes of the ecosystem.





The ESR for the financial year (FY) 2023-43 aims to fulfill the objectives stated in the guidelines stipulated by GOM pertaining to ESR. Broadly, the purpose of this study is;

- To analyse trends or changes in the environment as well as identify the causes of these changes of VVCMC.
- To highlight the condition of the biophysical environment of VVCMC
- To assess and interpret the implications and impacts of these trends
- To check adequacy of existing environmental infrastructure of VVCMC
- To set process for public participation
- To redevelop action plans of VVCMC
- To set targets, allocate responsibilities & institute monitoring and tracking mechanisms for making Vasai-Virar city environment friendly sustainable city.

To analyze the environmental health of the Vasai Virar area, environmental survey / onfield was conducted by SAGE to analyze the current environmental health of study area i.e., Vasai Virar area along with reviewing the secondary data accessible from VVCMC, MJP, MPCB, CPCB, MIDC, MoHFW, MoEF&CC, NDMA, MSEB, Vasai Tehsil etc.. The purpose of the on field survey was to know the environmental issues and efforts of VVCMC in mitigating the issues and also to understand the reasonable expectations of households in developing the city as sustainable and environmentally friendly.

The Vasai Virar city is divided into 115 wards for which elections are reportedly conducted in every 5 year interval. As per provisional reports of Census India, population of Vasai Virar in 2011 was 12,34,690 of out of which approximately 6,54,635 were males while 5,80,055 were females. The sex ratio of Vasai Virar city was 886 per 1000 males. The child sex ratio of girls is 911 per 1000 boys. The average literacy rate of Vasai Virar city is 88.57 percent of which male and female literacy was 91.53 and 85.22 percent. *(Source: Election Dept., VVCMC)* 

Vasai Virar City Municipal Corporation has total administration over the entire jurisdiction to which it supplies basic amenities like water and sewerage. It is also authorized to build





roads within Municipal Council limits and impose taxes on properties coming under its jurisdiction.

The increasing population due to high growth of mitigation, affordable housing, wellorganized railway connectivity, and enlargement of industrial activities are the main drives for pressure on environment. The ESR brings out the depletion of natural resources like water & biodiversity due to urbanization & industrialization. Also changes in land use & land cover suggest rapid urbanization in the city. A large number of slums emerged in recent years that are preliminary unplanned & has contributed to the issue like decrease in tree cover, high density population, spread of diseases etc.

On the other hand, ESR analyses the status of Air quality, water quality & noise level was found within a healthy limit as provided by MPCB online monitoring data. The scientific analysis based on GIS & satellite images discover the land use & land cover in the city & also enabled us to understand classification of land cover & percentage distribution of land use. Further, the study of biodiversity helps us understand the impact of urbanization on the environment. The increase in tree cover could lead to better oxygen level, heat stress and less pollution in the city. The report also highlights the attempts made by VVCMC to increase tree cover through tree plantation programs and plantation awareness programs, reuse and recycling of treated water, segregation at source, processing solid waste to generate unconventional source of fuel & energy, banning the usage of Single Use Plastic (SUP), to form an environment regulation body at VVCMC, installing environment monitoring station at VVCMC & to enhance the participation of NGOs including SHGs in conserving environment in the city, advance medical facilities for COVID- 19 like emergencies etc.





### **1 Background of ESR**

ESR is one of the forms of State of Environment Reporting (SoE). This data is often analyzed to show trends of environmental pollution, impacts of growth and possible environmental action planning in the city. According to the municipal legislations, the Urban Local Bodies (ULBs) in Class I cities are required to publish an annual Environmental Status Report (ESR) which will indicate the status of environment management in the city and identify the areas where mitigation measures are required to be considered.

Environmental Reporting finds its roots in the Local Agenda 21 mandate that was passed in the Earth Summit of 1990 in Rio. Under this mandate, Urban Local Bodies (ULBs) are required to undertake the preparation and publication of an annual State of Environment Report (SoE) or equivalent.

The ESR indicates the city's environmental concerns, growth factors and its impacts, provides information on the environmental infrastructure including water supply, sewage management, traffic & transportation, solid waste management, biodiversity, overall environmental pollution and degradation and possible mitigation measures required, information for investment and management decisions for the ULB (Urban Local Body), assessment of various natural resources, level of pollution & its direct or indirect impact on human beings and other life forms and annual budgeting and planning exercises etc.

As per the guidelines published in June 2009 by the Department of Environment, Government of Maharashtra (GOM), the ESR has to be developed as per the DPSIR (Driving Force Pressure State Impact Response) framework. This frame-work focuses on dynamic relationship between the human activities and its impact on physical and biological processes of the ecosystem

DPSIR framework assumes a chain of causal links starting with 'driving forces' (economic sectors, human activities) through 'pressures' (emissions, waste) to 'states' (physical,





chemical and biological) and 'impacts' on ecosystems, human health and functions, eventually leading to political 'responses' (prioritization, target setting, indicators).

ESR studies also include analysis of trends or changes in the environment, analysis of the causes of these changes, assessment and interpretation of the implications and impacts of these trends and assessment of the actual and potential societal response to environmental problems. Today, ESR study have emerged from being solely environment oriented to being all encompassing, interfacing with economic and social elements. Hence, the ESR report has come to identify the key driving forces that influence environmental change and policies.

The ESR for the financial year (FY) 2023-24 aims to fulfill the objectives stated in the guidelines stipulated by GOM pertaining to ESR. Broadly, the purpose of this study is;

- To analyze trends or changes in the environment as well as identify the causes of these changes of VVCMC
- To set targets, allocate responsibilities & institute monitoring and tracking mechanisms for making Vasai-Virar city environment friendly, sustainable city.
- To highlight the condition of the biophysical environment of VVCMC
- To assess and interpret the implications and impacts of these trends,
- To check the adequacy of the existing environmental infrastructure of VVCMC.
- To set process for public participation,
- To redevelop action plans of VVCMC,





### 2 Vasai Virar – City Profile

#### 2.1 Background

Vasai Virar City, a twin city, is a historical place known for its beaches and a major tourist attraction – Vasai Fort which was originally built in 1184. The city has seen different cultural diversions due to various rulers ruling the area. Much of the Vasai area was under Portuguese rule, the fort in fact was built by Portuguese to defend their colony and participate in the lucrative spice trade and the silk route that converged in the area. Part of Portuguese Bombay and Vasai were then seized by Marathas during the period of Peshwa rule, after the Battle of Vasai in 1739. The British East India Company then took over the territory from the Maratha Empire in 1780 during the First Anglo-Maratha War. Municipal Corporation is the governing body of the city of Vasai Virar in Palghar district.

Vasai-Virar City is the only Metropolitan City having a population of more than ten lakhs in Palghar district which is also a Municipal Corporation. It is located at the North of greater Mumbai. Vasai Virar Municipal Corporation was formed on 3rd July, 2009, comprising 4 Municipal Councils and 53 villages. It is a Class C Municipal Corporation with a geographical area of 311.0 sq.km. It is also declared as Special Planning Authority for 21 Vasai Virar Sub Region villages.

Vasai town, Virar and a number of other nearby communities were officially combined to establish the Vasai-Virar twin city in 2009, and it quickly rose to the position of one of the state's most populous urban districts. The city has historically been a major hub for commercial fishing and the wholesale export of agricultural goods. Traditional industries include salt production and handloom weaving of silk and cotton. Construction and technology-related activity have also increased in the city.

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 plantations with traditional villages maintaining peculiar Konkan-type character and offering beauty to the Sub-Region. The area of Vasai-Virar City is 311 sq. km. And total green cover is about 43.93%. The basic corporational information has been tabulated in Table 2.1.

Sr. No	Index	Information
1	City	Vasai Virar
2	Municipal Ground Coverage	311 Sq. Km.
3	Population (as per 2011 census)	12,34,690
4	Current Population	21,50,000
5	VVCMC Establishment	3 <sup>rd</sup> July 2009
6	Municipal Class	С
7	Election Ward	115
8	River	Ulhas River, Vasai Creek
9	Nearby Dam	Pelhar dam
10	MSL	36 ft
11	Location	19.3919° N, 72.8397° E
12	Road Network	<ul> <li>Mumbai-Delhi Highway NH 8</li> <li>Mumbai- Ahmedabad National Highway</li> </ul>
13	Rail Network	<ul> <li>Central line from Diva / Panvel</li> <li>Western line from Church gate</li> <li>Konkan railway line from Panvel</li> </ul>
14	Heritage	Vasai Fort

#### Table 2.1: Brief Information of Vasai Virar City

Source: VVCMC Official Website





#### 2.2 Location

Vasai Virar with a jurisdiction of about 311 sq. km. is geographically located at 19.3919° N, Latitude and 72.8397° E Longitude at about 36 feet above mean sea level. It is located in Maharashtra, India's Konkan region. Vasai-Virar is one of the twin cities that make up the Mumbai Metropolitan Region (MMR). Vasai-Virar city has been separated from Greater Mumbai and Mira-Bhayandar City by Vasai Creek. Vasai Virar is well connected with all the nearest cities like Mumbai & Thane. Vasai Virar falls in the Palghar district, which approximately lies 53 km from Mumbai by road.

Vasai Virar city is situated in the north-west of the Mumbai Metropolitan Region. Location of Vasai Virar city is shown in Figure 2.1 & 2.2. The sanction plan of Vasai Virar city as given on the VVCMC website is shown in Figure 2.3.



Figure 2.1: Location of Vasai Virar City on Google











Environmental Status Report, 2023-2024 Vasai Virar City Municipal Corporation







Source: VVCMC's Official Website





#### 2.3 Connectivity Network

Vasai Virar has emerged to be one of the fastest developing cities not only in Maharashtra but in the whole of India as well. The fact that it is a neighboring city to Mumbai has led to an influx of people constantly migrating to it. These people see Vasai Virar as the best option to not only beat the overcrowded, congested ways of Mumbai but also to tackle the paucity of land and skyrocketing rent that Mumbai is commonly infamous for. This is also one of the driving reasons the real estate market in Vasai Virar has expanded. Figure 2.4 shows the connectivity of Vasai Virar City with Mumbai and MMR Region.



Figure 2.4: Vasai Virar City Connectivity

Source: www.mapsofindia.com





The city is well connected to Mumbai by Western Railway and through Mumbai-Ahmedabad National Highway. The Vasai-Diva Railway line connects the city to Navi Mumbai, Thane, Bhiwandi, Kalyan, and Panvel Node of Navi Mumbai City. It serves as a connecting point for the trains coming from Vadodara to Konkan Railway, Pune junction railway station and further towards cities of Bengaluru and Hyderabad.

Vasai-Virar's potential for expansion is substantial, given its proximity to Mumbai's core. On October 3, 2012, the Vasai-Virar City Municipal Corporation launched its own transportation service in collaboration with VVMT, also known as Bhagirathi Transport Corporation Pvt Ltd. It runs numerous bus lines in the city. Additionally, it operates in Mumbai, Thane, and the nearby cities of Mira-Bhayandar. Vasai to Thane and Vasai to Mulund are served by the VVMT bus. Refer Figure 2.5 for the road connectivity of Vasai Virar City.







Figure 2.5: Road Connectivity to Vasai Virar

Vasai Virar is one of the most important railway stations on the western railway route. While it comes under the Mumbai Division of Western Railway from Church gate to Dahanu, central line from Panvel/ Diva all meet at Vasai Road railway station. Figure 2.6 shows the rail connectivity of Vasai Virar City.







Figure 2.6: Vasai Virar Railway Connectivity Map





#### 2.4 Climatic Conditions

The general climatic regime is fairly equitable since seasonal fluctuations of temperature are not significantly large. The moderating effects of the nearby sea and the fairly high amount of relative humidity in the atmosphere have restricted the variability. According to the Department of Agriculture, Government of Maharashtra, the state is divided into 9 Agro-climatic zones. The climate of the Vasai Virar Sub-region can be described as hothumid with moderate seasonal temperature fluctuations. Due to a long coast-line and high relative humidity, the variations are not significant. The Vasai Virar Region is a narrow coastal belt fringed with dense thickets of coconut groves with a near pastoral ambience, and thus the relative humidity in Vasai-Virar is high.

#### Average Temperature and Precipitation:

The average daily temperature varies from 13°C to 39°C. Major part of Vasai Virar city is in its developing stages. Most of the area either falls under agricultural land followed by open fallow land (Refer Figure 2.9-Land Use Pattern). Vasai Virar experiences fluctuations in temperatures across the year. Refer Figure 2.7 captures the average monthly temperature in Vasai Virar.



Figure 2.7: Vasai Virar City Temperature and Rainfall Chart

(https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/vir%c4%81r india 1253 133)





#### Rainfall:

Majority of the rainfall in the region is from the South–West monsoon between June and September. The annual rainfall averages between 2000 mm to 2500 mm. Maximum rainfall is received in the month of July.



Figure 2.8: Annual Wind Rose for Vasai Virar Municip al Corporation

(Source:https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/vir%c4%81r\_indi a\_1253133)





Figure 2.8 shows the annual wind rose for Vasai Virar. The wind rose shows the wind flow in hours per year from different directions. For example, the wind blows with the speed of > 1 km/ hour for around 237 hours a year from SW to NE direction. Similarly, wind blows from W to E for about 324 hours a year at the speed of > 1 km/ hour. Also, wind blows from SSW to NNE for about 139 hours in a year at the speed of > 1 km/ hour.

### 2.5 Land Use and Land Cover

Vasai Virar Municipal Corporation is in the Palghar district. The total geographical area of the VVCMC is 311 sq.km. Figure 2.9 gives the land use pattern of Vasai Virar City.



Figure 2.9: Palghar District Map and Vasai Virar Municipal Corporation

Source: https://vvcmc.in/town-planning




The Vasai-Virar City 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 a higher level and moderately plain. The average elevation of the area above sea level is 36 ft. Many local variations are caused by small hillocks scattered in the eastern and north-eastern part of the region. The area to the east of the National Highway is hilly and mostly covered 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, mainly to the south of Nalla Sopara 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 plantations with traditional villages maintaining peculiar Konkan-type character and offering beauty to the Sub-Region. Vasai Virar City Development Plan under the scheme of UID in Satellite Towns Tandon & Associates Page 26 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%. The sand is also extracted through the Vaitarna Creek as building material by dredging, which helps the creek remain desilted yearly.

Major area in non-urbanized part of the city has been used for agricultural purposes. The city is in its developmental stage, and hence the percentage of the developed sectors is lower than that of the undeveloped sectors. The percentage of existing developed and undeveloped areas are tabulated in Table 2.2 & Table 2.3.





Sr. No.	Developed Area	Area (Hectare)	NU Zone area (%)
1	Existing Settlements and Gaothans	105.65	0.3688
2	Roads	171.48	0.5961
3	Railways	2.10	0.0053
4	Water Bodies	123.15	0.4279
5	Cattle Sheds	14.60	0.0576
6	Forest	8626.26	30.1124
7	Agriculture/Cattle and Grazing	19603.55	68.4319
	Total Area of N-U Zone	28,646.79	100

#### Table 2.2: Existing Land Use for Non-Urbanisable Area (NU Zone) of VVCMC



### Figure 2.10: Bifurcation of NU-Area

Source: Vasai Virar City Development Plan under scheme of UID in Satellite Towns





Sr. No.	Developed Area	Area (Hectare)	U Zone area (%)
1	Residential	1550.25	16.574
2	Commercial	73.50	0.785
3	Industrial	155.40	1.661
4	Social Facilities	144.10	1.541
5	Public Utilities	11.80	0.126
6	Recreational	97.77	1.045
7	Forest	183.61	1.963
8	Transport & Road	346.50	3.705
9	Railways	55.00	0.588
10	Water Bodies	233.22	2.493
11	Salt Pans	1065.00	11.386
12	Agriculture	5437.06	58.133
	Total Area of U Zone	9353.21	100

# Table 2.3: Existing Land Use for Urbanisable Area (U-Zone) of VVCMC



#### Figure 2.11: Bifurcation of U-Area

Source: Vasai Virar City Development Plan under scheme of UID in Satellite Towns





### Land Use as per final Development Plan (2007)

VVCMC has modified the revised D.P. and submitted by CIDCO to the State Government within the framework, policies and decisions. The proposed land-use analysis of the modified D.P. is as under. Graphical representation has been given in Fig. 2.12 & 2.13.

Sr. No.	Land-Use	Area (Hectare)	% with developable Area	% with Sub- Region Area
1	Residential Zone	3642.50	43.76	
	General Residential Zone	2993.24	35.96	
	Special Residential Zone	486.96	5.85	9.59
	Low-Density Residential Zone	762.30	1.95	
2	Public/Semi-Public Zone (Govt. offices, educational, medical, religious, community activities)	935.0	11.23	2.46
3	Commercial Zone (sites or complexes and APMC)	116.50	1.40	0.31
4	Industrial Zone	922.00	11.08	
	a) Service Industrial Zone (I1)	99.20	1.19	2.42
	b) General Industrial Zone (I2)	822.80	9.89	
5	Public Utilities (solid waste or sewage disposal, water supply, electricity, etc.)	189.0	2.27	0.50
6	Transport & Communications	2096.00	25.18	
	a) Sites	74.00	0.89	5.52
	b) Roads	1780.00	21.38	
	c) Railways/Carshed	242.00	2.91	
7	Organized Open Spaces (playgrounds, parks, gardens, fairgrounds, etc.)	423.0	5.08	1.11
	Total area considered for development	8324.0	100	21.91
8	Plantation Zone	5520.50		14.53
9	Green Zone	18277.0		48.09

#### Table 2.4: Proposed Land-Use Analysis of modified DP





Sr. No.	Land-Use	Area (Hectare)	% with developable Area	% with Sub- Region Area
10	No Development Zone	4802.0		12.64
11	Cattle Shed Zone	465.0		1.22
12	Water Bodies	611.50		1.61
	Total area of restricted and No Development Zones	29676.0		78.09
	Total Area of Sub-Region	38000.0		100

Source: VVCMC



Figure 2.12: Percentage with Developable Area







Figure 2.13: Percentage with Sub-Region Area

# 2.6 VVCMC Urban Infrastructure

VVCMC is a historical town and comparatively less developed than the neighboring corporations. Though a slowly developing corporation, it is still a metropolitan city with all the facilities and infrastructure evolving at speed.

Sr. No.	Urbanization	Planning & Design Authority	Developed by	0/М
1	Planning & Development	MMRDA, Local Planning Authority		
	Infrastructure & Services			
2.	<ul><li>Water Supply service</li><li>Sewerage service</li><li>Sanitation service</li></ul>	VVCMC	VVCMC	VVCMC
	Stormwater drainage system	VVCMC	VVCMC	VVCMC
	Municipal Solid Waste	VVCMC	VVCMC	VVCMC

### Table 2.5: Urban Infrastructure Facilities by VVCMC





Sr. No.	Urbanization	Planning & Design Authority	Developed by	0/М
	Management <ul> <li>(Collection, Disposal &amp; Treatment)</li> </ul>			
	Municipal roads & flyovers	VVCMC & Town Planning	VVCMC & PWD	VVCMC
	<ul> <li>Street lights facility</li> <li>Fire Brigade</li> <li>Municipal Gardens</li> <li>Municipal Hospital</li> <li>Disaster management</li> </ul>	VVCMC	VVCMC	VVCMC
	<b>Transportation &amp; Traffic</b>			
2	Urban transport facilities	MSRTC & VVMT	MSRTC & VVMT	MSRTC & VVMT
3	Registration & regulations			RTO
	Traffic Management			Traffic Police
	<ul> <li>Indian Railways</li> <li>Mumbai Suburban Railway</li> <li>– Central Line</li> </ul>	Indian Railways		
4	Metro Service	MMRDA		

VVCMC : Vasai Virar City Municipal Corporation

*PWD* : *Public Works Department* 

MMRDA : Mumbai Metropolitan Region Development Authority

MSRTC : Maharashtra State Road Transport Corporation

VVMT : Vasai Virar Municipal Transport

RTO : Road Traffic Police

#### Source: VVCMC DPR

Apart from the basic service delivery facilities like water supply, solid waste management, electricity, and transportation, VVCMC also strives to improve financial management and upgradation of the city, skill development and capacity building, improving urban environment, implementation of public – private partnership projects for mobilizing investments and efficiency gains.





The details of the Reform Commitments envisaged are given in Table 2.6.

Desired Outcome	ULB Responsibilities
Financially self-sustainable	Adoption of accrual based double entry
	Property Tax reforms
	E Governance
	Levy user charges to achieve full cost recovery
	Provision of basic services to urban poor
Well-functioning, efficient	Professionalize property mgmt.
and equitable urban land	Simplify rezoning, construction
market	Computerize land titles
	Earmark 20-25% land for EWS and LIG
Transparent accountable	Introduce Area Sabhas and Ward
governance and service	Committees
delivery	Publish Performance Reports
	Introduce service scorecards
	Structural reforms

# Table 2.6: Reform Commitments envisaged





# **3 Driving Forces of Vasai Virar City**

# 3.1 Driving Forces, Pressure, State, Impact, Responses (DPSIR) Framework

This framework was initially developed by the Organization for Economic Co-operation and Development (OECD), in 1994 and has been used extensively by various national/international environmental agencies to relate the effects of human activities on the state of environment. The DPSIR model can be used as an analytical framework for assessing the environmental issues by examining inter-linkages between each of these elements.

It is the most effective form of conveying environmental status to the citizens and government authorities. This framework helps policy/decision makers to get ground level/real time feedback about the impacts of various pressures on the states, thereby helping prepare a forward action plan necessary for implementation of any future changes in policies useful for mitigating environmental issues. Refer Figure 3.1 below which shows the DPSIR framework.



Figure 3.1: Relationship between Strategic Action Planning and the DPSIR framework





**Driving Forces:** Socio-economic and socio-cultural forces driving human activities which increase or mitigate pressures on the environment **Pressures:** Stresses that human activities place on the environment (e.g. Wastewater)

**State of the Environment (SoE):** The condition of the environment (e.g. Air or water quality assessment)

*Impacts:* Effects of environmental degradation (e.g. biodiversity loss, economic damage) *Responses:* Responses by society to the environmental situation (e.g. Cleaner production, regulations)

The state of the environment is represented by the qualitative and quantitative indicators of environmental resources as well as the quality of services it offers. Environmental monitoring data for air and water quality and the extent of land contamination are some typical quantitative indicators.

The environment is being degraded due to human intervention like shifting cultivation, over exploitation of forest resources, cattle grazing, and changes in land use by converting forests to agricultural lands, urbanization and dwelling sites. These activities have continued ever since man started cultivating and exploiting the natural resources for livelihood. The local urban bodies suffer from large human intervention in managing increasing demand for resources that generates pressure on environment and also attempt to conserve and protect the environment with its efforts in creating more environmental resources. The human intervention creates pressure on land and land cover in urban spaces. And hence it becomes imminent to understand the status of land use and resource extraction and evaluate its impact on environment.

# 3.2 Driving Forces of Vasai Virar City

Urbanization refers to the growth in towns and cities. The process of urbanization is one of the most important dimensions of economic, social and physical change. Although it provides opportunities for job, better housing, education, knowledge, and technology etc., it also exerts enormous stress on natural resources. The growth of the industries results in





the expansion of the business sector and economic growth of the city, which in turn attracts the inflow of population from other towns and villages, thus setting a continuous and everexpanding cycle. Thus, population, industrial, economic, and spatial growths act as primary driving forces in the growth of any city. Similarly, availability of resources like Air, Water, and Land act as key factors in the growth of cities and have been analyzed in separate sections for their status, the-Pressures being exerted on them, the —Impact of various urban activities on these resources, and the —Response taken by the corporation to reduce the impacts.

# 3.2.1 **Population Growth**

The size of the population is one of the main factors that impact the environment by generating pressure on environmental resources available in a region. Natural resources like land and water are scarce and they are to be used efficiently and sustainably. These resources get exhausted as a large population makes use of them unsustainably. Hence there is some threshold level of population that can sustain the use of environmental resources. An area's carrying capacity can be defined as the maximum number of people that the environment of that area can support through optimum utilization of the available resources (ILPWRM, 2012). Perhaps this carrying capacity is crossed in many regions globally, increasing the pressure on the environment and caused environmental degradation. Crutzen (2016) introduced the concept of the Anthropocene Epoch which describes human influence on the environment. Hence one has to contextualize the population and its impact on the environment.

The current estimated population of Vasai Virar city in 2023 is 21,50,000. The last census was conducted in 2011 and the scheduled census for Vasai Virar city in 2021 was postponed due to Covid. The current estimates of Vasai Virar city are based on past growth rate. As per provisional reports of Census India, population of Vasai Virar in 2011 is 12,34,690. The details are given in Table 3.1. Vasai-Virar city had a sex ratio of 886 for total population in 2011. The VVCMC is administratively divided into 115 wards.





Decorintion	As per 2011 Census			
Description	Total	Male	Female	
City Population	12,34,690	6,54,635	5,80,055	
Literates	9,52,411	5,22,814	4,29,597	
Children (0-6)	147102	76993	70109	
SC Population	51,468	26,901	24,567	
ST Population	58,608	29,341	29,267	
Average Literacy (%)	88.57%	91.53%	85.22%	
Sex Ratio (F:M)	886			
Child Sex Ratio (F:M)	911			

### Table 3.1: Population in Vasai Virar City

#### Source: Election Department, VVCMC

**Population Projections:** Projections as tabulated in Table No. 3.2 provide a base for determining future needs. Based on past trends and internal and external factors, assumptions are framed and thus population projections are worked out. It is very crucial to determine the growth trends as it gives base data to estimate the physical and social infrastructure. Therefore, it is essential to project the population for 20-25 years to set out the overall infrastructure.

The Vasai Virar region is fast developing, considering its nearness to the megacity of Mumbai and improvement in its connectivity to Mumbai through many projects proposed for this region. The low-cost housing project is also proposed for the urban poor in this area. The VVCMC proposes to develop the Heritage installations and create Recreational hubs in the area for Tourism development.

Year	Population
2011	12,34,690
2019	15,00,000
2021	19,80,000
2031	26,30,000
2041	41,80,000

### Table 3.2: Population Projections as per Approved City Development Plan

Source: Approved City Development plan of VVCMC





**Decadal Growth Rate:** The concentration of economic activities and population in Mumbai has put tremendous strain on the delivery of services. At the same time, there has been a growing need for the decentralization of activities so as to reduce the burden on the cities. Looking into the imperative need to plan to develop new township/satellite towns around million plus /large cities, it is proposed to develop Vasai Virar Municipal Corporation into a Satellite Town/counter magnets spatially separated from the mother city of Mumbai. With improvement in the transport corridors and low cost housing projects for urban poor, extra built-up space, which would be generated on account by redevelopment of old properties with higher FSI there, will be an increase in the population of the Region.

Year	Population (Lakhs)	Decadal Growth Rate
2011	12.34	-
2019	19.50	20%
2021	20.76	70%
2031	31.14	50%
2041	39.93	25%

Source: Approved City Development Plan of VVCMC, VVCMC DPR

## 3.2.2 Industrial Growth

The rapid growth of Vasai Virar has made the city a prime region for commercial growth. The upcoming projects in this city are the potential destination for new and innovative startups and many industries interested in initializing a new trade in this area. Vasai Virar City Municipal Corporation has also developed its own small -scale industrial estate. The MMRDA had prepared a plan for Waliv - Gokhivare - Sativali Industrial Complex. The industrial activities at Waliv - Gokhivare are coming up for many small and medium scale industries, providing employment in the sub-region. Refer Figure 3.2 for Industrial area earmarked in VVCMC.







Figure 3.2: Industrial Zone - VVCMC

Source: Vasai Virar City Development Plan under scheme of UID in Satellite Towns, VVCMC DPR

### 3.2.3 Tourism

Vasai Virar is an important tourist destination because of its pleasant weather, which keeps visitors cool and comfortable. It is the most crowded locality in the Palghar district of Maharashtra. The place has developed into a good tourist destination while maintaining its natural rawness. So, you can get all kinds of facilities in this place and can also appreciate & enjoy the beautiful creation of nature.

The city is situated on the banks of Vasai Creek. It is known for the fort in Vasai. Vasai Fort, Tungareshwar waterfall, Chandika Devi temple, Tungareshwar wildlife sanctuary,





Jivdani temple and Bhuigaon Beach are the important and frequently visited tourist places in Vasai Virar area (Fig. 3.3). Vasai fort is a historical place which is a more popular tourist destination.



Figure 3.3: Tourist destinations in Vasai Virar





# 3.2.4 Economic Development

Population and economic growth tend to affect natural environment adversely if not managed properly. While economic growth may positively impact in measures such as nutrition, health, and life expectancy, coupled with population growth, it also can adversely affect the local eco-systems. Unsustainable natural resource extraction, defunct waste management systems, and unregulated habitat settlements can significantly impact the mid-term sustainability of natural resources. Hence it is vital to assess the effects of economic activities on environment.

Broadly, the informal sector provides income-earning opportunities for many workers. The Government has to play the role of facilitator and promoter so that the workers employed in the informal sector are able to get a requisite level of skills enabling them to upgrade their capabilities necessary for enhancing the competitiveness of their outputs and thereby raising their income and socio-economic status.





# **4 Air Environment**

Earth's atmosphere is a layer of gases surrounding the planet. This mixture of gases that envelopes the earth is commonly known as air. Pure air consists of 78% nitrogen & 21% oxygen, while other gases like argon, carbon dioxide, methane, and so on are present in trace amounts. Change in natural composition of air occurs due to addition of undesirable elements arising from anthropogenic activities like the combustion of fossil fuels. Emissions from power plants, industries, automobiles, construction activities and so on emit tones of air pollutants (any solid, liquid, or gaseous substance, including noise) into the atmosphere, which deteriorates the air quality and exposes citizens to great health risks.

Higher concentrations of air pollutants may be or tend to be harmful to human beings, other living creatures, plants, property, or environment. The Global Burden of Disease (GBD) stated about 4.2 million deaths due to exposure to  $PM_{2.5}$  (Particulate Matter <2.5 microns) have occurred, thus ranking fifth for total deaths worldwide. In 2015, about 17.1% of deaths occurred from ischemic heart disease, 14.2% from stroke, 16.5% from lung cancer, 24.7% from LRIs (Lower Respiratory tract Infections), and 27.1% from COPD (Chronic Obstructive Pulmonary Disease) were recorded due to exposure for Particulate Matter. As per the WHO (World Health Organization), almost 80% of the urban population is exposed to air quality that fails to meet the WHO guidelines, thus resulting in respiratory disease and other health problems.

In order to monitor the ambient air quality, Central Pollution Control Board (CPCB) at national level compares the status of ambient air quality parameters, which indicate the comparative status of various cities. In addition to this, at state level Maharashtra Pollution Control Board (MPCB) and at city level VVCMC also monitors the air quality parameters. This section discusses the status of the ambient air quality monitoring network and the ambient air quality recorded for various air pollutants and the processing comparisons.





# 4.1 Ambient Air Quality Monitoring Station (MPCB Stations)

MPCB has established one Ambient Air Quality Monitoring Station (AAQMS) in VVCMC. The monitoring station is continuous and it is under National Air Quality Monitoring Program (NAMP). The monitoring station is at Diwanman Fire Bridgade premises, 100 Feet Raod, Vasai-West, Palghar-401201. The details of the monitoring station are given in Table 4.1.

City	Vasai-Virar
Program	CAAQMS
Implementing Agency	МРСВ
Location	Diwanman Fire Bridgade premises, 100 Feet Raod, Vasai-West , Palghar-401201.
MPCB Region	Vasai-Virar
Frequency	Continuous Monitoring
Parameters Monitored	SO <sub>2</sub> , NO <sub>x</sub> , RSPM

### Table 4.1: Details of AAQMS at Vasai-Virar





#### **Concentration of Parameters** 160 134 140 Annual Average (μg/m<sup>3</sup>) 120 104 100 75 80 67 67 61 56 56 60 51 51 40 17 17 20 0 2020 2021 2022 2023 Year SO2 NOX RSPM

# 4.1.1 Annual Trend in the Concentration of Parameters

Parameters	$SO2\mu g/m^3$	NOx	RSPM		
NAAQS	80	80	100		

#### Figure 4.1: Annual Trend in the Concentration of Parameters

As per Figure 4.1, it can be observed that SO<sub>2</sub> and NO<sub>x</sub> emissions are mostly resulted from the combustion of fuel in automobiles and mobile sources (50%), electric power plants (20%), and other home uses (30%) (EPA 456/F-99-006R, November 1999). As shown in Figure 4.1, SO2 and NOX concentration levels dropped from in 2022. It could be because of of restrictions on use of private & public vehicles as well as industrial operations except for biomedical production. The projected emissions observed due to operations & vehicles were used as emergency services. The average annual SO<sub>2</sub> and NO<sub>x</sub> concentration is lower than the CPCB prescribed annual standard of  $80\mu g/m^3$  for all the years. The highest average concentration of SO<sub>2</sub> and NO<sub>x</sub> was reported in 2020, which is 67  $\mu g/m3$  for both





parameters and RSPM was reported in 2023, which is 134  $\mu$ g/m3 and the lowest was reported in 2022 (17  $\mu$ g/m<sup>3</sup>).

Particulate matter is a complex mixture of extremely small particles and liquid droplets composed of a variety of constituents such as acids (such as nitrates and sulphates), organic compounds, metals, and soil or dust particles. They are emitted by combustion processes, vehicles, and industrial processes. Particles with a diameter of 10 micrometres or less can pass through the throat and nose and enter the lungs, and are commonly referred to as RSPM. These particles, when inhaled, can harm the heart and lungs and create major health problems. In 2021 and this year, the average annual RSPM concentration is higher than the CPCB standard. To solve such concerns, it is advised that VVCMC improve or strengthen its real-time monitoring network. It is also necessary to increase the amount of vegetation in cities in order to significantly reduce PM10 levels.

# **Air Quality Index**

Air Quality Index (AQI) is the most convenient way to convey the information on outdoor air quality which could be easily understood by general public. AQI transforms complex air quality data of various pollutants into a single index value. AQI is calculated using the AQ sub index and the health breakpoints, which are evolved for eight pollutants (PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>, NH<sub>3</sub>, and Pb) for which short-term (up to 24-hours) are prescribed by NAAQS. Based on the measured ambient concentrations of a pollutant, sub-index is calculated, which is a linear function of concentration. The worst sub-index determines the overall AQI. The sub-indices for individual pollutants at a monitoring location are calculated using its 24-hourly average concentration value (8-hourly in case of CO and O3) and health breakpoint concentration range. AQI are within a range of 0 to 500 and is categorized into 'Good', 'Satisfactory', 'Moderate', 'Poor', 'Very Poor' or 'Severe' based on the concentration of various pollutants and their health impacts at various concentrations. Higher value of AQI indicates high level of pollution. Figure shows the AQI classification.





### Table 4.2: AQI Classification

AQI	Quality Classification	Remarks	Colour Code
0-50	Minimal Impact	Good	
51-100	Minor breathing discomfort to sensitive people	Satisfactory	
101-200	Breathing discomfort to the people with lung, heart disease, children and older adults	Moderate	
201-300	Breathing discomfort to people on prolonged exposure	Poor	
301-400	Respiratory illness to the people on prolonged exposure	Very Poor	
> 401	Respiratory effects even on healthy people	Severe	

Source: MPCB



Source: MPCB

### Figure 4.2: VVCMC Annual AQI Classification

Data for the VVCMC Annual AQI Classification for the years 2020–2023 was gathered from the MPCB website. For each year, data on good and poor days was calculated. As shown in Figure 4.2, the air quality index for the year 2020 was good or satisfactory for 153 days out





of the year and moderate for the remaining 142 days. A similar pattern was seen in 2021. Due to the COVID-19-induced lockdown, there were restrictions on the use of vehicles and operations in industries. The lockdown significantly impacts social and economic activities, but it has temporarily improved the air quality in most of the polluted cities. AQI was expected to cause minor respiratory discomfort in sensitive people in the years 2020–2021. After the lockdown was released in 2022, the air quality started to deteriorate. For the entire year of 2022, the air quality index was good or satisfactory for 112 days and moderate for the other 127 days. Due to increased urban mobility, post-COVID restrictions have significantly increased the concentration of air pollutants. In order to help minimize automobile pollution, VVCMC should launch its own low-cost, heavily subsidized municipal transportation system. This system should primarily consist of electric buses, and it should also incorporate renewable energy sources to cut down on CO2 emissions.





# **5 Noise Environment**

Noise pollution is caused by an unwanted sound that is produced by various natural or man-made sources such as oceans, construction, industries, transportation etc. Noise pollution is one of the major environmental pollutants that are encountered in daily life and has a direct effect on human performance. Noise pollution is regarded as a public nuisance under Sections 268, 290 & 291 of the Indian Penal Code. There are several other legislations relating to noise pollution such as - The Factories Act, 1948 (under which 'noise induced hearing loss' is notified as a disease); Motor Vehicles Act, 1988 (which specifies rules for horns and silencers); Law of Torts (civil suits can be filed for claiming damages); The Air (Prevention and Control of Pollution) Act, 1981 (ambient noise standards have been given), The Environment (Protection) Act, 1986; Noise Pollution (Regulation and Control) Rules, 2000 and regulations in respect of Loudspeakers/Public Address System.

There are standards and guidelines for ambient noise quality, automobiles, domestic appliances and construction equipment, generator sets and firecrackers as notified under the Environment (Protection) Act, 1986. According to the World Health Organization, sound levels less than 70 dBA are not damaging to living organisms, regardless of how long or consistent the exposure is. Exposure for more than 8 hours to constant noise beyond 85 dBA can be considered to be potentially hazardous. Working for 8 hours daily in close proximity to a busy road or highway, makes someone highly vulnerable to be exposed to traffic noise pollution of around 85dBA. CPCB Limits for Ambient Noise are given in the Table 5.1.

Area Cada	Catagomy of Area	Limit in dB (A), L <sub>eq</sub>			
Alea Coue	Category of Area	Day Time	Night Time		
А	Industrial Area	75	70		
В	<b>Commercial Area</b>	65	55		
С	<b>Residential Area</b>	55	45		
D	Silent Zone	50	40		

Table 5.1: CPCB Limits for Ambient Noise





- Daytime shall mean from 6:00 a.m. to 10:00 p.m.
- Night time shall mean from 10:00 p.m. to 6:00 a.m.
- A silence Zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.
- Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
- dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A, which is relatable to human hearing.
- A "decibel" is a unit in which noise is measured.
- "A", in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.
- Leq is the energy mean of the noise level over a specified period.

This type of pollution is so omnipresent in today's society that we often fail to even notice it anymore:

- Street traffic sounds from cars, buses, pedestrians, ambulances etc.
- Construction sounds like drilling or other heavy machinery in operation.
- Airports, with constant, elevated sounds from air traffic, i.e. planes taking off or landing.
- Workplace sounds often common in open-space offices.
- Constant loud music in or near commercial venues.
- Industrial sounds like fans, generators, compressors, mills etc.
- Train station traffic.
- Household sounds, from the television set to music playing on the stereo or computer, vacuum cleaners, fans and coolers, washing machines, dishwashers, lawnmowers etc.





- Events involving fireworks, firecrackers, loudspeakers etc.
- Conflicts generate noise pollution through explosions, gunfire etc. The dysfunctions, in this case, are likely caused by the conflict and insecurity and less by the noise pollution in itself, although that compounds stress levels too.

### **Consequences of Noise Pollution:**

Whether we realize we are subjected to it or not, noise pollution can be hazardous to our health in various ways.

- Hypertension is a direct result of noise pollution caused elevated blood levels for a longer period of time.
- Hearing loss can be directly caused by noise pollution, whether listening to loud music in your headphones or being exposed to loud drilling noises at work, heavy air or land traffic or separate incidents in which noise levels reach dangerous intervals, such as around140 dB for adult or 120 dB for children.
- Sleep disturbances are usually caused by constant air or land traffic at night, and they are a serious condition in that they can affect everyday performance and lead to serious diseases.
- Child development. Children appear to be more sensitive to noise pollution and a number of noise-pollution-related diseases and dysfunctions are known to affect children, from hearing impairment to psychological and physical effects. Also, children who regularly use music players at high volumes are at risk of developing hearing dysfunctions. Various cardiovascular dysfunctions, Elevated blood pressure caused by noise pollution, especially during the night, can lead to various cardiovascular diseases.
- Dementia isn't necessarily caused by noise pollution, but its onset can be favored or compounded by noise pollution.
- Psychological dysfunctions and noise annoyance. Noise annoyance is, in fact, a recognized name for an emotional reaction that can have an immediate impact.





Studies have shown that loud noise can cause caterpillars' hearts to beat faster and bluebirds to have fewer chicks.

• Noise pollution makes it difficult for animals to use sound for navigation, finding food, mating, and avoiding predators, affecting many animals' ability to survive.





# **6 Water Environment**

Earth is termed as '*Blue Planet*' because 71% of the earth's surface if covered with water. The earth has an abundance of water yet majority of water (97.5%) is saline water. Out of the remaining 2.5% of fresh water, around two thirds if it is in frozen form in ice caps and glaciers. Only about 0.3% of freshwater is available for human use majority of which comes from rivers. Water is one of the vital renewable resources on earth. Lakes, rivers, streams groundwater are important fresh water sources. The majority of freshwater is actually found underground as soil moisture and in aquifers.

# 6.1 Surface Water

Surface water is any body of water that exists on the earth's surface like streams, creeks, rivers, wetlands, and reservoirs. The major water supply sources in Vasai-Virar city are Surya River, Usgaon dam and Pelhar dam which is on Pelhar Lake. Figure 6.1 gives the distribution of water supply in Vasai-Virar city and Table 6.1 gives the VVCMC water profile.

Water Availability	Allocated Drawn Quantity (MLD)	230 MLD	
Source of Water Supply	Surya Scheme (River)	200 MLD	
	Usgaon Scheme (Dam)	20 MLD	
	Pelhar Scheme (Dam)	10 MLD	
Water received after treatment	223 MLD		
Actual distribution of water	190 MLD		
Total water reaching residences	190 MLD		
Overall water loss	26%		
Net Supply Per Person	90 LPCD		

### Table 6.1: VVCMC Water Profile

Source: Water Supply Department, VVCMC







### Figure 6.1: Distribution of Water Sources

Municipal Corporations Residential Connections are 57,971 & Industrial connections are 1,407 and govt. offices/schools are 295.

#### Table 6.2: Tap Connections in VVCMC

Sr. No.	Household	Numbers	Percentage (%)
1	Total Households with sourced water	427922	-
2	Тар	57971	13.54
3	Handpump	1346	0.31
4	Tube Well	0	-
5	Well	441	0.1
6	Other	-	-

# Table 6.3: Water Supply shifts in VVCMC

Sr. No.	Details	Period	Mode of Supply	Total Water Supply	Per Capita Supply
1	Existing Water Supply	3 hrs	Piped	190	190
2	Min. Water Req. (as per norms)	8 hrs	Piped		135





As tabulated in Table No. 6.4, the existing scenario of water supply and a comparative for yearly target to be achieved has been given. The data has been submitted to Performance Assessment System (PAS) that assesses the service level progress of the corporations.

Water Supply: KPIs	2020-21	2021-22	Target for 2021-22	Target for 2022-23	Target for 2023-24
Coverage of water supply connections (%)	71.1	66.3	80.0	78.0	79.0
Per capita supply of water at consumer end (LPCD)	71.1	72.4	100.0	90.0	90.0
Extent of metering of water connections (%)	NA	NA	0.0	0.0	0.0
Extent of non-revenue water (%)	28.0	26.7	28.0	26.7	26.7
Continuity of water supply (hrs per day)	2.5	2.5	4.0	4.0	4.0
Efficiency in redressal of customer complaints (%)	85.3	95.1	90.0	95.1	96
Quality of water supplied (%)	100.0	99.9	100.0	100.0	100.0
Cost recovery in water supply services (%)	96.4	83.5	97.0	90.0	92.0
Efficiency in collection of water supply related charges (%)	74.3	76.8	80.0	77.0	77.0
Coverage of water supply connections in slums (%)	NA	NA	35.0	35.0	35.0

# Table 6.4: Service Level Benchmark and Target Setting for Water Supply

## 6.1.1 Pelhar Dam, Pelhar Lake

Pelhar Lake has a rock earth dam – Pelhar Dam situated in Vasai -Virar region which is a part of water supply unit in the city of VVCMC. It is located at Latitude 19°26'45.32"N and Longitude 72°53'40.58"E in District Palghar of Maharashtra state. The Vasai -Virar city gets 10 MLD of water from Pelhar Dam. This dam was established in 1975. The dimensions are appx. 500m x 700m x 700m. The water level goes down during summer but during rains the iron gates are removed and kept which releases water and on the opposite waterfall is formed. The water gushes down the rocks with rapid force. Dam is deep and rich in flora





and fauna. During heavy rainfall water level can increase abruptly. The dam gets its water through rivers from Tungareshwar Hills.



Figure 6.2: Pelhar Dam (Location:19°26'45.32"N, 72°53'40.58")



Figure 6.3: Pelhar Lake





# 6.1.2 Usgaon Dam

Usgaon dam is a small man-made reservoir has been built near Tansa River. It is located at Latitude 19°28'3.43"N and Longitude 73°0'41.76"E in District Palghar of Maharashtra state. The water in the reservoir is used for irrigation, dinking and domestic purpose. The Vasai -Virar city gets 20 MLD of water from this dam for dinking purpose.



Figure 6.4: Usgaon Dam







#### Figure 6.5: Usgaon Lake

#### 6.1.3 Surya River

The Surya River is located in the Palghar district of Maharashtra. It is located 95.8 kilometers north of Mumbai the capital of the state. The Surya (Dhamni) dam, is an earthfill dam on Surya River near Dhamni. The height of the dam above lowest foundation is 59 m (194 ft) while the length is 1,563 m. The volume content is 300 m<sup>3</sup> and gross storage capacity is 68,449.51 m<sup>3</sup>. The Surya Regional Water Supply Project is being implemented in Mumbai, which will provide 403 MLD water supplies to Mira-Bhayander Municipal Corporation & Vasai-Virar City Municipal Corporation at the western sub-region of Mumbai. Approx. 185 MLD water shall be supplied to VVCMC under this scheme. Mumbai Metropolitan Regional Development Authority (MMRDA) has achieved the first tunnel breakthrough of the project. The project is expected to be completed in phases till 2023.

The installation of water supply lines has been started in VVCMC. It is a 10 km line project from Kashid Kopar MBR to Vasai Phata, of which 3.8 km supply line has been installed.



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Figure 6.6: Surya (Dhamni) dam



Figure 6.7: Surya (Dhamni) Dam Onsite Location





# 6.1.4 Surface Water Quality

Currently, surface water sources are facing a lot of pressure due to anthropogenic activities. Surface water sources are the major receivers of solid waste, industrial effluent and domestic sewage. This causes water pollution and degrades the quality of surface water. It is very detrimental to the aquatic ecosystem and overall components of the ecosystem. The industrial residues are likely to get bio accumulated in the aquatic organisms which are in turn consumed by the humans. This will have a very harmful effect on the humans as well. It is very important to continuously track the level of pollutants in water bodies. Therefore, MPCB has installed water quality monitoring stations (WQMS) across the Maharashtra state to monitor the overall water quality of a particular surface water resource. Water quality is monitored per month across all the stations.

MPCB, under NWMP - National Water Quality Monitoring Programme has set up Water Monitoring Stations around Vasai Virar City at –

- 1. Bassein Creek at Vasai Fort
- 2. Pelhar Dam on Pelhar River
- 3. Surya Dam on Surya River
- 4. Surya River at MIDC Pumping Station
- 5. Surya River at Intake of Vasai-Virar Water Scheme

The details of the monitoring stations and the quality of surface water at all the aforementioned monitoring stations are tabulated in Tables 6.5 to 6.14 below.





# Table 6.5: Details of the Monitoring Station – Bassein Creek at Vasai Fort

Water Quality Monitored at: Bassein Creek at Vasai fort					
Name of the Program	NWMP	Type of Sample	Surface		
Station Code	1316	Frequency	Monthly (Trend)		
<b>Regional Office</b>	Thane	<b>Regional Lab</b>	Thane		

Table 6.6: Annual	Average W	ater Qualit	y Monitoring	Data o	f Bassein	Creek at V	asai
fort							

Voar		nЦ	DO	BOD	COD	Nitrate	Fecal
Teal		pii	(mg/l)	(mg/l)	(mg/l)	(mg/l)	Coliform
	Min.	6.9	3.2	7	84	1.2	7.8
2018	Max.	8.1	5.3	18	248	5.6	920.0
	Avg.	7.4	4.32	11.67	174.33	3.07	166.73
	Min.	6.9	3.7	6	20	0.9	21
2019	Max.	8.2	5.6	14	220	4.7	79
	Avg.	7.47	4.64	9.83	116.33	2.15	46
	Min.	6.6	3.6	3.4	20	0.1	11
2020	Max.	7.9	6.9	12	208	6.4	350
	Avg.	7.43	5.06	8.37	120.67	2.16	91.92
	Min.	7.2	3.4	8	72	0.3 (BDL)	27
2021	Max.	7.9	5.2	15	256	3.6	350
	Avg.	7.59	4.11	11.38	155	1.81	144.67
	Min.	7.4	3.7	3	12	0.3 (BDL)	49
2022	Max.	7.9	6.8	14	288	15.75	140
	Avg.	7.62	4.76	10.5	184	3.38	111
	Min.	7.1	3	4.2	44	1.06	17
2023	Max.	8.3	6.2	18	300	3.65	920
	Avg.	7.72	4.68	9.77	178.33	2.31	212.92

Source: MPCB





# Table 6.7: Details of the Monitoring Station – Pelhar Dam on Pelhar River

Water Quality Monitored at: Pelhar Dam on Pelhar River					
Name of the Program	NWMP	Type of Sample	Surface		
Station Code	2696	Frequency	Monthly (Trend)		
<b>Regional Office</b>	Thane	<b>Regional Lab</b>	Thane		

Table 6.8	Annual	Average	Water	Quality	Monitoring	Data	of Pelhar	<b>River</b> a	at Pelha	r
Dam.										

Year		рН	DO	BOD	COD	Nitrate	Fecal Coliform
			(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/ 100ml)
2018	Min.	7.4	6.2	3	12	0.2	1.8
	Max.	8.7	7.4	4	24	0.9	21
	Avg.	7.94	7.02	3.17	17.67	0.48	12.61
2019	Min.	6.8	6.1	3	12	0.2	1.8
	Max.	8.5	7.4	4	20	0.9	170
	Avg.	7.48	6.94	3.43	14.33	0.46	42.12
2020	Min.	7	6.4	2.8	12	0.1	1.8
	Max.	8.2	7.4	4	216	0.5	21
	Avg.	7.72	6.97	3.33	32.67	0.23	8.98
	Min.	7.1	6.5	3	12	0.3 (BDL)	2
2021	Max.	8.1	7.5	4	28	1.12	22
	Avg.	7.53	7.06	3.47	16.67	0.47	8.45
2022	Min.	7.2	6.2	2.8	8	0.3 (BDL)	1.8 (BDL)
	Max.	7.8	7.3	5	52	1.42	26
	Avg.	7.53	6.9	3.62	17.33	0.48	10.89
	Min.	7.2	6	2.2	8	0.3 (BDL)	1.8 (BDL)
2023	Max.	8.2	7.5	4	12	0.86	32
	Avg.	7.65	6.64	2.71	10.75	0.55	11.2

Source: MPCB




### Table 6.9: Details of the Monitoring Station – Surya Dam on Surya River

Water Quality Monitored at: Surya River U/s of Surya Dam					
Name of the Program	NWMP	Type of Sample	Surface		
Station Code	2706	Frequency	Monthly (Trend)		
<b>Regional Office</b>	Thane	<b>Regional Lab</b>	Thane		

<b>Table 6.10</b>	Annual	Average	Water	Quality	Monitoring	Data	of	Surya	Dam	on	Surya
River											

Voar		nЦ	DO	BOD	COD	Nitrate	Fecal Coliform
Ital		рп	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/ 100ml)
	Min.	6.9	6	3	16	0.1	1.8
2018	Max.	8.6	7.2	4	24	1.1	17
	Avg.	7.87	6.83	3.38	19	0.5	10
	Min.	6.8	6.5	3	12	0.1	1.8
2019	Max.	8.5	7.6	4	16	0.4	1.8
	Avg.	7.48	7.08	3.32	13.33	0.21	55.35
	Min.	6.9	6.2	2.8	12	0.1	1.8
2020	Max.	8.1	7.7	4	20	0.9	<1.8
	Avg.	7.59	6.96	3.35	16	0.32	6.16
	Min.	7	6.8	3	12	0.3	1.8
2021	Max.	8.2	7.6	3.6	20	12.6	17
	Avg.	7.73	7.33	3.33	14.33	1.37	6.86
	Min.	6.8	6.2	2.4	12	0.3(BDL)	1.8 (BDL)
2022	Max.	8.5	7.6	7	128	0.56	22
	Avg.	7.7	7.18	3.52	2.5	0.35	7.98
	Min.	7.6	5.4	1(BDL)	12	0.3(BDL)	1.8 (BDL)
2023	Max.	8.9	7.5	5	5(BDL)	0.58	13
	Avg.	8.16	6.72	2.47	11.17	0.34	5.86

Source: MPCB





#### Table 6.11: Details of the Monitoring Station – Surya River at MIDC Pumping Station

Water Quality Monitored at: Surya River at MIDC Pumping Station						
Name of the Program	NWMP	Type of Sample	Surface			
Station Code	2707	Frequency	Monthly (Baseline)			
<b>Regional Office</b>	Thane	<b>Regional Lab</b>	Thane			

Table 6.12 Annual Average Water Quality Monitoring Data of Surya River at MIDCpumping station

Voor		nЦ	DO	BOD	COD	Nitrate	Fecal Coliform
rear		рп	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/ 100ml)
	Min.	6.9	6.5	3	16	0.1	4
2018	Max.	8.6	7.3	4	24	1.3	40
	Avg.	7.8	7.03	3.23	18	0.46	13.7
	Min.	6.7	6	3	12	0.1	1.8
2019	Max.	8.5	7.5	4	20	2	1.8
	Avg.	7.57	6.98	3.58	15.67	0.5	25.05
	_						
	Min.	7.2	6.5	2.8	12	0.1	12
2020	Max.	8.17	7.6	4	20	1.7	<1.8
	Avg.	7.67	7.08	3.22	15.64	0.51	10.02
	Min.	7.4	6.9	3	12	0.3 (BDL)	2
2021	Max.	8.3	7.6	4	28	1.2	22
	Avg.	7.91	7.32	3.37	15.67	0.46	10.74
	Min.	6.8	6.8	2.4	12	0.3 (BDL)	1.8 (BDL)
2022	Max.	8.8	7.6	4	16	1.4	23
	Avg.	7.73	7.28	3.1	13.33	0.56	7.56
	Min.	7.5	5	2.2	8	0.3 (BDL)	1.8 (BDL)
2023	Max.	8.9	7.5	4	16	0.58	17
	Avg.	8.1	6.69	2.74	10.67	0.34	5.06

Source: MPCB





Table 6.13: Details of the Monitoring Station – Surya River at Intake of Vasai-Virar Water Scheme

Water Quality Monitored at: Surya River at Intake of Vasai-Virar Water Scheme						
Name of the Program	NWMP	Type of Sample	Surface			
Station Code	2708	Frequency	Monthly (Baseline)			
<b>Regional Office</b>	Thane	<b>Regional Lab</b>	Thane			

Table 6.14 Annual Average Water Quality Monitoring Data of Surya River at Intake of Vasai-Virar water scheme

Voor		ъЦ	DO	BOD	COD	Nitrate	Fecal Coliform
rear		рп	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(MPN/ 100ml)
	Min.	7.3	6.2	3	16	0.1	1.8
2018	Max.	81	7.5	4	32	4.6	170
	Avg.	13.96	6.98	3.28	19.67	0.96	29.23
	Min.	6.9	6.6	3	12	0.2	1.8
2019	Max.	8.4	7.6	4	20	1.2	1.8
	Avg.	7.6	7.1	3.52	15.33	0.42	46.52
	Min.	7.2	6.1	2.8	12	0.1	7.8
2020	Max.	8.2	7.5	4.2	28	1.7	<1.8
	Avg.	7.7	7.02	3.33	17.45	0.5	8.75
	-						
	Min.	7.5	6.9	3	12	0.3(BDL)	1.8
2021	Max.	8.5	7.5	3.8	20	1.2	17
	Avg.	7.96	7.16	3.47	15.67	0.42	8.52
	Min.	6.6	6.3	1.6	8	0.3 (BDL)	1.8 (BDL)
2022	Max.	8.6	7.5	5	16	1.04	22
	Avg.	7.63	7.11	3.1	13.08	0.37	14.88
	Min.	7.6	5.2	2.2	8	0.3 (BDL)	1.8 (BDL)
2023	Max.	8.8	7.5	4	16	0.58	23
	Avg.	8.08	6.7	2.78	11	0.33	11.54





#### Source: MPCB

#### Water Quality Index

Water Quality Index (WQI) provides a single number that expresses the overall water quality, at a certain location and time, based on several water quality parameters. The objective of WQI is to turn complex water quality data into information that is understandable and usable by the public. Table 6.15 gives the visual representation of WQI of all locations.

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		-			-	-	-	-		-			
1316													
2696													
2706	2019												
2707													
2708													
1316													
2696												-	
2706	2020												
2707					NA								
2708					NA								
1316													
2696													
2706	2021												
2707													
2708													
1316													
2696													
2706	2022												
2707													
2708													
1316													
2696													
2706	2023												
2707													
2708													

#### Table 6.15: Trend of the WQI for all monitoring location (2019-2023)

\* NA: Not Available





#### Data Source: MPCB

#### **Table 6.16: Water Quality Index**

WQI	Quality Classification	Remarks	Colour Code
63-100	Good to Excellent	Non-Polluted	
50-63	Medium to Good	Non-Polluted	
38-50	Bad	Polluted	
38 and less	Bad to very Bad	Heavily Polluted	

As shown, all the samples monitored are of good to excellent quality except for the water sample of the station code – 1316, which was found to be of medium to good quality i.e., non-polluted throughout the except for the month of May and June. This can be due to less flow of water in summer season resulting in less dilution of the creek water.

### 6.2 Water Resource Management

Vasai-Virar City Municipal Corporation has water supply from three sources namely; Surya Scheme, Usgaon Dam and Pelhar Dam. Around 195 MLD water is distributed around the city excluding 26% water loss. The sourced water is treated in corporation's water treatment plants and distribute through water distribution system. Pelhar WTP situated in Vasai -Virar region which is a part of water supply unit in the city of VVCMC. It is located at Latitude 19°27'48.16"N, and Longitude 72°56'17.01"E in District Palghar of Maharashtra state. The Vasai -Virar city gets 10 MLD of water from Pelhar Dam. The details of Water Treatment plant are given in table 6.17 and Refer Figure 6.8-6.11 for Water Treatment Plant in VVCMC.





Table 6.17: List of Water	<b>Freatment Plants in VVCMC</b>
---------------------------	----------------------------------

Sr. No.	Scheme	WTP	Location	Capacity (MLD)
1	Surya Phase 1&2	1	Dovolipada, Dhuktan	100
2	Surya Phase 3	1	Dovolipada, Dhuktan	100
3	Parole WTP	1	Tungareshwar Phata	20
4	Pelhar WTP	1	Pelhar	10



Figure 6.8: WTP under Surya Phase 1&2 (19°40'51.05"N, 72°52'24.69"E)



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Figure 6.9: WTP under Surya Phase 1&2 (19°40'51.6"N, 72°52'27.1"E)



Figure 6.10: Parole WTP (19°27'48.16"N, 72°56'17.01"E)



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Figure 6.11: Pelhar WTP (19°26'35.46"N, 72°53'22.41"E)

### 6.3 Ground Water

Due to well-planned and established chain of water supply, the dependence of the VVCMC region on ground water table for its daily activities is low compared to other regions. According to the block wise ground water assessment conducted by Central Ground Water Board (CGWB), the major sources of ground water sources in VVCMC are borewell and wells. The overall usage of groundwater in VVCMC had been calculated to be 0.95 MLD. (*Source: Drainage Dept., VVCMC*) Details of total borewells and dug wells have been tabulated in Table 6.18 and Table 6.19 respectively.

Sr. No.	Wards	Number of dug wells	Percolation Lake
1	А	42	-
2	В	0	-
3	С	16	-

Table 6.18: Details of Ground Water Resource - Dug wells





4	D	0	2
5	Е	39	-
6	F	44	-
7	G	119	1
8	Н	49	-
9	Ι	132	-
	Total	441	3

#### Table 6.19: Details of Ground Water Resource - Borewells

Sr. No.	Wards	Number of borewells	Un-Operational	Without Handpump	Dry
1	А	34	-	-	-
2	В	57			-
3	С	97	-	-	-
4	D	145	-	-	-
5	Е	56	-	-	-
6	F	193	-	-	-
7	G	370	18	5	20
8	Н	83	3	-	-
9	Ι	357	-	-	-
	Total	1392	21	5	30

### 6.4 Sewage Treatment

Sewage generation in VVCMC is about 147.20 MLD (*source: Drainage Dept., VVCMC*). As the city is in its developmental stage, not all the properties are connected to the sewerage network. The city has a partially developed sewerage network, and others have septic tanks in place for the disposal of sewage and fecal sludge. No waste is disposed of in an open area. All the sewage generated goes to the Sewage Treatment Plant for treatment.

VVCMC has its sewage treatment plant (STP) at Bolinj, Virar (W) with a capacity of 30 MLD which is owned and operated by corporation. Apart from this, corporation also have private STP's for the treatment of sewage water. All these STPs are hydraulically tested and commissioned. The storm water is also collected in these STPs and treated as well. The outlets of treated water are the nallahs which run through the city. VVCMC is certified as





ODF++ (Open Defecation Free). A city / ward / work circle1 can be notified/ declared as SBM ODF++ city/ SBM ODF++ ward/ SBM ODF++ work circle if, at any point of the day, not a single person is found defecating and/ or urinating in the open, all community and public toilets are functional and well maintained, and fecal sludge/seepage and sewage is safely managed and treated, with no discharging and/or dumping of untreated fecal sludge/seepage and sewage in drains, water bodies or open areas (*Ref: Swachh Bharat Abhiyaan, Swachh Survekshan Toolkit for Urban Local Bodies*).

The technology used at all STPs is Moving Bed Biofilm Reactor (MBBR). The MBBR process utilizes floating plastic carriers (media) within the aeration tank to increase the number of microorganisms available to treat the wastewater. The microorganisms consume organic material. The media provides increased surface area for the biological microorganisms to attach to and grow in the aeration tanks. The media is continuously agitated by bubbles from the aeration system that adds oxygen at the bottom of the first compartment of the aeration tank. The microorganisms consume organic material. When compared to conventional secondary treatment it provides superior efficiency and value.







Figure 6.12: STP with MBBR Technology

#### Components used in MBBR wastewater treatment process: -

 Basin – In aeration tank, thousands of media made up of polyethylene are put to provide surface for microorganism's development. The size of the tank & quantity of plant depends upon quantity of water filtered per day. Mostly there are two tanks presents for complete aeration process. MBBR media are round, or wheel shaped. Their density matches the density of water which enables them to neither to sink nor to float on surface.





- Media MBBR tanks is filled up with thousands of small circular shape plastic polyethylene chips. They occupy about 60-70 % space in tanks and provide surface area for biofilm
- Aeration Grid It helps in movement of media effectively through the complete tank & provides air inside water forming water bubble enable proper mixing of water.
   With the help of blower's air is passed through pipeline and then to diffusers.
- Sieve- It stops the MBBR media to pass through exit of the tank.

#### Table 6.20: List of STP's in VVCMC

Sr. No.	Village	Owner	Capacity (KLD)	Treatment Technology
STP ur	nder Corporation			
1	Bolinj	Corporation	30	
Privat	e STP's			
1	Bolinj	Deepak H. Thakur		
2	More	M/s. Maner Land Development Co.	500	
	Deepak Shah		400	
3	Achole	Anil Gupta	2567	
4	Juchandra	Rakeshkumar Wadhwan	1310	
5	Chandansar	M/s. Evershine Developers	700	
6	Dongre		12900	MBBR
7	Virar		1000	
8	Bolinj		800	
9	Bolinj		535	
10	Bolinj		974	
11	Bolinj		641	
12	Dongre		650	
13	Diwanman/Chulne		Under	
15	Diwaiman/ Chume		Construction	
11	Bolini	MHADA Phase 1	3500	
17	Domij	MHADA Phase 2	1500	
	Total		28407.0	







Figure 6.13: STP's with VVCMC

Performance Assessment Framework was developed for the cities in India to assess the service delivery by ULB to the citizen. Performance Assessment System (PAS) measures performance of each sector (water, sanitation, solid waste and storm water drainage) across five themes and 32 key performance indicators. These indicators are monitored by





state and local governments. It is mandatory for all the ULB's to set the Service Level Benchmark, existing scenario of services and targets to be achieved so as to assess the service level progress of the corporations.

As tabulated in Table No. 6.21, the existing scenario of sanitation services and a comparative for yearly target to be achieved has been given for VVCMC.

Proposed Indicator	2020-21	2021-22	Target for 2021-22	Target for 2022-23	Target for 2023-24	
Coverage of Toilets (%)	100.0	100.0	100.0	100.0	100.0	
Coverage of sewage network services (%)	3.8	3.6	13.0	13.0	13.0	
Collection efficiency of sewage network (%)	22.2	21.8	25.0	25.0	25.0	
Adequacy of sewage treatment capacity (%)	22.2	21.8	25.2	25.0	25.0	
Quality of sewage treatment	100.0	100.0	100.0	100.0	100.0	
Extent of reuse and recycling of sewage (%)	0.0	0.0	2.0	2.0	2.0	
Extent of cost recovery in sewage management (%)	NA	NA	NA	NA	NA	
Efficiency in re-dressal of customer complaints (%)	100.0	100.0	100.0	100.0	100.0	
Efficiency in collection of sewage charges (%)	NA	NA	NA	NA	NA	
Coverage of Toilets in Slums (%)	77.1	78.1	80.0	80.0	80.0	
Coverage of sewage connections in Slums (%)	0.0	0.0	0.0	0.0	0.0	
SWD: KPIs						
Coverage of Storm Water Drainage network (%)	3.8	3.6	13.0	13.0	13.0	
Incidents of Water Logging/Flooding (No.)	22.2	21.8	25.0	25.0	25.0	

#### Table 6.21: Service Level Benchmark and Target Setting for Sanitation Services





# 7 Soil Environment

Soil may be defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to, and influenced by genetic and environmental factors – parent material, climate, organisms and topography all acting over a period of time. They serve in varying degree as a reservoir of nutrients and water for crops, provide mechanical anchorage and favorable tilt. The components of soil are mineral material, organic matter, water and air, the proportion of which vary and which together form a system for plants growth; hence the need to study the soils in perspective.

A study of the soil profile is important from crop husbandry point of view, since it reveals the surface and the sub- surface characteristic and qualities namely, depth, texture, structure, drainage conditions and soil moisture relationship which directly affect the plant growth. A study of soil profile supplemented by physical, chemical and biological properties of the soil will give full picture of soil fertility and productivity. Physical properties of the soil include water holding capacity, aeration, plasticity, texture, structure, density and colour etc. Chemical properties refer to the mineralogical composition and the content of the type of mineral such as Kaolinite, illite and montmorillonite, base saturation, humus and organic matter content. The biological property refers to a content of extent and types of microbes in the soil which include bacteria, fungi, worms and insects.

Some dominant groups of Indian soil, classified according to soil taxonomy and chemical property:

- Red Soil: They are wide inn their spread. The red color is due to diffusion of iron in the soil.
- 2) Lateritic Soil: Are composed of mixture of hydrated oxides of aluminium and iron with small amounts of fertility.
- 3) Black Soil: Contains a high proportion of Calcium and Magnesium Carbonates and have a high degree of fertility.





- 4) Alluvial Soil: This is the largest and agriculturally most important group of soils.
- 5) Desert Soil: Occurs mostly in dry areas and important content is quartz.
- 6) Forest and Hill Soils high in organic matter.

The predominant soil cover in Mumbai city is sandy, whereas in the suburban district, the soil cover is alluvial and loamy. 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.kms 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.

The three main types of soils are the black-colored soils, occurring on plains, the lightercolored coarse soils occupying hill-slopes (also known as varkas) and black colored soils along the coast in the district. The coastal soils are further divided into sweet lands supporting the garden crops and the khar or saline lands which grow coarse varieties of paddy after partial reclamation. The soil of the district in general is almost neutral in reaction, free from calcium carbonate and is sandy in texture. The soil is fairly well supplied with nitrogen but is low in phosphate and potash contents.

The soil all along the coast and particularly in parts of Dahanu, Palgharand Vasai talukas, is blackish and contains sand. It is very suitable for garden crops. Towards the east the soil is red and brown. It is not very deep but is suitable for rice. Further east on the hill-slopes, the soil is poor and is used only for growing grass and coarse grains, viz., nagliand vari. In the valleys there are patches of black soil in Bhiwandi, Kalyan, Mokhada and Shahapur talukas where rice is grown in ample quantity.

As far as agriculture is concerned the soils in the district are mainly classified into three main classes, viz.,coastal soils, mid-plane soils and varkas type soils. Coastal soils are further sub-divided into bagayat, sandy loam and salt paddy soils near creeks. Mid-plane soils are mainly derived from the trap rock and are sub-divided into late soils and mid-late soils. Varkas soils are mostly found in the far eastern part of the district.





# **8 Biodiversity**

Biodiversity is the variety of life on Earth, it includes all organisms, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems (What is biodiversity? United Nations Environment Program, World Conservation Monitoring Centre). Biodiversity is a variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystem. Biodiversity forms the foundation of the vast array of ecosystem services that critically contributed to human well-being. Biodiversity is important in human managed as well as natural ecosystem.

Our planet's essential goods and services depend on the variety and variability of genes, species, populations and ecosystems. Biological resources feed and clothe us and provide housing, medicines and spiritual nourishment. The natural ecosystems of forests, savannah, pastures and rangelands, deserts, tundra's, rivers, lakes and seas contain most of the Earth's biodiversity. The decline in biodiversity is largely the result of human activities and represents a serious threat to human development. The loss of biological diversity may reduce the resilience of ecosystems to climatic variations and air pollution damage. Atmospheric change can have important impact on forests, biodiversity, and freshwater and marine ecosystem, as well as on economic activities, such as agriculture (UNCED, 1992).

All of the Earth's species work together survive and maintain their ecosystems. Much of the Earth's biodiversity, however, is in jeopardy due to human consumption and other activities that disturb and even destroy ecosystems. Pollution, climate change, and population growth are all threats to biodiversity. These threats have caused an unprecedented rise in the rate of species extinction. Some scientists estimate that half of all species on Earth will be wiped out within the next century. Conservation efforts are necessary to preserve biodiversity and protect endangered species and their habitats





("What is biodiversity?". United Nations Environment Program, World Conservation Monitoring Centre).

Urbanization is often cited as a major reason for loss of native biodiversity and its replacement with non-native vegetation across the world (McKinney, 2002; Sanderson et al., 2002). While urbanization does have an intense effect on native biodiversity and dramatic transformation of biophysical processes, there is also a growing recognition that urban areas are heterogeneous with variations and transitions in the synthesis of social, political, economic, biophysical processes at different scales (Cadenasso, Pickett, & Schwarz, 2007). Urban ecosystems are serving as key sites where scholars across disciplines are finding a common ground to explicitly integrate the dynamics of social-ecological and political processes (Francis, Lorimer, & Raco, 2011).

#### **Measures of Biodiversity**

In spite of many tools and data sources, biodiversity remains difficult to quantify precisely. But precise answers are seldom needed to devise an effective understanding of where biodiversity is, how it is changing over space and time, the drivers responsible for such change, the consequences of such change for ecosystem services and well- being, and the response options available. Ideally, to assess the conditions and trends of biodiversity either globally or sub- globally, it is necessary to measure the abundance of all organisms over space and time, using taxonomy (such as the number of species), functional traits (for example, the ecological type such as nitrogen- fixing plants like legumes versus nonnitrogen fixing plants), and the interaction among species that affect their dynamic and function (predation, parasitism, competition, and facilitation such as pollination, for instance and hoe strongly such interactions affect ecosystems).even more important would be to estimate turnover of biodiversity, not just point estimates in space or time.

Currently, it is not possible to do this with much accuracy because the data are lacking. Even for the taxonomic component of biodiversity, where information is the best, considerable uncertainty remains about the true extent and changes in taxonomic diversity (Hassan, Scholes and Ash, 2005). there are many measures of biodiversity; species





richness(the number of species in a given area) represents a single but important metric that is valuable as the common currency of the diversity of life but it must be integrated with other metrics to fully capture biodiversity (Hassan, Scholes and Ash, 2005).

#### Suggestion

Environmental protection is an integral component of sustainable development. The environment is threatened in all its biotic and abiotic components: animals, plants, microbes and ecosystems comprising biological diversity; water, soil and air, which from the physical components of habitats and ecosystems; and all the interactions between the components of biodiversity and their sustaining habitats and ecosystem. With the continue increase in use of chemicals, energy and non- renewable resources by an expanding global population, associated environmental damage caused by over consumption, the quantities of waste generated and the degree of unsustainable land use appear likely to continue growing (UNCED, 1992).

The need for a diverse genetic pool of plant, animal and microbial germ plasma for sustainable development is well established. Biotechnology is one of many tools that can play an important role in supporting the rehabilitation of degraded ecosystems and landscapes (UNCED, 1992). Vasai-Virar city is located at a crossroads of two major bio geographical zones. This includes the Western Ghats and Malabar Coastal zones and comprise of forest, open grass and scrub, agriculture and plantations, freshwater wetlands, urban parks/gardens/avenues and diversity of human dominated spaces ranging from rural agro pastoral landscapes to core urban built-up zones. Thus, Vasai-Virar city comprises of a spectrum of habitats from intensely human-dominated spaces at one end and tracts of native ecosystem at other, linked together in a dynamic matrix of heterogenic complexity.

A survey for Tree Census was carries out during year 2013-2016 6 in 9 Prabhag's of city, where thousands of different varieties of trees found along with animals and birds which are common in Vasai-Virar City and Palghar District.





#### **Animals and Birds**

Animals found in Vasai-Virar City constitute to a wide range of amphibians, reptiles, mammals, butterflies and birds. Perhaps with increasing urbanization their survival is in danger. Figure 8-1 shows the common species of fauna found in Vasai-Virar.





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Figure 8.1: Common Species of Fauna Found in Vasai-Virar City





#### **Tree Cover**

Urban tree ecosystem provides a range of social and ecological services, but due to the heterogeneity of these canopies their spatial extent us difficult to quantify and monitor. Traditional pre-pixel classification methods have been used to map urban canopies; however, such techniques are not generally appropriate for assessing these highly variable landscapes. Landsat imagery has historically been used for pre-pixel driven land use/land cover (LU/LC) classifications, but the spatial resolution limits our ability to map small urban features. In such cases, hyper spatial resolution imagery such as aerial or satellite imagery with a resolution of one meter or below is preferred. Analysis and classification of remote sensing imagery, along with geographic information system (GIS) analysis and modeling provide the most efficient method for assessment. The detailed survey of biodiversity reveals that there has been decrease in tree cover and trees are cut due to construction activities by private builders in the city.

The state of biodiversity is very well rich in Vasai-Virar city. As the temperature of the city is moderate and facilitates better living environment for animals, birds and plants along with human beings. There might be changed is the biodiversity count in the past few years due to changing climatic conditions and natural calamities. Up to 2500 mm precipitation was observed in July 2022. This did not affect the water supply system and the residence in Vasai- Virar city could get enough water across the year. As there are varied variety of plants and trees various species of birds and butterflies are observed. Also, various reptile species can be seen in the city.

#### **Impact of Biodiversity**

India is one of the recognized mega-diverse countries of the world, harboring nearly 7-8% of the recorded species of the world, and representing 4 of the 34 globally identified biodiversity hotspots (Himalaya, Indo-Burma, Western Ghats and Sri Lanka, Sunda land). India is also a vast repository of traditional knowledge associated with biological resources. So far, over 91,200 species of animals and 45,500 species of





plants have been documented in the ten biogeographic regions of the country. Inventories of floral and faunal diversities are being progressively updated with several new discoveries through the conduct of continuous surveys and exploration. Along with species richness, India also possesses high rates of endemism. In terms of endemic vertebrate groups, India's global ranking is tenth in birds, with 69 species; fifth in reptiles with 156 species; and seventh in amphibians with 110 species. Endemic-rich Indian fauna is manifested most prominently in Amphibian (61.2%) and Reptile (47%). India is also recognized as one of the eight Vavilovian centers of origin and diversity of crop plants, having more than 300 wild ancestors and close relatives of cultivated plants, which are still evolving under natural conditions.

The main threats to biodiversity include: habitat fragmentation, degradation and loss; over-exploitation of resources; shrinking genetic diversity; invasive alien species; declining forest resource base; climate change and desertification; impact of development projects; impact of pollution. In the backdrop of the varying socio-cultural milieu and often conflicting demands of various stakeholders, there is an urgent need for augmenting and accelerating the efforts for conservation and sustainable use of biodiversity, and for the fair and equitable sharing of benefits arising from the utilization of genetic resources.

Human activities are disturbing both structure and functions of ecosystem and altering biodiversity. Such disturbances reduce the abundance of some organisms, causing an increase in population of other organisms, modify the interaction among organisms, and alter the interactions between the organisms and their physical and chemical environments. Pattern of infectious diseases are sensitive to these disturbances.





#### Initiatives by VVCMC for Biodiversity Conservation

#### 1. Bird Census

VVCMC has started the bird census initiative and the first stage and second stage monitoring is been completed. Dr. Sagar Gholap, Additional Commissioner, VVCMC along with BNHS, NEST and local volunteers have contributed in this bird census. Total 22 sites were selected including salt pans, open spaces and mangroves belt for studying the birds. According to that data, including migratory as well as native species, a total number of 172 bird species have been recorded in the study area. As a result of this, VVCMC is planning to design new strategies for conservation of their habitats.

#### 2. Habitat conservation for biodiversity

Grassland ecosystem in Vasai, Nalla Sopara, Virar and Naigaon serves as an important link in biodiversity conservation. VVCMC has taken initiative to conserve these natural habitats and ecosystems. Strict action is being taken against those who cause any harm to these ecosystems. VVCMC is strictly monitoring the grassland ecosystems, salt pans, open spaces and mangrove belts.





# 9 Solid Waste Management

Municipal solid waste (MSW) is defined as waste collected by the municipality or disposed of at the municipal waste disposal site and includes residential, institutional, commercial, municipal, and construction and demolition waste. MSW management includes the collection, transportation, and responsible disposal of waste generated in the city.

"Solid Waste" means and includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities mentioned in rule 2 (SWM Rules 2016)

Solid waste generation is a continuously growing problem at all levels including local levels. Solid wastes are those organic and inorganic waste materials produced by various activities of the society, which have lost their value to the first user. Improper disposal of solid wastes pollutes all the vital components of the living environment (i.e., air, land and water) at local and global levels. Urban society rejects and generates solid material regularly due to rapid increase in production and consumption. The problem in India is more acute as its economic growth and urbanization have been very rapid in recent times. This necessitates management of solid waste at generation, storage, collection, transfer and transport, processing and disposal stages in an environmentally sound manner in accordance with the best principles of public health, economics, engineering, conservation, aesthetics and environmental considerations. Thus, solid waste management includes all administrative, financial, legal, planning, and engineering functions.

Source: www.sciencedirect.com/topics/engineering/municipal-solid-waste





At present, the daily average solid waste generated and collected by VVCMC in 2023 was about 686 tons per day (TPD).

### 9.1 Existing Situation of MSW in VVCMC

The present system of waste collection, storage, and transportation in the VVCMC is a mixture of improved storage and transportation along with an old collection and transportation system. SWM functions were Solid Waste Management Rules 2016, compliant until recently.

Administration has been made conscious efforts to improve through internal revenue and grants from various government scheme. Service level contracts have been given ward wise to improve collection and transportation efficiency. The daily MSW generation in VVCMC is about 975 TPD considering 500 gms/day as the per capita waste generation for a population of about 19 Lakhs (2019) and the average daily collection and conveyance of the MSW which is actually dumped at the dumpsite at Gokhiware is about 525 to 565 tons. At present there is no Segregation taking place at source. The per capita waste generation calculation is tabulated under Table 9.1 below.

Sr. No.	Population (Year)	Per Capita Waste Generation	Total
1	19,50,000 - 2019	0.50 ( kg/day)	975 (Tons/day)
2	21,50,000 - 2023	0.55 ( kg/day)	1155 (Tons/day)

 Table 9.1: Per Capita Waste Generation Calculation

Note: As per the CPHEEO Manual 2016, Page No 43, Table 1.5: per Capita Waste Generation rates, for population above 5 lakhs are 0.5 Kg/person/day Also, it is mentioned that 0.6 kg/person/day is the generation of MSW is observed in metro cities.

#### Current Status of Construction and Demolition (C&D)

The C&D activity within the VVCMC generates about 120 TPD waste. With the activities of new constructions in the city and redevelopment projects on the rise, this number is likely to rise to about 200 to 250 TPD by year 2030. Making recycling difficult, sometimes it gets





mixed with municipal solid waste. The VVCMC shall accord high priority to proper management of C&D waste in accordance with the provisions of Solid Waste Management Rules 2016 and Recommendations of various committees and Task forces on the subject.

#### **Current Status of Electronic Waste (E-waste)**

At the current level of domestic e-waste generation, VVCMC produces about 60 Tons of electronic waste per month (extrapolated from MPCB Report for electronic waste generation in MMR Region) and it is projected to increase upto 100 tons/month by year 2030.

## 9.2 Waste Collection, Segregation and Transportation

At present, the total solid waste generated in the city is estimated to be around 686 TPD of which Dry waste is 40% (275 TPD) of Total Waste Generation and wet waste is 60% (411 TPD) of Total Waste Generation.



VVCMC has implemented a door-to-door collection mechanism to collect solid waste effectively. VVCMC has approximated 70-85% door to door collection facility. Some of this is segregated at source. The schematic diagram of the waste generation to disposal is shown in Figure 9.1 below.







#### Figure 9.1 Waste generation to disposal

Present system of waste collection, storage and transportation in the VVVMC is a mixture of improved storage and transportation along with old collection and transportation system. VVCMC have deployed following Vehicles to ensure Waste Segregation as given below.

Compactors	Dumper	Tippers	Tractors	Tricycle	Handcarts
63	44	108	19	219	208

VVCMC has achieved 73% of door-to-door collection by giving service level contracts ward wise. The solid waste from market area is collected twice a day. And the solid waste is collected more frequently as per requirements during festivals and fairs in city. Other mechanised Vehicles include for Dust Mitigation are 7 Sweeping Machines under NCAP and SBM 2.0 Guidelines. Electric Ride On Gobbler Pro Litter Picking Machines are 5. VVCMC has





adopted windrow composting method for processing MSW (Wet Waste) which is being practiced on regular interval due to limitation caused during Monsoon Season.

Recently VVCMC has appointed Agency for Dumpsite Remediation of around 15,00,000 cum Legacy Waste and for Daily Fresh waste processing on DBFOT (Design, Build, Finance, Operate and Transfer Basis. VVCMC has 2 Drain Master for Cleaning Nallah.

It is planned 60% of solid waste is segregated. The organic waste is converted into compost and later the compost is used in various gardens situated in the city. The remaining is discarded in the dumping ground.

## 9.3 Service Level Benchmark

Performance Assessment Framework was developed for the cities in India to assess the service delivery by ULB to the citizen. PAS measures performance of each sector (water, sanitation, solid waste and storm water drainage) across five themes and 32 key performance indicators. These indicators are monitored by state and local governments. It is mandatory for all the ULB's to set the Service Level Benchmark, existing scenario of services and targets to be achieved so as to assess the service level progress of the corporations.

As tabulated in Table 9.2, the existing scenario of Solid Waste Management services and a comparative for yearly target to be achieved has been given for VVCMC.

 Table 9.2: Service Level Benchmark and Target Setting for Solid Waste Management

 Services

Proposed Indicator	2020- 21	2021- 22	Target for 2021- 22	Target for 2022-23	Target for 2023- 24
Household level coverage of SWM services (%)	100.0	100.0	100.0	100.0	100.0
Efficiency of collection of MSW (%)	100.0	100.0	100.0	100.0	100.0





Extent of segregation of municipal solid waste (%)	78.7	80.0	100.0	100.0	100.0
Extent of MSW recovered (%)	82.3	73.6	82.3	82.3	82.3
Extent of scientific disposal of MSW (%)	100.0	100.0	100.0	100.0	100.0
Extent of cost recovery in SWM services (%)	6.0	26.1	50.0	50.0	50.0
Efficiency in redressal of customers complaints (%)	98.3	97.9	100.0	100.0	100.0
Efficiency in collection of SWM charges	66.5	76.4	80.0	80.0	80.0
HH level coverage of SWM Services in Slum Settlement (%)	100.0	100.0	100.0	100.0	100.0

### 9.4 Action on Single Use Plastic Waste

Vasai Virar City Municipal Corporation conducts regular awareness campaign for ban on single use plastic. As per recent update, single use plastic with <100 microgram size is banned in city. Around 50,000 pamphlets distributed; 1,00,000 posters posted and Banners/Hoardings displayed at 100 Locations viz. commercial shops, markets, malls etc. for plastic ban awareness purpose. Vasai Virar City Municipal Corporation conducts raids and penalizes the shops, restaurants and other institutions that use singe use plastic. In 2023-24 more than 20,069.5 kg single use plastic seized and more than 6,99,000 rupees fine levied on violators.

## 9.5 Waste to Art and RRR

"Meri Life Mera Swachh Shehar" Mission launched by Ministry of Housing & Urban Affairs (MoHUA) from Dated. 15th May 2023 to 5th June 2023. Objective of this mission was to collect used old books, discarded plastic, cloths, footwears and other non-usable items from citizen at Reduce Reuse Recycle (RRR) Centre established by urban local body. Collected items is to be recycled or reutilised is the main objective of this mission in order to reduce waste generation.





In order of that conference with former corporators, NGOs, private organisations, SHGs, press etc. conducted to propagate RRR Centre Concept. Member of Parliament of Palghar District Hon. Rajendra Gavit Sir were present as a chief guest in the conference. At Conference swachhata pledge owed by all attendees. Further 1 RRR centre established by VVCMC. Thousands of needy are benefitted from these RRR centers. Important squares and rotaries in the city are beautified by using waste material. Art structures are produced out of the waste material. Under Swachh Bharat Abhiyan based on Plastic Ban activity and **"Reduce, Reuse, Recycle (RRR)"** activity VVCMC implemented "Natural Coconut Planter" model as its Best Practice under Swachh Survekshan 2024.

On account of World Environment Day, on 05th June 2023, Cleanliness drive, 3-R principle awareness drive, tree plantation and flash mob conducted.





# **10 Primary Monitoring**

Primary environmental monitoring was carried out in the areas inside Vasai-Virar city in the month of December 2023. Monitoring for, water quality, Ambient air quality, Ambient noise level and soil quality was done by UltraTech environmental consultancy & laboratory. The number of sampling locations for primary monitoring are given in Table 10.1. The results of the primary monitoring are described in the following sub-sections.

#### **Table 10.1: Number of Sampling Locations for Primary Monitoring**

Particulars	No. of Sampling Locations
Ambient Air Quality	3
Ground Water Quality	9
Surface Water Quality	9
Ambient Noise Levels	3
Soil Quality	3

## **10.1 Ambient Air Quality**

Ambient air quality was monitored at 3 locations inside Vasai-Virar city to assess the ambient air quality status of the area and also to check its conformity with the ambient air quality standards specified by Central Pollution Control Board (CPCB).

The monitoring locations were selected based on the data analysis of the past years and topography of the study area and the location of potential sensitive receptors such as habitations. The factors considered while selection of the monitoring locations include:

- Topography of the study area
- Representative nature of the sample
- Accessibility
- Location of the receptors
- Availability of power





Particulate Matter – size less than 2.5  $\mu$ g/m3 (PM<sub>2.5</sub>), Particulate Matter - size less than 2.5  $\mu$ g/m3 (PM<sub>10</sub>), Nitrogen Oxides (NOX), Sulphur Dioxide (SO2), and Carbon Monoxide (CO) were monitored at 3 locations. Monitoring was done on 29<sup>th</sup> May 2023. Monitoring locations for ambient air quality were selected based on the guidelines given in Environmental Impact Assessment manual from the Ministry of Environment, Forest and Climate Change (MoEF&CC). The purpose is to ascertain the baseline pollutant concentrations in ambient air in and around the study area. The details of the monitoring stations are given in Table 10.2. The sampling methodology and protocol are given in Table 10.3. The monitoring results are given in Table 10.4.

#### **Table 10.2: Ambient Air Quality Monitoring Locations and Parameters**

Code	Site Location	Location Coordinates	Landmark	Parameters
AQ1	Bolinj Naka	19.4445° N, 72.7944° E	Residential Area	
AQ2	Pelhar Police Station	19.4435° N, 72.8804° E Commercial Area		NOx, CO
AQ3	Vasai Police Station	19.3328° N, 72.8101° E	Open Area	

#### **Table 10.3: Sampling Methodology and Protocol**

Sampling Parameters	Standards referred	Sample Collection Sampling Equipment	Sample Analysis Analytical Equipment	Methodology	
PM <sub>10</sub>	IS 5182-Part 23	Respirable Dust Sampler	Electronic Polonco	Gravimetric	
PM <sub>2.5</sub>	-	Fine Dust Sampler	Electionic balance	Method	
SO <sub>2</sub>	IS 5182-Part 2	RDS with	Sportrophotomotor	Improved West & Gaeke Method	
NOx	IS 5182-Part 2	impinger	specirophotometer	Na Arsenite Method	
CO	IS 5182-Part 10	Tadler Bag	GC-FID	Chromatography	

Source: Standard Practices



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Figure 10-1: Ambient Air Monitoring photograph





Code	Parameters Locations	SO <sub>2</sub> (µg/m <sup>3</sup> ) 24 Hourly	NO2 (µg/m <sup>3</sup> ) 24 Hourly	PM <sub>10</sub> (μg/m <sup>3</sup> ) 24 Hourly	PM <sub>2·5</sub> (μg/m <sup>3</sup> ) 24 Hourly	CO (mg/m <sup>3</sup> ) 8 Hourly
AQ1	Bolinj Naka	BDL[DL=5]	36	70	23	1.3
AQ2	Pelhar Police Station	BDL[DL=5]	18	174	26	1.4
AQ3	Vasai Police Station	BDL[DL=5]	15	87	20	1.1
	NAAQS	80	80	100	60	2

#### Table 10.4: Ambient Air Quality Monitoring Results (Pre-monsoon)

#### Table 10.5: Ambient Air Quality Monitoring Results (Post-monsoon)

Code	Parameters Locations	SO2 (μg/m <sup>3</sup> ) 24 Hourly	NO2 (μg/m <sup>3</sup> ) 24 Hourly	PM <sub>10</sub> (μg/m <sup>3</sup> ) 24 Hourly	PM <sub>2·5</sub> (μg/m <sup>3</sup> ) 24 Hourly	CO (mg/m <sup>3</sup> ) 8 Hourly
AQ1	Bolinj Naka	BDL[DL=5]	27	84	26	1.2
AQ2	Pelhar Police Station	BDL[DL=5]	20	77	35	1.3
AQ3	Vasai Police Station	BDL[DL=5]	23	87	32	1.3
NAAQS 80		80	80	100	60	2

#### Inference:

As reported in Table 10.4 & 10.5, the SO2, NO2 and CO concentrations were below the NAAQS in all the areas. However, the concentrations of  $PM_{10}$  &  $PM_{2.5}$  are more than prescribed limits at Bolinj Naka and Pelhar Police Station and concentration of  $PM_{2.5}$  exceeds in Vasai Police Station. Generally,  $PM_{10}$  &  $PM_{2.5}$  concentration increases mainly due to by traffic, industrial activities, domestic fuel burning, as well as from unspecific sources of human origin. In the post-monsoon scenario, the pollution load is usually low as rain depends on particles floating in the air, its falls with them to the ground reducing the concentration of pollutants.




In the pre-monsoon scenario, the maximum  $PM_{10}$  concentrations are seen at Pelhar Police Station, 174 µg/m<sup>3</sup> respectively. As the monitoring location site is surrounded by the industrial and commercial area. Also, the major transport route - Golden Quadrilateral national highway and Pelhar road besides the study location. Due to the industrial activities, agriculture and material transportation facilities increased particulate matter concentration in the said area.

## **10.2 Ambient Noise Environment**

Baseline noise levels were monitored at the same locations where the ambient air quality monitoring was done, using a noise measurement device. Noise level measurement locations were identified for assessment of existing sound level status, keeping in view the land use pattern, residential areas, schools, bus stands etc. The noise monitoring locations are shown in Table 10.6. The day and night time hours as prescribed by CPCB are from 06:00 AM to 10:00 PM and 10:00 PM to 06:00 AM, respectively, CPCB noise limits for day and night time are given in Table 10.7. The results of ambient noise level monitoring for day time and night time are given in Table 10.8 & 10.9.

Code	Site Location	Location Coordinates	Area
NQ1	Bolinj Naka	19.4445° N, 72.7944° E	Residential Area
NQ2	Pelhar Police Station	19.4435° N, 72.8804° E	Commercial Area
NQ3	Vasai Police Station	19.3328° N, 72.8101° E	Open Area

## Table 10.6: Ambient Noise quality monitoring locations

#### **Table 10.7: CPCB Limits for Ambient Noise**

Area Cada	Catagory of Area	Limit in dB (A), Leq			
Area Coue	Category of Area	Day Time	Night Time		
А	Industrial Area	75	70		
В	Commercial Area	65	55		
С	Residential Area	55	45		





D	Silent Zone	50	40

- Day time shall mean from 6:00 a.m. to 10:00 p.m.
- Night time shall mean from 10:00 p.m. to 6:00 a.m.
- Silence Zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
- Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
- dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.
- A "decibel" is a unit in which noise is measured.
- "A", in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.
- Leq is the energy mean of the noise level over a specified period.

#### Table 10.8: Results for Noise Level Monitoring (Pre - monsoon)

Code	Parameters Locations	Minimum L <sub>eq,</sub> dB(A)	Maximum L <sub>eq,</sub> dB(A)	Average Leq, dB(A)
NQ1	Bolinj Naka	49	90.9	68
NQ2	Pelhar Police Chowki	75.4	96.2	85
NQ3	Vasai Police Station	63.6	99.4	79

#### Table 10.9: Results for Noise Level Monitoring (Post- monsoon)

Code	Parameters Locations	Minimum L <sub>eq,</sub> dB(A)	Maximum L <sub>eq,</sub> dB(A)	Average Leq, dB(A)
NQ1	Bolinj Naka	54.7	91	69
NQ2	Pelhar Police Chowki	77	118	94
NQ3	Vasai Police Station	48	101	59





## Inference:

As seen in Tables 10.8 & 10.9, the noise level in commercial, residential and open areas reportedly exceeds the CPCB limits, which are mention in table 10.7. The Average noise level is highest in Pelhar Police Chowki area (94 dB). It can be due to its proximity to the Golden Quadrilateral national highway and the industrial activities. The average noise level is the lowest at the Vasai Police Station (59 dB).

## **10.3 Water Quality**

The water quality of the area was assessed for physio-chemical and bacteriological analysis of ground and surface water samples. Nine ground and surface water samples were collected from Vasai-Virar city for analysis of the existing water quality in the area. For surface water, samples were collected from the pond and lakes in the city and for groundwater, samples were collected from the bore wells and hand pumps. The surface water samples were rated according to the CPCB Water Quality Criteria against A, B, C, D and E class of water based on the parameters identified in the criteria. The parameters of the ground water samples were compared with the drinking water quality standards specified in IS 10500: 2012.

The details of the ground water and surface water quality locations and parameters are given in Table 10.10. The sample results are given in the Table 10.12 & 10.13.

Code	Site Location	Location Coordinates	Wards	Parameters
CW1	Polini Lako	19°26'32.48"N	A-Bolinj Virar	pH, Turbidity,
21/1	BOIIIIJ LARE	72°47'44.14"E	West	Total Coliform,
CIND	Manual Dada Talau	19°26'37.12"N	B-Nalla Sopara-	Free Ammonia,
3002	Malivel Paua Talav	72°49'18.30"E	Virar East	TDS, Nitrate,
CIND	Konri Lako	19°28'36.32"N	C-Chandansar	Total hardness as
3113	KOPITLake	72°49'33.82"E	Vibhag	CaCO3,
CIALA	Asholo Tolow	19°24'37.30"N		Total alkalinity as
5004	Actione Talav	72°49'44.66"E	D-Achole Gaon	CaCO3,

#### Table 10.10: Surface & Ground Water Sample Collection Locations and Parameters





Code	Site Location	Location Coordinates	Wards	Parameters
SW5	Chakreshwar Talav	19°25'0.32"N 72°47'58.73"E	E-Nalla Sopara West	COD, BOD, DO, TSS,
SW6	Pelhar Lake	19°26'34.51"N 72°53'54.23"E	F-Dhaniv/Pelhar	Sodium Absorption Ratio
SW7	Waliv Talav	19°24'53.76"N 72°51'41.63"E	G-Waliv	
SW8	Manikpur Talav	19°22'27.83"N 72°49'40.33"E	H-Navghar- Manikpur	
SW9	Papdi talav	19°21'18.93"N 72°48'45.90"E	I- Vasai Gaon	
GW1	Bolinj Naka	19°26'40.08"N 72°47'39.07"E	A-Bolinj Virar West	
GW2	Tiwari Nagar Stable	19°27'19.32"N 72°49'15.47"E	B-Nalla Sopara- Virar East	
GW3	Chandansar Market	19°28'22.95"N 72°49'51.80"E	C-Chandansar Vibhag	pH, Turbidity, TDS, Arsenic,
GW4	Santur Building, Vasant Nagri	19°24'11.53"N 72°49'54.59"E	D-Achole Gaon	Total hardness as CaCO <sub>3</sub> , Total
GW5	Nearby Chakreshwar Talav	19°25'7.08"N 72°47'59.59"E	E-Nalla Sopara West	alkalinity as CaCO3, DO, Chloride,
GW6	Nearby Pelhar Lake	19°26'32.89"N 72°53'11.12"E	F-Dhaniv/Pelhar	TSS, Fluoride, Mercury,
GW7	Waliv Ward Office	19°24'59.52"N 72°51'41.24"E	G-Waliv	Lead
GW8	Nearby Diwanman Lake	19°22'43.29"N 72°49'21.52"E	H-Navghar- Manikpur	
GW9	Nearby Papdi talav Area	19°21'19.94"N 72°48'23.19"E	I- Vasai Gaon	

## **10.3.1 Surface Water Analysis**

Surface water samples were collected from pond and lakes of all the wards around the city. The parameters of the surface water samples were compared against the designated best use classification of CPCB as given in Table 10.11.





## Table 10.11: Water Quality Standards by CPCB for Best Designated Usage

Designated- Best-Use	Class of Water	Criteria
Drinking Water Source Without Conventional Treatment but	А	Total Coliforms Organism MPN/100 ml shall be 50 or less.
After Disinfection		pH between 6.5 – 8.5
		Dissolved Oxygen: 6 mg/l or more
		Biochemical Oxygen Demand 5 Days 20 °C: 2 mg/l or less
Outdoor Bathing (Organized)	В	Total Coliforms Organism MPN/100 ml shall be 500 or less
		pH between 6.5 and 8.5
		Dissolved Oxygen: 5 mg/l or more
		Biochemical Oxygen Demand 5 Days 20 °C: 3 mg/l or less
Drinking Water Source After Conventional Treatment and	С	Total Coliforms Organism MPN/100 ml shall be 500 or less
Disinfection		pH between 6.5 and 9
		Dissolved Oxygen: 4 mg/l or more
		Biochemical Oxygen Demand 5 Days 20 °C: 3 mg/l or less
Propagation of Wildlife and	D	pH between 6.5 and 8.5
Fisheries		Dissolved Oxygen: 4 mg/l or more
		Free Ammonia (as N): 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Water Disposal	E	pH between 6.5 and 8.5 Electrical Conductivity at 25°C micro mhos/cm: Max 2250
		Sodium Absorption Ration: Max. 26
		Boron: Max. 2 mg/l
		Free Ammonia (as N): 1.2 mg/l or less
		Sulphates: 1000 mg/l
-	Below-E	Not Meeting A, B, C, D & E Criteria

The results of the surface water monitoring are presented in Table 10.12



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**Surface Water Collection** 





Sr. No.	Parameter	Normal Range	Units	(SW1)	(SW2)	(SW3)	(SW4)
1.	рН	6.0-8.5		7.6	7.1	7.3	7.4
2.	Electrical Conductivity	<2250	µS/cm	633	1373	1190	749
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Hazen	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidity	NS	NTU	8.3	10.6	3.3	2.3
7.	TSS	NS	mg/l	13	17	7	4
8.	TDS	<2100	mg/l	411	892	774	487
9.	COD	NS	mg/l	58	33	41	26
10.	BOD@ 27°C for 3 days	NS	mg/l	8.3	4.1	6.7	3.4
11.	DO	NS	mg/l	5.3	5.4	5.5	5.5
12.	Total Hardness as CaCO3	NS	mg/l	200	475	327	298
13.	Total Alkalinity as CaCO3	NS	mg/l	148	190	233	161
14.	Free Ammonia as N	NS	mg/l	0.88	0.33	BDL[DL=0.01]	0.02
15.	Nitrates as NO <sup>3</sup>	NS	mg/l	0.004	0.2	0.197	0.003
16.	SAR	By Calculation	%	3	5	10	3
17.	Total Coliform	NS	MPN/100 ml	280	110	220	140

## Table 10.12: Results of Surface Water Samples Analysis (Pre-monsoon)

\*NS: Not Specified

NTU: Nephelometric Turbidity Unit





Sr. No.	Parameter	Range	Units	(SW5)	(SW6)	(SW7)	(SW8)	(SW9)
1.	pН	6.0-8.5		7.2	6.4	7.3	7.6	7.4
2.	Electrical Conductivi ty	< 2250	μS/c m	652	192	521	554	736
3.	Taste	NS		Agreeabl e	Agreeabl e	Agreeabl e	Agreeabl e	Agreeable
4.	Colour	NS	Haze n	BDL[DL= 1]	BDL[DL= 1]	BDL[DL= 1]	BDL[DL= 1]	BDL[DL= 1]
5.	Odour	NS		Agreeabl e	Agreeabl e	Agreeabl e	Agreeabl e	Agreeable
6.	Turbidity	NS	NTU	8	1.9	4.7	1.2	7.3
7.	TSS	NS	mg/l	13	4	9	4	10
8.	TDS	< 2100	mg/l	424	120	339	360	478
9.	COD	NS	mg/l	41	26	55	42	46
10.	BOD@ 27oC for 3 davs	NS	mg/l	3.2	6.60	7.8	5.2	6
11.	DO	NS	mg/l	5.6	4.14	5.4	5.3	5.2
12.	Total Hardness as CaCO3	NS	mg/l	226	82	163	91	129
13.	Total Alkalinity as CaCO3	NS	mg/l	171	74	130	167	198
14.	Free Ammonia as N	NS	mg/l	0.03	0.02	0.68	0.03	0.03
15.	Nitrates as NO3	NS	mg/l	0.3	0.5	0.2	0.3	0.3
16.	SAR	By Calcula tion	%	4	1	3	9	10
17.	Total Coliform	NS	MPN/ 100 ml	110	80	240	280	220

\*NS: Not Specified NTU: Nephelometric Turbidity Unit





## Table 10.13: Results of Surface Water Samples Analysis (Post- monsoon)

Sr. No.	Parameter	Normal Range	Units	(SWI)	(SW2)	(SW3)	(SW4)
1.	рН	6.0-8.5		7.4	7.7	7.6	7.6
2.	Electrical Conductivity	< 2250	μS/cm	1707	1058	1061	857
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Hazen	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidity	NS	NTU	7.5	9.5	4.1	2.5
7.	TSS	NS	mg/l	12	14	5	5
8.	TDS	< 2100	mg/l	1105	680	678	556
9.	COD	NS	mg/l	56	36	44	28
10.	BOD@ 27oC for 3 days	NS	mg/l	1.4	8.4	10	7.2
11.	DO	NS	mg/l	5.2	5.3	5.2	5.3
12.	Total Hardness as CaCO3	NS	mg/	228	327	287	226
13.	Total Alkalinity as CaCO3	NS	mg/l	103	117	180	137
14.	Free Ammonia as N	NS	mg/l	0.76	0.05	0.01	0.03
15.	Nitrates as NO3	NS	mg/l	0.3	0.4	0.4	0.3
16.	SAR	By Calculation	%	2.8	5.4	10.5	3.4
17.	Total Coliform	NS	MPN/100 ml	300	220	280	140

\*NS: Not Specified

NTU: Nephelometric Turbidity Unit





Sr. No.	Parameter	Normal Range	Units	(SW5)	(SW6)	(SW7)	(SW8)	(SW9)
1.	рН	6.0-8.5		7.6	7.9	7.3	7.4	7.4
2.	Electrical Conductivity	< 2250	μS/cm	817	135	469	417	556
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Hazen	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidity	NS	NTU	7.7	1.7	4.2	1.8	6.8
7.	TSS	NS	mg/l	11	4	8	5	9
8.	TDS	< 2100	mg/l	529	85	304	271	361
9.	COD	NS	mg/l	44	28	60	44	36
10.	BOD@ 27oC for 3 days	NS	mg/l	7.2	3.8	10.7	7.4	5.6
11.	DO	NS	mg/l	5.1	5.5	5.3	5.2	5.3
12.	Total Hardness as CaCO3	NS	mg/l	244	63	156	99	123
13.	Total Alkalinity as CaCO3	NS	mg/l	147	63	105	113	135
14.	Free Ammonia as N	NS	mg/l	0.04	0.03	0.54	0.04	0.04
15.	Nitrates as NO3	NS	mg/l	0.4	0.4	0.1	0.008	0.4
16.	SAR	By Calculation	%	4.3	1.7	2.4	4.4	3.5
17.	Total Coliform	NS	MPN/100 ml	170	90	280	300	170

\*NS: Not Specified NTU: Nephelometric Turbidity Unit





## Inference:

The summary of inferences of the analysis of surface water samples results is as follows:

- pH of the Surface water samples was observed to be in the range of 6.4 7.9.
- The Chemical Oxygen Demand (COD) value was found to be in the range of 26 mg/l to 60 mg/l. The Highest level of COD (60 mg/l) was seen in sample SW7(Waliv Talav). All values obtained were within the desirable limit for COD as prescribed by CPCB.
- The maximum concentrations of Biochemical Oxygen Demand (BOD) were observed at SW7 (10.7 mg/l), whereas the minimum concentration was observed at SW1 (1.8 mg/l); but all the values are within the permissible limits.
- Total Hardness was observed to be ranging between 63 to 327 mg/l. The highest value of hardness was recorded at Manvel Pada Talav, and minimum value was recorded at SW6; which is a sample collected in Pelhar Lake in the study area.
- The concentrations of Total Dissolved Solids were in the range of 120 mg/l to 1105 mg/l. All values obtained were within the permissible limit for TDS as prescribed by CPCB.

## **10.3.2 Ground Water Analysis**

The ground water samples were analyzed for parameters as specified in IS: 10500 (2012) standards, "Drinking Water- Specifications" and analyzed as per methods specified in IS: 3025, "Methods of sampling and test (physical and chemical) for water and wastewater". The results of the analysis are presented in Table 10.14 & 10.15. The summary of results is presented in the following sub section.



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Figure 10-2: Ground Water sampling





Sr. N o.	Paramete r	Norm al Range	Units	(GW1)	(GW2)	(GW3)	(GW4)
1.	рН	6.0- 8.5		8	7.7	6.9	7.3
2.	Electrical Conductiv ity	< 2250	μS/c m	3511	1005	2455	1410
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Haze n	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidity	NS	NTU	1.5	2.9	2.4	1
7.	TSS	NS	mg/ L	3	8	4	4
8.	TDS	< 2100	mg/ L	2278	692	1596	917
9.	Total Hardness as CaCO3	NS	mg/ L	292	342	1710	836
10	Total Alkalinity as CaCO3	NS	mg/ L	494	301	288	251
11	Chloride as Cl	NS	mg/ L	570	108	453	227
12	Fluoride as F	NS	mg/ L	0.2	0.4	BDL[DL=0.2	0.3
13	Lead as Pb	NS	mg/ L	BDL[DL=0.6	BDL[DL=0.6	BDL[DL=0.6	BDL[DL=0.6
14	Mercury as Hg	NS	mg/ L	BDL[DL=0.0 06]	BDL[DL=0.0 06]	BDL[DL=0. 006]	BDL[DL=0.0 06]
15	Arsenic as As	NS	mg/ L	0.006	BDL[DL=0.0 03]	BDL[DL=0.0 03]	BDL[DL=0.0 03]
16	Dissolved Oxygen	NS	mg/ L	5.3	5.4	5.5	5.7

## Table 10.14: Results of Ground Water Samples Analysis (Pre-monsoon)

\*NS: Not Specified BDL: Below Detectable Limit, DL: Detectable Limit NTU: Nephelometric Turbidity Unit





Sr. No.	Paramet er	Normal Range	Units	(GW5)	(GW6)	(GW7)	(GW8)	(GW9)
1.	pН	6.0-8.5		7.6	7.8	7.9	7.5	8.5
2.	Electrical Conducti vity	< 2250	μS/c m	359	588	483	1052	928
3.	Taste	NS		Agreeabl e	Agreeabl e	Agreeabl e	Agreeabl e	Agreeab le
4.	Colour	NS	Hazen	BDL[DL =1]	BDL[DL =1]	BDL[DL =1]	BDL[DL =1]	BDL[DL =1]
5.	Odour	NS		Agreeabl e	Agreeabl e	Agreeabl e	Agreeabl e	Agreeab le
6.	Turbidity	NS	NTU	1.1	1.8	2.6	3.7	1.3
7.	TSS	NS	mg/L	3	9	7	7	3
8.	TDS	< 2100	mg/L	233	382	314	684	603
9.	Total Hardness as CaCO3	NS	mg/L	127	219	205	226	213
10.	Total Alkalinit y as CaCO3	NS	mg/L	60	130	204	313	342
11.	Chloride as Cl	NS	mg/L	26	42	30	104	83
12.	Fluoride as F	NS	mg/L	0.9	BDL[DL =0.2]	BDL[DL =0.2]	BDL[DL =0.2]	BDL[DL =0.2]
13.	Lead as Pb	NS	mg/L	BDL[DL =0.6]	BDL[DL =0.6]	BDL[DL =0.6]	BDL[DL =0.6]	BDL[DL =0.6]
14.	Mercury as Hg	NS	mg/L	BDL[DL =0.006]	BDL[DL =0.006]	BDL[DL =0.006]	BDL[DL =0.006]	BDL[DL =0.006]
15.	Arsenic as As	NS	mg/L	BDL[DL =0.003]	BDL[DL =0.003]	BDL[DL =0.003]	BDL[DL =0.003]	BDL[DL =0.003]
16.	Dissolve d Oxygen	NS	mg/L	5.5	5.6	5.5	5.4	5.4

\*NS: Not Specified BDL: Below Detectable Limit, DL: Detectable Limit NTU: Nephelometric Turbidity Unit





Sr. N o.	Paramet er	Norm al Rang e	Unit s	(GW1)	(GW2)	(GW3)	(GW4)
1.	рН	6.0-8.5		7.6	7.2	7.3	7.7
2.	Electrical Conductiv ity	< 2250	µS/c m	2212	868	1155	4413
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Haze n	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidity	NS	NTU	1.6	2.1	2.4	2.4
7.	TSS	NS	mg/ L	5	13	11	16
8.	TDS	< 2100	mg/ L	1432	559	745	2860
9.	Total Hardness as CaCO3	NS	mg/ L	695	166	469	788
10	Total Alkalinity as CaCO3	NS	mg/ L	232	85	238	307
11	Chloride as Cl	NS	mg/ L	310	122	110	220
12	Fluoride as F	NS	mg/ L	BDL[DL=0.2 ]	BDL[DL=0.2 ]	BDL[DL=0.2 ]	BDL[DL=0.2 ]
13	Lead as Pb	NS	mg/ L	BDL[DL=0.6 ]	BDL[DL=0.6 ]	BDL[DL=0.6 ]	BDL[DL=0.6 ]
14	Mercury as Hg	NS	mg/ L	BDL[DL=0.0 06]	BDL[DL=0.0 06]	BDL[DL=0. 006]	BDL[DL=0.0 06]
15	Arsenic as As	NS	mg/ L	BDL[DL=0.0 03]	BDL[DL=0.0 03]	BDL[DL=0.0 03]	BDL[DL=0.0 03]
16	Dissolved Oxygen	NS	mg/ L	5.4	5.3	5.3	5.6

## Table 10.15: Results of Ground Water Samples Analysis (Post- monsoon)

\*NS: Not Specified





Sr N 0.	Parame ter	Nor mal Rang e	Uni ts	(GW5)	(GW6)	(GW7)	(GW8)	(GW9)
1.	рН	6.0- 8.5		7.7	7.1	7.5	7.5	8.1
2.	Electric al Conduct ivity	< 2250	μS/ cm	365	909	683	1192	1.38
3.	Taste	NS		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Colour	NS	Haz en	BDL[DL=1 ]	BDL[DL=1 ]	BDL[DL=1 ]	BDL[DL=1 ]	BDL[DL=1 ]
5.	Odour	NS		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
6.	Turbidit y	NS	NT U	1.6	2	2.3	2.4	1.1
7.	TSS	NS	mg/ L	9	10	11	13	6
8.	TDS	< 2100	mg/ L	230	582	439	768	722
9.	Total Hardnes s as CaCO3	NS	mg/ L	105	154	137	248	255
1 0.	Total Alkalinit y as CaCO3	NS	mg/ L	97	131	87	208	224
1 1.	Chloride as Cl	NS	mg/ L	51	39	26	59	61
1 2.	Fluoride as F	NS	mg/ L	BDL[DL=0 .2]	BDL[DL=0 .2]	BDL[DL=0 .2]	BDL[DL=0 .2]	BDL[DL=0 .2]
1 3.	Lead as Pb	NS	mg/ L	BDL[DL=0 .6]	BDL[DL=0 .6]	BDL[DL=0 .6]	BDL[DL=0 .6]	BDL[DL=0 .6]
1 4.	Mercury as Hg	NS	mg/ L	BDL[DL=0 .006]	BDL[DL=0 .006]	BDL[DL=0 .006]	BDL[DL=0 .006]	BDL[DL=0 .006]
1 5.	Arsenic as As	NS	mg/ L	BDL[DL=0 .003]	BDL[DL=0 .003]	BDL[DL=0 .003]	BDL[DL=0 .003]	BDL[DL=0 .003]
1 6.	Dissolve d Oxygen	NS	mg/ L	5.4	5.3	5.4	5.4	5.5





### \*NS: Not Specified

#### Inference:

- The above results indicate that the pH of all the ground water samples was observed to be in the range of 6.9-8.5.
- Total Dissolved Solids in the samples were in the range of 247 2860 mg /l.
- Total Hardness was found to vary between 126-788 mg/l.
- Chloride was detected in the range of 26 to 570 mg/l.
- Sulphates are more than prescribed limits at GW6, GW7, GW8, GW9.
- TDS are more than prescribed limits at GW4.
- EC of the Ground water in the study area range between <2250, but are more than prescribed limits at GW1, GW3, GW4.

# **10.4 Soil Sample Analysis**

Four soil samples were collected from Residential, Commercial and Industrial area. Analytical results of the four samples are tabulated in Table 10.16.

Sr. No.	Description	Unit	Normal Range	SQ1	SQ2	SQ3
1	pН	-	6.5-8.5	7.4	7.7	6.6
2	Texture	-	Not Specified	Silt Loam	Silt Loam	Silt Loam
3	Electrical Conductivity (1:2 Soil: Water Extract)	μS/cm	Not Specified	873	10130	1926
4	Total Organic Matter	%	0.5 – 0.75	0.35	0.63	0.67
5	SAR	-	<26.0	BDL[DL=1]	5.6	BDL[DL=1]

## Table 10.16: Soil Sample Analysis Results (Pre-monsoon)





Sr. No.	Description	Unit	Normal Range	SQ1	SQ2	SQ3
6	Water holding Capacity	%	Not Specified	47	45.7	55.5
7	Total Nitrogen (Kjeldahl Method)	mg/kg	Not Specified	2135	792	3408
8	Potassium as K++	mg/kg	Not Specified	47	101	50
9	Phosphorus as P	mg/kg	Not Specified	257	153	161

## Table 10.17: Soil Sample Analysis Results (Post- monsoon)

Sr. No.	Parameters		Normal Range	SQ1	SQ2	SQ3
1	рН	-	6.5-8.5	7.6	7.9	7.2
2	Texture	-	Not Specified	Silt Loam	Silt Loam	Silt Loam
3	Electrical Conductivity (1:2 Soil: Water Extract) (µS/cm)	μS/cm	Not Specified	287	874	1758
4	Total Organic Matter	%	0.5 – 0.75	0.56	0.52	0.5
5	SAR	-	<26.0	BDL[DL=1]	3.2	BDL[DL=1]
6	Water holding Capacity	%	Not Specified	49.5	48.3	48.2
7	Total Nitrogen (Kjeldahl Method)	mg/kg	Not Specified	1728	557	2873
8	Potassium as K++	mg/kg	Not Specified	24	88	31
9	Phosphorus as P	mg/kg	Not Specified	161	123	139





### Inference:

- pH of the soil in the study area ranged between 6.6-7.9.
- The soil textural class is silt loam
- Acceptable range for EC of the soil in the study area should be between 0 <2. EC of SQ1, SQ2 and SQ3 are all under this limit.
- Total organic matter present in the soil should be between the range of 0.5-0.67. The total organic matter of SQ1,SQ2 and SQ3 all are within this range.
- Sodium absorption ratio (SAR) of the soil is also within permissible limits.
- Water holding capacity of soil is between 45-56%
- The values for Total Nitrogen at all locations varied between 792-3408 mg/kg. This indicates as the Nitrogen is 'Moderate' as per the classification at all locations.



Figure 10-3: Soil Sample Collection





# **11 Conclusion and Recommendation**

For the first time, the Vasai-Virar City Municipal Corporation carried out an environmental assessment study (Environmental Status Report) to identify environmental challenges and working towards better environmental management. Increased population, industrial and commercial growth, acts as driving forces for the growth of a city and all these increasing demands exerts pressure on the city's municipal facilities as well as natural resources like Air, Water and Land. Taking this into consideration the current report is prepared based on DPSIR framework proposed by MPCB guidelines 2009. Based on the study results, the following conclusions and recommendations are made:

#### Water supply and Wastewater management

- Safe and Adequate Drinking Water is a necessity of residents in Vasai-Virar City. The Surya River, Usgaon Dam, and Pelhar Dam constitute the main water supply sources in Vasai-Virar City, providing 200 MLD, 20 MLD, and 10 MLD of water, respectively.
- 2. The city's water supply has been impacted by the city's expanding population. To fulfill the future water demand, Surya Regional Water Supply Project has been implemented in Mumbai. This project will offer around 185 MLD of additional water supply to VVCMC. The installation of water supply lines has been started in VVCMC. It is a 10 km line project from Kashid Kopar MBR to Vasai Phata, of which 3.8 km supply line has been installed.
- 3. To prevent water loss, the VVCMC's water supply division must detect the leakage points in water line and replace the water pipe lines which are identified in the detection processs.
- 4. To avoid future water scarcity, it is advised to install rainwater harvesting units.





- 5. The overall usage of groundwater in VVCMC is reported to be 0.95 MLD. Total of 441 dug wells & 1392 bore wells are currently in working as per the water supply department of VVCMC. Mainly the groundwater is used for irrigation purpose in the city. As a result, we recommend rejuvenation of groundwater through aforementioned rainwater harvesting system. Maintenance is reccomended on a biannual basis frequency to avoid contamination and clogging and to maintain premium water quality.
- 6. It is necessary to take appropriate measures to recharge the aquifers. Rainwater and storm water harvesting system can be installed to recharge the aquifers.
- 7. To track the overall water quality of surface water resources, MPCB established water quality monitoring stations (WQMS) at 5 locations throughout Vasai Virar City. According to the findings, the water quality is good to excellent at all testing locations, although we recommend that to conduct clean up drives regularly to maintain the water bodies.
- 8. According to our findings, the Achole and Papdi ponds surfaces are blocked by an algal bloom. Thus we recommend that to clean the ponds and preventing the algal bloom using aeration. Aeration is an environmentally-friendly technique that rejuvenates water bodies. It increases the oxygen level in water. Aeration systems can help avoid chemicals and create a healthy ecosystem.
- 9. The VVCMC must make arrangements to develop temporary artificial ponds during Ganesh Festival to immerse Ganesh Idols at various locations in the City. The water must be treated before discharge in the water bodies and sludge must be disposed using scientific technology.





- 10. VVCMC has its sewage treatment plant (STP) at Bolinj, Virar (W) with a capacity of 30 MLD which is owned and operated by the corporation. Apart from this, corporation also has private STP's for the treatment of sewage water. All these STPs are hydraulically tested and commissioned. The storm water is also collected in these STPs and treated as well.
- 11. The analysis conducted by IIT, Bombay reported that VVCMC produces more sewage than its treatment facilities can handle. Hence, we recommend adding more STP plants for wastewater treatment.
- 12. The Municipal authorities' must implement a strict compulsion for every industry to obtain permission from the State Pollution Control Board before discharging wastewater or trade effluent into bodies of water. The municipal authorities should also conduct yearly inspections of industrial activities.
- 13. Vasai-Virar city is encircled by an industrial sector; therefore, pollution from these industrial clusters in air and water bodies is likely to impact it. Therefore, it is recommended to develop an environmental management framework.

## Air Quality improvement

14. In VVVCM area, MPCB installed a Continuous Ambient Air Quality Monitoring Station (CAAQMS) at Diwanman Fire Brigade and one more station is in the process of installation. We advise installing the third station close to the Pelhar police chowki (near industrial hub) as this location is one of the critical and populated region.





- 15. The air quality was measured at three distinct locations. Results from the monitoring show that the Pelhar Police Chowki's PM<sub>10</sub> and PM<sub>2.5</sub> concentrations were reported to be higher than permissible limits. This could potentially be due to the selected monitoring location is surrounded by the industrial and commercial area. Also, the major transport route viz. Golden Quadrilateral National Highway and Pelhar road besides the study location. Due to the industrial activities, material transportation facilities potentially contribute to the particulate matter concentration in the area. Hence, it can be recommended that internal industrial roads should be cleaned by dust sweeping machines, and green corridors should be created for the Golden Quadrilateral National Highway.
- 16. It is also advised to place water fountains or water sprinklers at important traffic intersections, nakas, and city centres in order to lessen the amount of dust pollution.
- 17. For Building construction projects, construction sites must be inspected by VVCMC in order to determine whether project authorities adhered to environmental standards.
- 18. In order to mitigate air pollution, it is also advised to plant species along roadsides and on road dividers that have aesthetic value and are tolerant of pollution includes Common Ivy plant, Babhool, Marginata, Peacock Flower, Vinca rosea, etc.
- 19. VVCMC should put 25% vehicle charging points in the parking area as mandatory condition in each building planning.
- 20. CNG based public transport vehicles The change in fuel type in public vehicles (buses, taxis, rickshaws) from conventional fuels like petrol, diesel to CNG can result in reduction of nitrous oxide by 40%, hydrocarbons by 90%, CO by 80% which are





considered to be harmful to human health. The noise level of CNG engine is also low as compared to diesel engine.

- 21. Improvement of road quality and introduction of one-way routes to regulate the traffic is highly recommended to help reduce the air pollution of the city.
- 22. In order to help minimize automobile pollution, VVCMC should launch its own lowcost, heavily subsidized municipal transportation system. This system should primarily consist of electric buses, and it should also incorporate renewable energy sources to cut down on CO<sub>2</sub> emissions during the production of electricity.
- 23. Vasai-Virar is a center for industry, so the city's vegetation can be anticipated to be less dense. Therefore, concentration of PM<sub>10</sub> can be significantly by increasing city's vegetation.
- 24. The air pollution mitigation measures for domestic and commercial sector can include the use of PNG as effective alternative for firewood and LPG for cooking purposes. Enhance the production and use of biogas and Biomethanization as sources of fuel for cooking. Use of firewood as source of fuel for cooking purposes can be replaced by smokeless chulhas. Smokeless chulhas reduces pollution load of CO, soot particles and particulate matter which potentially results in acute respiratory infection disorders. Also, these chulhas are time and cost effective.

#### Control and mitigation measures for noise pollution

25. Noise levels were measured using a noise level meter in all of the city's major areas, including the Silent Zone, Industrial Area, Commercial Area, and Residential Area. The data was collected continuously for 24 hours. Noise levels were noted exceed





the CPCB standards in the residential, commercial, and industrial zones. Noise levels have increased as a result of increased human activity<del>.</del>

- 26. The Pelhar Police Chowki region has the highest average noise intensity. It could possibly be due its proximity to the Golden Quadrilateral National Highway and increased industrial activities.
- 27. To reduce traffic and noise pollution, encourage people to use public transport instead of driving their own automobiles. Create programs that raises awareness and educate the public about the negative effects of noise pollution.
- 28. There are several species of trees like Neem, Kusum, Kindal, Palas, Ashoka that will absorb sound and create noise barrier or reduce noise levels in metropolitan areas and along the busy highways and roads. Additionally, trees enhance air quality and provide other aesthetic benefits too.

## Solid waste management

- 29. Solid waste generation is a continuously growing problem at all levels including local levels. Solid wastes are the organic and inorganic waste materials produced by various activities of the society, which have lost their value to the first user. Improper disposal of solid wastes pollute all the vital components of the living environment (i.e., air, land and water) at local and global levels.
- 30. The daily MSW generation in VVCMC is about 975 TPD considering 500 gms/day as the per capita waste generation for a population of about 19 Lakhs (2019) and the average daily collection and conveyance of the MSW which is actually dumped at the dump site at Gokhiware is about 525 to 565 tons. At present there is no segregation taking place at source.





- 31. Initially the corporation should understand the nature of solid waste of the city and develop a DPR with a long-term vision to mitigate the issues pertaining to solid waste management.
- 32. The development of a scientific landfill site over a dumping site is advised for proper solid waste management in order to process the solid waste. Adopt a more environmentally friendly procedure for the efficient collection of household waste.
- 33. Incorporate waste to energy techniques for effective disposal of solid waste such asBio methanation plant, Biomass Gasifier, pyrolysis technique.
- 34. On a local level, VVCMC needs to hold workshops or awareness campaigns about wet/dry waste segregation. Encourage peoples to adopt the same behavior in their daily lives.
- 35. There are various gardens inside the corporation boundaries. Every garden in the city is periodically cleaned and maintained. The number of trees in gardens should be raised, and the aesthetics of gardens as well as plants with flowers are crucial components that relieve inhabitants' tension.
- 36. In order to make a city sustainable, it is equally necessary to clean up and beautify the roads. Roadside landscaping in vacant and open spaces will improve how the highways look. It will ease the strain on residents and commuters using the roads.
- 37. The Vasai-Virar region is one of the richest biodiversity regions voted by naturists and bird enthusiasts on the outskirts of Mumbai with more than 250 rare and common species of birds found and documented. VVCMC has to take more initiative





to conserve these natural habitats and ecosystems like their previous bird & tree census activities.

38. There are numerous higher educational institutions in and around Vasai- Virar City, particularly in the fields of engineering, medicine, science, technology, business, and humanities. VVCMC should encourage these institutions by offering financial aid to start up innovative and scientific projects for researching environmental impacts that are beneficial to VVCMC from an environmental standpoint to support its sustainable development.





# **12 Past Initiatives by VVCMC**

Sr. No	Department	Work Type	Year	Project Name
1		Awareness Activity	2023	Hon. Prime Minister Shri. On the occasion of the birth anniversary of the Father of the Nation, Mahatma Gandhi on the concept of Narendra Modi, in the "One Date One Hour" campaign organized under the campaign "Swachhta Hi Seva
2		Awareness Activity	2023	On 02/10/2023, Municipal Corporation honors cleanliness ambassadors, ex-servicemen and families of heroes who died in the service of the country under the campaign "Swachhta Hi Seva".
3	Solid Waste Management Department	Awareness Activity	2023	Union Ministry of Housing and Urban Affairs (MoUHA) Central Government had directed to implement the cleanliness campaign "Swachh Diwali Shubh Diwali" from 06/11/2023 to 13/11/2023. Accordingly, 'C' Ward Committee Office, Solid Waste Management Department, Vasai Virar City Municipal Corporation on 09/11/2023 with the help of women's self-help groups organized an exhibition of supplementary items.
4		Awareness Activity	2023	On the occasion of World Toilet Day Hon. According to the instructions of the Minister, Union Ministry of Housing and Urban Affairs (MOHUA), Government of India, Swachh Toilet Abhiyan is being implemented in our city.





Sr. No	Department	Work Type	Year	Project Name
5		Awareness Activity	2023	A workshop was organized at Kargil Nagar under Ward Committee 'B' through Ornet Company regarding wet/dry waste and single use plastic ban and public awareness was created.
6		Awareness Activity	2023	Meri Life Mera Swachh Sahar – On 20th May 2023 One permanent Reduce Reuse Recycle (RRR) Centre established and is in operation.
7		Dry waste collection and recycling drive	2023	Dhyas Foundation took Dry waste collection and recycling drive at Vasai.
8		Mega Drive (Collect- Reuse-Recycle)	2023	Dhyas foundation took Mega Drive (Collect-Reuse-Recycle) at Vasai.
9		Dry waste collection and recycling drive	2023	Dhyas Foundation took Dry waste collection and recycling drive at Vasai.
10		clean up drive	2023	Dhyas foundation and Usha Mittal institute of technology taken koliwada clean up drive with the help of VVCMC Prabhag I at Vasai.
11		E-Waste Collection Drive	2023	Dhyas Foundation taken Dry Plastic and E-Waste Collection Drive and recycling at Vasai.
12		Dry Plastic Collection Drive	2022	Dhyas Foundation taken Dry Plastic Collection Drive at Virar.
13	Solid Waste Management Department	Dry Plastic & E-Waste Collection Drive	2022	Dhyas Foundation taken Dry waste collection drive(Dry Plastic, E-Waste etc.) at Virar.
14		Dry waste collection drive	2022	Dhyas Foundation has organized Dry waste collection drive and recycling at Virar.





Sr. No	Department	Work Type	Year	Project Name
15		Beach Cleaning Campaign	2022	Under Swachhata Amrut Mohotsav-Indian Swacchata League, VVCMC conducted Beach Cleaning Campaign at Suruchi Beach, Vasai on 21st Sep 2022. More than 3000 volunteers participated in this campaign.
16		dry waste collection and recycling	2022	Dhyas Foundation taken drive of dry waste collection and recycling of waste at Vasai.
17		lean Sea Campaign	2022	lean Sea Campaign taken on Suruchi beach at vasai(Ward I), In that 500 students of Sant Gonsalo Garcia College, 50 women's of SHG Groups and staff and officers of Ward Committee I also participated in this. A total of 600 people participated in this cleanliness drive.
18		Cleanliness Campaign	2022	on the occasion of Amrit Mahotsav of Independence Day, a cleaning campaign was conducted at Suruchi Beach through Ward Committee I and local citizens and municipal employees. A total of 25 people were included in it.
19		Cleanliness Campaign	2022	Under VVCMC Rajodi Beach Cleanliness Campaign was conducted by Go Green Foundation and Sanitation Staff of Ward A. 35 people participated in this campaign.
20		Beach cleaning	2022	Beach cleaning was done through the Killa pachu group, Killabandar vasai organization and Sanitary Inspectors and Sanitary workers of Ward I at Suruchi Beach vasai. A total of 35 people were included in it.





Sr. No	Department	Work Type	Year	Project Name
21		Workshop	2022	Workshop conducted on Ban on Single use plastic & Meeting Conducted on Domestic Hazardous Waste Management by Solid Waste Management Dept., VVCMC in Collaboration of MPCB with Industrial Associations.
22		Beach clean-up drive	2022	Suruchi Beach cleans up drive taken by Dhyas foundation and VVCMC (ward I) at Vasai.
23		Beach clean-up drive	2022	International Coastal Cleanup Day(beach cleaning campaign at Bhuigaon, Nalla Sopara West )
24		awareness	2022	workshop on Under single use plastic ban public awareness on what to use and what not to use and on penal action in this regard
25		awareness	2022	Plastic Awareness program taken by Dhyas Foundation at Nirmala Mata High School, Manipur, vasai (w).
26		Workshop	2022	Workshop on plastic management was organized by Save the earth Foundation at Education B.Ed. High School, Vasai
27		Dry Plastic Collection	2022	Dhyas Foundation has organized Dry Plastic Collection Drive at Virar.
28	Water Supply Department	Well rejuvenation	2022	Well rejuvenation program arranges at Santosh Bhuvan Naka, Chandip 1, Jyoti kumchiwadi, Katarwadi goan, Manickpur gavnighar fadbav and Manickpur naupada nata bai.
29	Water Supply Department	Artificial immersion spots	2022	Vasai-Virar City Municipal Corporation creates artificial immersion spots for Visarjan at Kopari talav & makvana Complex, Prabhag C to reduce the water pollution during festivals.





Sr. No	Department	Work Type	Year	Project Name
30	Drainage Department	STP installation	2022	Vasai-Virar City Municipal Corporation installed 30MLD Sewage Treatment plant zone 2 at Bolinj.
31		Compost from nirmalya	2022	Compost made from Nirmalya collected during Pre- Immersion Activity at Water Bodies.
32	Department	Centralised Wet Waste Processing Facility	2022	Installed Centralised Wet Waste Processing Facility/Plant (Wet Waste Process through Windrow Composting Method) at Golani Naka, Vasai East.
33	Solid Waste Management Department		2022	Initiative for earthen pots immersed in water bodies during pooja on "Dusshera festival" and "Makar Sankranti" is collected by SHGs which is reused for plantation.
34		Awareness activities	2022	Conduct awareness activities for banning single use plastic/ Use of alternatives of plastic
35	Electrical Department	LED Streetlights	2022	LED Streetlights installed at following location : 1.Ward Committee (H) at Navghar East-West flyover 2.Ward Committee (H) from Panchvati Chowk to Guruvdara (Shri Guru Singh Sabha) 3.Ward Committee (H) from Vartak Chowk to Manikpur Naka 4.Ward Committee (H) Hanuman Mandir (Manikpur Naka) to Stella Petrol Pump
36		plantation	2022	Miyawaki tree plantation done at Achole road, Nalla Sopara East.
37	Garden Department	Tree Plantation	2022	Trees plantation done during Majhi Vasundhara Abhiyan 3.0. at Mhada Complex Area, Madhuban Road , Vasai East and Vasant Nagari Road, Nalla Sopara east





Sr. No	Department	Work Type	Year	Project Name
38	Public work department	Water Body rejuvenation	2022	Umelman & Diwanman Talav rejuvenated during Majhi Vasundhara Abhiyan3.0
39	Water Supply Department	Rainwater Harvesting system	2022	Installed of Rooftop Rainwater Harvesting system at Golani Naka, Vasai.
40	Solid Waste Management Department	Awareness campaign	2022	Conduct workshops and seminars for all age groups, all genders and social groups including tribal and villages for creative use of their talent to produce useful articles and handicrafts using the waste materials to minimize the waste quantity.
41		Awareness and education of the citizen groups	2022	For dissemination of process & technology to be adopted by the VVCMC for IMSWM and educating all audiences about the project perspectives
42		Awareness campaign	2022	Utilize public functions and festivities by displaying posters and banners, wall murals, graffiti to sensitize the general public to the emerging project, its features and expectations from the citizens
43		Awareness campaign	2022	Create and use Facebook /Twitter and other social e- platforms to form groups and spread messages of awareness
44		Awareness campaign	2022	Distribution among the residents and also the casual visitors and tourists to dump waste at designated locations and keep the roads/paths clean
45		Competitiveness for waste management and disposal	2022	Rolling trophy to be awarded to the ward within the city and the village within the Investment Area for cleanest environment





Sr. No	Department	Work Type	Year	Project Name
46		Awareness campaign	2022	Footnotes to capture the TV audience depicting the ill effects on health and environment due to open dumping of waste and uncontrolled burning
47		Awareness campaign	2022	Involvement of Senior Citizens and School children to improve sanitation along the major roads and thoroughfares
48		To initiate a debate among the citizens	2022	Depicting case studies of success stories of municipal waste management in other similar towns
49	R.T.O, VVCMC, Traffic Police	Awareness campaign	2022	Launch public awareness campaigns for air pollution control, vehicle maintenance, minimising use of personal vehicles, lane discipline etc.
50	VVCMC	R.T.O	2022	Installed Computerised PUC check stations to avoid fake certificate.
51	Environmental Department	Water fountains	2022	VVCMC introduce water fountains for major traffic intersections
52	Solid Waste Management Department		2022	VVCMC has proposed new landfill site for segregated solid waste. Composting will be done.

Source: VVCMC Website





# 12.1 Initiatives under Swachh Bharat Mission and Majhi Vasundhara Abhiyan

Meri Life Mera Swachh Shehar: On 20th May 2023 One permanent Reduce Reuse Recycle (RRR) Centre established and is in operation. Establishment of Two more permanent RRR Centre is in Action Plan which will be transfer to local based NGOs for Operations. Flash Mob and ward level cleanliness drive conducted where more than 2000 citizen participated.





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SWACHHOTSAV 2023, WORLD ZERO WASTE DAY: Under Swachh Bharat Mission 2.0, on account of International Women's Day, to empower and to lead women in sanitation and waste management sector "Swachhotsav 2023" launched on Dtd. 7<sup>th</sup> Mar 2023 – 31<sup>st</sup> Mar 2023 by Ministry of Housing & Urban Affairs (MoHUA). On account of International Day of Zero Waste, VVCMC organized "Zero Waste Exhibition" for SHGs on Dtd. 31<sup>st</sup> Mar 2023

**Street Play and Mass Rally** were also conducted by SHG's Women regarding Zero Waste – 3 R Principle Awareness.







Hon. Prime Minister Shri. On the occasion of the birth anniversary of the Father of the Nation, Mahatma Gandhi on the concept of Narendra Modi, in the "One Date One Hour" campaign organized under the campaign "Swachhta Hi Seva" today - dt. On October 01, 2023, cleanliness drive was conducted at a total of 97 places in Vasai Virar City Municipal Corporation area.







On 02/10/2023, Municipal Corporation honors cleanliness ambassadors, ex-servicemen and families of heroes who died in the service of the country under the campaign "Swachhta Hi Seva".







Union Ministry of Housing and Urban Affairs (MoUHA) Central Government had directed to implement the cleanliness campaign "Swachh Diwali Shubh Diwali" from 06/11/2023 to 13/11/2023. Accordingly, 'C' Ward Committee Office, Solid Waste Management Department, Vasai Virar City Municipal Corporation on 09/11/2023 with the help of women's self-help groups organized an exhibition of supplementary items. Also, an oath ceremony and signature campaign was organized. The exhibition was inaugurated by Hon'ble Commissioner. Paper lanterns, handcraft items, chemical-free cosmetics etc. through women's self-help groups. Eco-friendly products were displayed in the said exhibition. Vasai Virar City Municipal Corporation Mr. Deputy Commissioner, Hon. Assistant Commissioner and other department staff were present in the said exhibition.







Clean Toilet Campaign: On the occasion of World Toilet Day Hon. According to the instructions of the Minister, Union Ministry of Housing and Urban Affairs (MOHUA), Government of India, Swachh Toilet Abhiyan is being implemented in our city.









National Unity Race: Rashtriya Ekta Run was concluded on 31/10/2023. More than 250 runners and citizens participated in this national unity race.







A program was organized at YMCA Hall, Manikpur under Ward Committee H Navghar for effective implementation of "My Vasundhara Abhiyan 4.0" and \*World Soil Day.







A program was organized for the effective implementation of "My Vasundhara Abhiyan 4.0" at Deendayal Nagar under Ward Committee H Navghar, Mr. Swapnil Shah and M.P. Joint Commissioner Mr. Nilesh Mhatre, Senior Clerk Mr. Joel D'Souza, women self-help groups and citizens were present.









A program was organized for the effective implementation of "Mazi Vasundhara Abhiyan 4.0" at Paranaka under Ward Committee I Vasai, Mr. Swapnil Shah and M.P. Joint Commissioner Mr. Nilesh Mhatre, Superintendent Mr. Victor D'Souza, women self-help groups and citizens were present.







The Asian Waterbird Census 2024: The Asian Waterbird Census (AWC) is an annual event held every January to monitor waterbirds and wetlands. Birders from across the country join in to contribute to monitoring waterbirds and their habitats.







## > Awareness: Painting competition for effective implementation of My Vasundhara Abhiyan 4.0







Bicycle and E-Bike Rallies: A program was organized for the effective implementation of "Mazi Vasundhara Abhiyan 4.0







Climate change programs: Awareness programme organised by VVCMC under Majhi Vasundhara Under the guidance of Commissioner Shri AnilKumar Pawar, under the guidance of My Vasundhara Abhiyan 4.0, Vasai Virar City Municipal Corporation organized an awareness program on climate change.







Prize Distrubution through CSR Fund: A total of 27 prizes of three for each ward committee will be given to the citizens participating in the activity through lucky draw from the CSR fund.







Prize distribution of eco-friendly Ganeshotsav competition: In a bid to promote eco-friendly practices and sustainable living, the Vasai Virar City Municipal Corporation (VVCMC) Environment Department is organizing the "Environmentally Friendly Home Ganeshotsav Competition 2023." This event, sponsored by CSR funds under the "My Vasundhara 4.0" initiative and "Mission Life," aims to encourage citizens to celebrate Ganeshotsav in an environmentally conscious way.





