Monitoring, Sampling and Analysis for Ambient Air Quality, Surface Water Quality and Ground Water Quality in Critically/Severely/Other Polluted Industrial Areas of Maharashtra

NAVI MUMBAI

Post Monsoon (December 2022 to February 2023)

Maharashtra Pollution Control Board

Kalptaru Point, Sion East, Mumbai – 400 022

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ABBREVIATIONS

CPCB	Central Pollution Control Board
MPCB	Maharashtra Pollution Control Board
CEPI	Comprehensive Environmental Pollution Index
EPA	Environmental Protection Act, 1986
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BIS	Bureau of Indian Standards
BLQ	Below the Limit of Quantification
CAAQMS	Continuous Ambient Air Quality Monitoring Station
CEMS	Continuous Emission Monitoring System
CETP	Common Effluent Treatment Plant
VOCs	Volatile Organic Compounds
MIDC	Maharashtra Industrial Development Corporation
NWMP	National Water Quality Monitoring Program
NAAQS	National Ambient Air Quality Standard
ZLD	Zero Liquid Discharge
CPA	Critically Polluted Area
SPA	Severely Polluted Area

1. Executive Summary

Navi Mumbai was monitored for Ambient Air Quality, Ground and Surface Water quality. Based on the data collected by monitoring, a Comprehensive Environmental Pollution Index (CEPI) Score [as per latest directions 120 of Letter No. B-29012/ESS (CPA)/2015-16 dated 26th April 2016 of Central Pollution Control Board (CPCB)] was calculated. Maharashtra Pollution Control Board (MPCB) has carried out monitoring at CPCB location with the additional locations of sampling for ambient air, surface and ground water in consideration with the previous CEPI monitoring and covering the entire CEPI Impact Zone. The post monsoon monitoring was carried out during the period of December 2022 to February 2023 to assess the ambient air quality, surface water quality and ground water quality.

The Ambient Air Quality stations were identified considering the upwind and cross wind direction in the CEPI impact area. Ambient Air Quality was monitored at eight locations. The concentration of all the ambient air parameters was found well within the limits prescribed by NAAQS. Six locations each for surface water and ground water were monitored for the study. Land index is represented by ground water in the CEPI. Ground water parameters were also found to be within the permissible limits when compared with IS10500:2012 drinking water standards.

Based on the study conducted by CPCB during the period January 2018, the CEPI score of Navi Mumbai region as per the revised guidelines of CEPI (2016) was 66.32 (Air Index–56, Water Index-63 and Land Index–16). However, the present study reports aggregated CEPI score of Navi Mumbai region of post-monsoon season (March, 2023). Based on the study, the present CEPI score is 53.59 (Air Index–36.00, Water Index-50.75 and Land Index–16.00). The CEPI score is the combination of A, B, C and D factors. Here, C factor represents the health data and D factor represents the initiatives taken by MPCB in past few years to mitigate pollution. As the regional offices of MPCB has taken various initiatives like the installation of CAAQMS, CETPs, online VOC analysers etc. in the past few years to control and mitigate air and water pollutants. This has contributed to the factor D, hence reduced the CEPI score of the region over the years.

The analysis of the aggregated CEPI score shows that the pollution in Navi Mumbai industrial clusters has reduced in last three years. Approximately 20% decrease in CEPI score is observed from 66.32 in 2018 to 53.59 in 2023.

2. Introduction

Over the past few decades, environmental deterioration has become a "common concern" for humanity. The distinctive nature of the current environmental issues is that human activity contributes to them more than natural events. Economic expansion and mindless consumption are beginning to have negative impacts on Mother Nature. It's been studied and reported that the majority of industries (77% approximately) contribute to water pollution, 15% to air pollution, and the remaining 8% to both air and water pollution. Additionally, the most polluting businesses are those that depend on natural resources and are expanding quickly.

These human activities have an adverse effect on the environment by polluting the water we drink, the air we breathe, and the soil in which plants grow. Untreated wastewater from industries has affected the potability and hygiene of drinking water due to the presence of hazardous impurities in it, causing detrimental health effects to human, animal and aquatic life. Exposure to air pollutants is closely related to Pulmonary Diseases, wheezing, asthma, respiratory disease, cardiovascular diseases etc. Moreover, air pollution seems to have various malign health effects in early human life, such as respiratory, cardiovascular, mental, and perinatal disorders, leading to infant mortality or chronic disease in adult age. Therefore, it is crucial to identify and investigate the major sources of pollution to implement mitigation strategies for substantial environmental and health co-benefits. Even though health is a major concern, industrial growth is a necessity for a developing economy. Research into the development of such systems that can cut down on the usage of freshwater by industrial sectors as well as the development of efficient and effective water treatment methods is encouraged for overall socioeconomic progress and well-being. To mitigate any hazardous impacts, new advancements and ongoing monitoring of the execution methods of various programmes and interventions related to industrial wastewater treatment are critically important.

In view of this, Central Pollution Control Board (CPCB) has evolved the concept of Comprehensive Environmental Pollution Index (CEPI) during 2009-10 as a tool for comprehensive environmental assessment of prominent industrial clusters and formulation of remedial Action Plans for the identified critically polluted areas. CEPI bridges the perceptive gap between experts, public, and government departments by simplifying the complexity of environmental issues. It aims at categorizing critically polluted industrial areas based on scientific criteria, so as to ascertain various dimensions of pollution. This is a combined framework used to evaluate the impacts caused by industrial clusters on the nearby environment, as a numerical value.

The present CEPI study includes Navi Mumbai region, which is the largest planned city in the world. Its development was started in 1972 to de-congest Mumbai. Navi Mumbai is environmentally very important, ecologically sensitive and are natural habitats for migratory birds. It also includes mangroves, lakes and wetlands. Its industrial area is commonly known as TTC MIDC Estate. This TTC MIDC accounts for about 3254 industrial units of various category engaged in the manufacturing of chemicals, dyes, dye-intermediates, Bulk drugs, pharmaceuticals, Textile auxiliaries, Pesticides, Petrochemicals, Textile processors, Engineering units etc. Besides the industries, there are other

sources which are major contributors of pollution like emissions by transport and construction activities etc.

The present report is based on the revised CEPI version 2016. The results of the application of the Comprehensive Environmental Pollution Index (CEPI) to selected industrial cluster or areas are presented in this report. The main objective of the study is to identify polluted industrial clusters or areas in order to take concerted action and to centrally monitor them at the national level to improve the current status of their environmental components such as air and water quality data, ecological damage, and visual environmental conditions. The index captures the various dimensions of environment including air, water and land. Comprehensive Environmental Pollution Index (CEPI), which is a rational number to characterize the environmental quality at a given location following the algorithm of source, pathway and receptor have been developed.

Fig. Navi Mumbai Region CEPI Monitoring Zone

3. Scope of Work

The major scope of work includes:

I. The scope of the present study is to perform three (3) rounds of "Monitoring, Sampling and Analysis for Ambient Air Quality, VOCs in Ambient Air, Surface Water Quality & Ground Water Quality in selected Pollution Industrial Areas (PIAs) of Navi Mumbai, Maharashtra" with a gap of one or two days. The analysis of the collected samples was carried out by the standard methods (CPCB, BIS, APHA, USEPA).

II. To Collect health-related data in the CEPI region.

III. To calculate the Comprehensive Environmental Pollution Index (CEPI) Score as per Revised CEPI-2016 issued by Central Pollution Control Board (CPCB).

The sampling details and frequency of sampling in Ambient Air, VOCs, Surface Water and Ground Water are given in Table 3.1 and Table 3.2 respectively.

Table 3.1 Sampling Details of Navi Mumbai

Sampling Criteria	Total Sites	Monitoring Parameters
Ambient Air Quality	**08**	PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3, C_6H_6, CO, BAP, Pb, Ni, As
Volatile Organic Compounds (VOCs)	**02**	Dichloromethane, Chloroform, Carbon Tetrachloride, Trichloroethylene, Bromodichloromethane, 1,3-Dichloropropane, 1,4-Dichlorobenzene, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dibromo-3-Chloropropane, Napthalene, Bromobenzene,1,2,4-Trimethylbenzene, 2-Chlorotoluene, Tert-Butylbenzene, SEC-Butylbenzene, P-Isopropyl toluene, M-Xylene, P-Xylene, Styrene, Cumene 1,2,3-Trichloropropane, N-Propyl benzene, Dibromochloromethane, 1,2-Dibromoethane, Chlorobenzene, 1,1,1,2-Tetrachloroethane, Ethylbenzene, 1,1-Dichloropropylene, 1,2-Dichloroethane, 1,2-Dichloropropane, Trans-1,3-Dichloropropene, CIS 1,3-Dichloropropene, 1,1,2-Trichloroethane, Tetrachloroethylene, 1,3,5-Trimethylbenzene, N-Butylbenzene, 1,2,3-Trichlorobenzene, Hexachlorobutadiene, 1,2,4-Trichlorobenzene, 2,2-Dichloropropane, Dibromo methane, Toluene, O-Xylene, Bromoform, 1,1,2,2-Tetrachloroethane, 4-Chlorotoluene, 1,1-Dichloroethylene, Trans-1,2-Dichloroethylene, 1,1-Dichloroethane, CIS-1,2-Dichloroethylene, Bromochloromethane, 1,1,1-Trichloroethane

Sampling Criteria	Total Sites	Monitoring Parameters
Water Quality Monitoring	**Surface water - 06**	**(i) Simple Parameters** Sanitary Survey, General Appearance, Colour, Smell, Transparency and Ecological **(ii) Regular Monitoring Parameters** pH, O & G, Suspended Solids, DO, COD, BOD, TDS, Electrical Conductivity, Total Dissolved Solids, Nitrite–Nitrogen, Nitrate-Nitrogen, (NO_2+NO_3) total nitrogen, Free Ammonia, Total Residual Chlorine, Cyanide, Fluoride, Chloride, Sulphate, Sulphides, Total Hardness, Dissolved Phosphates, SAR, Total Coliforms, Faecal Coliform **(iii) Special Parameters** Total Phosphorous, TKN, Total Ammonia (NH_4+NH_3)-Nitrogen, Phenols, Surface Active Agents, Anionic detergents, Organo-Chlorine Pesticides, PAH, PCB and PCT, Zinc, Nickel, Copper, Hexa-valent Chromium, Chromium (Total), Arsenic (Total), Lead, Cadmium, Mercury, Manganese, Iron, Vanadium, Selenium, Boron **(iv) Bio-assay (zebra Fish)** Test – For specified samples only.
	Ground water - 06	

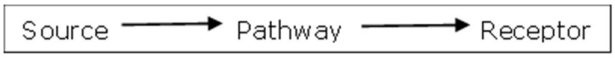
Table 3.2 Frequency of Sampling

	Parameter	Round of Sampling	Frequency in Each Round
A	**Ambient Air Quality Monitoring**		
1.	Particulate Matter (size less than 10 µm) or PM_{10}	03	3 Shifts of 8 hrs each
2.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	03	1 Shift of 24 hrs
3.	Sulphur Dioxide (SO_2)	03	6 Shifts of 4 hrs each
4.	Nitrogen Dioxide (NO_2)	03	6 Shifts of 4 hrs each
5.	Ammonia (NH_3)	03	6 Shifts of 4 hrs each

	Parameter	Round of Sampling	Frequency in Each Round
6.	Ozone (O_3)	03	24 Shifts of 1 hr each
7.	Benzene (C_6H_6)	03	1 Shifts of 24 hrs
8.	Carbon Monoxide (CO)	03	24 Shifts of 1 hr each
9.	Benzo (a) Pyrene (BaP) – particulate phase only	03	3 Shifts of 8 hrs each
10.	Lead (Pb)	03	3 Shifts of 8 hrs each
11.	Arsenic (As)	03	3 Shifts of 8 hrs each
12.	Nickel (Ni)	03	3 Shifts of 8 hrs each
B	**Volatile Organic Compounds (VOCs)**		
	As mentioned in Table 3.1	03	3 Shifts of 24 hrs each
C	**Ground Water**		
	As mentioned in Table 3.1	03	01 sample at each round
D	**Surface Water**		
	As mentioned in Table 3.1	03	01 sample at each round

4. Methodology

The present report is based on the revised Comprehensive Environmental Pollution Index (CEPI) version 2016. The index captures the various dimensions of the environment including air, water and land. Comprehensive Environmental Pollution Index (CEPI) is a rational number, which is used to characterize the environmental quality at a given location. It is three-step process based on the algorithm of Source, Pathway and Receptor.



Ambient air stations, Surface water locations and Ground water locations were decided by the respective regional officers. The sampling was done in 3 rounds with an interval of one or two days at each location. Sampling has been done at the potentially polluted areas so as to arrive at the CEPI. This will further help the authorities to monitor the areas in order to improve the current status of their environmental components such as air and water quality data, ecological damage and visual environmental conditions.

AIR ENVIRONMENT

5. Air Environment

For studying the Air Environment of Navi Mumbai area, monitoring stations were identified considering the upwind and cross wind direction and all 12 parameters as per the notification of National Ambient Air Quality Standards (NAAQS) were carried out.

**Kindly note: Volatile Organic Compounds (VOCs) concentration is not detected in most of the Air samples collected; hence it is not shown in the graphs.*

In Navi Mumbai eight locations have been monitored for checking the Ambient Air Quality (AAQ) in triplicate from 16th Jan., 2023 to 21st Jan., 2023. Volatile Organic Compounds (VOCs) were monitored at 2 locations namely Zoetis Pharmaceuticals Research Pvt. Ltd. and Deepak Fertilizer and Petrochemicals Ltd.

Table 5.1 Details of Sampling Location of Ambient Air Quality Monitoring

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	DY Patil Hospital	N19^{0}02'27.88"	E73^{0}01'27.22"	16.01.2023	18.01.2023	20.01.2023
2.	TTCWMA, Mahape	N19^{0}06'28.72"	E73°01'51.68"	16.01.2023	18.01.2023	20.01.2023
3.	Nearby Reliable IT Park	N19^{0}06'30.77"	E73^{0}01'49.57"	16.01.2023	18.01.2023	20.01.2023
4.	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.	N19°03'59.58"	E73°01'32.13"	16.01.2023	18.01.2023	20.01.2023
5.	CETP Koparkharine, near ETP Table No. I	N19^{0}04'30.99"	E73^{0}04'03.74"	16.01.2023	18.01.2023	20.01.2023
6.	Nearby Ashi India Glass	N19^{0}05'10.73"	E73^{0}06'19.14"	16.01.2023	18.01.2023	20.01.2023
7.	Nearby Technova Imaging System	N19^{0}03'27.50"	E73^{0}06'48.19"	16.01.2023	18.01.2023	20.01.2023
8.	Nearby Deepak Fertilizer and Petrochemicals	N19^{0}04'08.26"	E73^{0}07'59.22"	16.01.2023	18.01.2023	20.01.2023

Table 5.2 Details of Sampling Location of Volatile Organic Compounds (VOCs) Monitoring

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.	N19°03'59.58"	E73°01'32.13"	16.01.2023	18.01.2023	20.01.2023
2.	Nearby Deepak Fertilizer and Petrochemicals	N19^{0}04'08.26"	E73^{0}07'59.22"	16.01.2023	18.01.2023	20.01.2023

Fig: Geographical Locations of Ambient Air Quality Monitoring

Fig. Geographical Locations of VOCs Monitoring

Table 5.3 Ambient Air Quality Monitoring Results

Parameters	Unit	Results			
		DY Patil Hospital	TTC WMA, Mahape	Nearby Reliable IT Park	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.
Sulphur Dioxide (SO_2)	$\mu g/m^3$	31.82	19.51	15.42	29.45
Nitrogen Dioxide (NO_2)	$\mu g/m^3$	23.35	21.20	12.79	23.30
Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	62	65	56	65
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	18	17	16	15
Ozone (O_3)	$\mu g/m^3$	22.70	27.30	26.20	24.20
Lead (Pb)	$\mu g/m^3$	BLQ	BLQ	0.03	BLQ
Carbon Monoxide (CO) (1h)	mg/m^3	1.37	1.66	1.67	1.83
Carbon Monoxide (CO) (8h)	mg/m^3	1.78	2.01	1.97	2.16
Ammonia (NH_3)	$\mu g/m^3$	104.03	92.75	92.30	225.00
Benzene (C_6H_6)	$\mu g/m^3$	3.04	2.88	2.54	3.52

Parameters	Unit	Results			
		DY Patil Hospital	TTC WMA, Mahape	Nearby Reliable IT Park	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	0.70	BLQ	0.75	0.46
Nickel (Ni)	ng/m^3	4.54	BLQ	BLQ	3.48

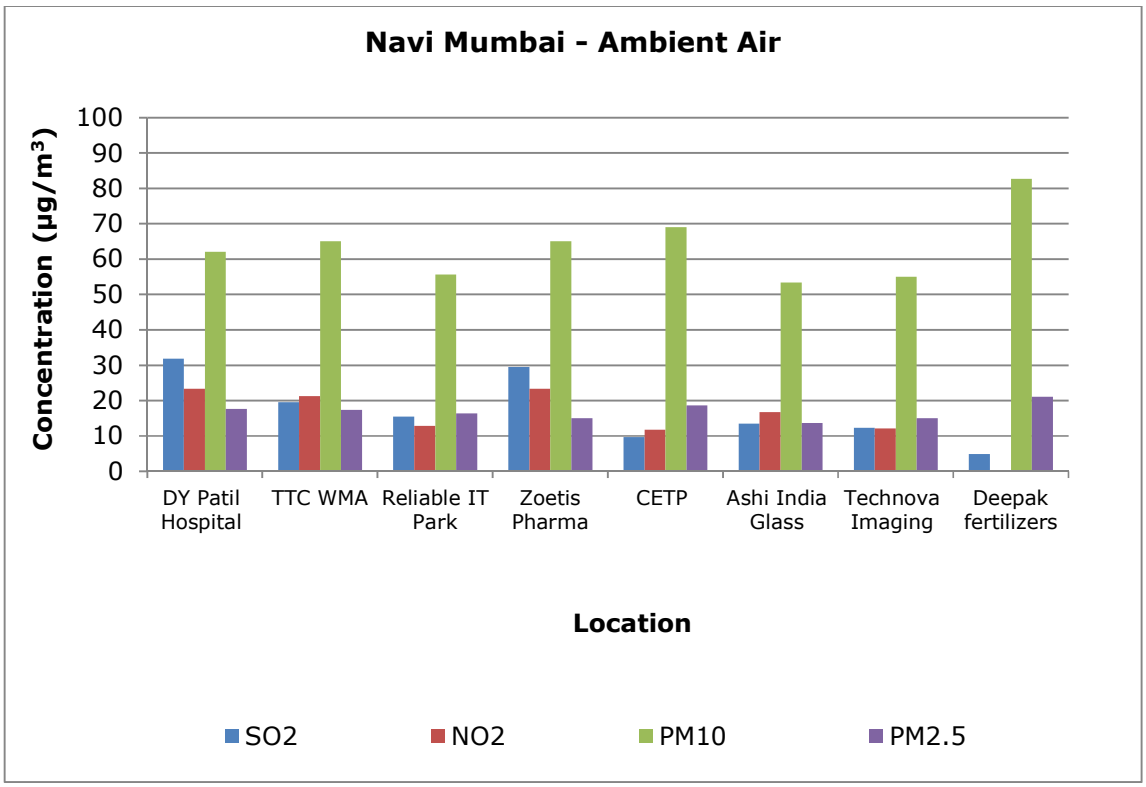
Parameters	Unit	Results			
		CETP Koparkharine Near ETP Table No. I	Nearby Ashi India Glass	Nearby Technova Imaging System	Nearby Deepak Fertilizer and Petrochemicals
Sulphur Dioxide (SO_2)	$\mu g/m^3$	9.66	13.50	12.30	4.87
Nitrogen Dioxide (NO_2)	$\mu g/m^3$	11.80	16.70	12.11	BLQ
Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	69	53	55	83
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	19	14	15	21
Ozone (O_3)	$\mu g/m^3$	BLQ	28.20	28.00	BLQ
Lead (Pb)	$\mu g/m^3$	BLQ	0.03	0.02	BLQ
Carbon Monoxide (CO) (1h)	mg/m^3	1.40	1.50	1.47	1.43
Carbon Monoxide (CO) (8h)	mg/m^3	1.60	1.86	1.63	1.84
Ammonia (NH_3)	$\mu g/m^3$	171.00	108.50	119.45	86.50
Benzene (C_6H_6)	$\mu g/m^3$	2.74	2.50	2.72	3.24
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	BLQ	0.30	BLQ	0.97
Nickel (Ni)	ng/m^3	BLQ	3.26	3.09	BLQ

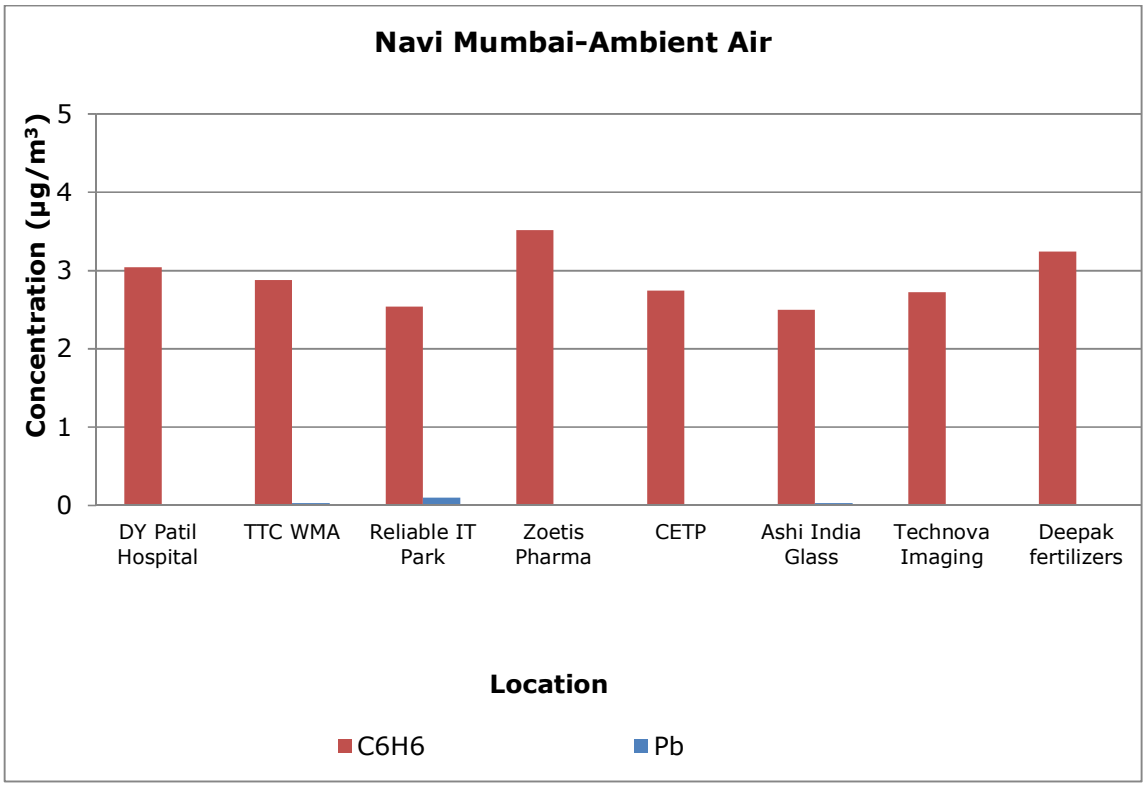
Table 5.4 Volatile Organic Compounds (VOCs) in Ambient Air Results

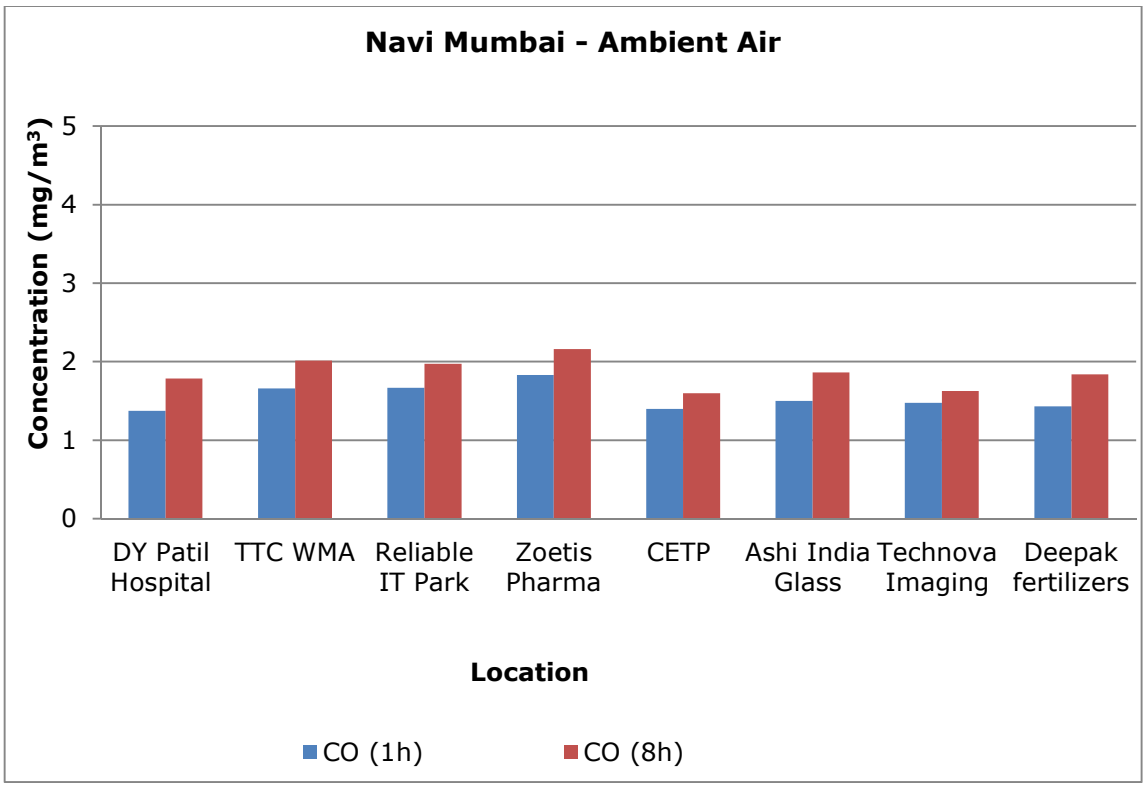
Parameters	Unit	Results	
		Zoetis Pharmaceuticals Research Pvt. Ltd.	Deepak Fertilizer and Petrochemicals
Dichloromethane	µg/m³	BLQ	BLQ
Chloroform	µg/m³	BLQ	BLQ
Carbon Tetrachloride	µg/m³	BLQ	BLQ
Trichloroethylene	µg/m³	BLQ	BLQ
Bromodichloromethane	µg/m³	BLQ	BLQ
1,3-Dichloropropane	µg/m³	BLQ	BLQ
1,4-Dichlorobenzene	µg/m³	1.66	2.58
1,3-Dichlorobenzene	µg/m³	1.74	1.89
1,2-Dichlorobenzene	µg/m³	1.60	BLQ
1,2-Dibromo-3-Chloropropane	µg/m³	BLQ	BLQ
Napthalene	µg/m³	3.01	2.00
Bromobenzene	µg/m³	BLQ	BLQ
1,2,4-Trimethylbenzene	µg/m³	0.55	0.62
2-Chlorotoluene	µg/m³	BLQ	BLQ
Tert-Butylbenzene	µg/m³	BLQ	BLQ
SEC-Butylbenzene	µg/m³	BLQ	BLQ
P-Isopropyltoluene	µg/m³	1.27	1.25
M-Xylene	µg/m³	BLQ	0.64
P-Xylene	µg/m³	BLQ	BLQ
Styrene	µg/m³	BLQ	0.57
Cumene	µg/m³	BLQ	BLQ
1,2,3-Trichloropropane	µg/m³	BLQ	BLQ
N-Propylbenzene	µg/m³	BLQ	BLQ
Dibromochloromethane	µg/m³	BLQ	BLQ
1,2-Dibromoethane	µg/m³	BLQ	BLQ
Chlorobenzene	µg/m³	0.54	BLQ
1,1,1,2-Tetrachloroethane	µg/m³	BLQ	BLQ
Ethylbenzene	µg/m³	BLQ	BLQ
1,1-Dichloropropylene	µg/m³	BLQ	BLQ
1,2-Dichloroethane	µg/m³	BLQ	BLQ
1,2-Dichloropropane	µg/m³	BLQ	BLQ

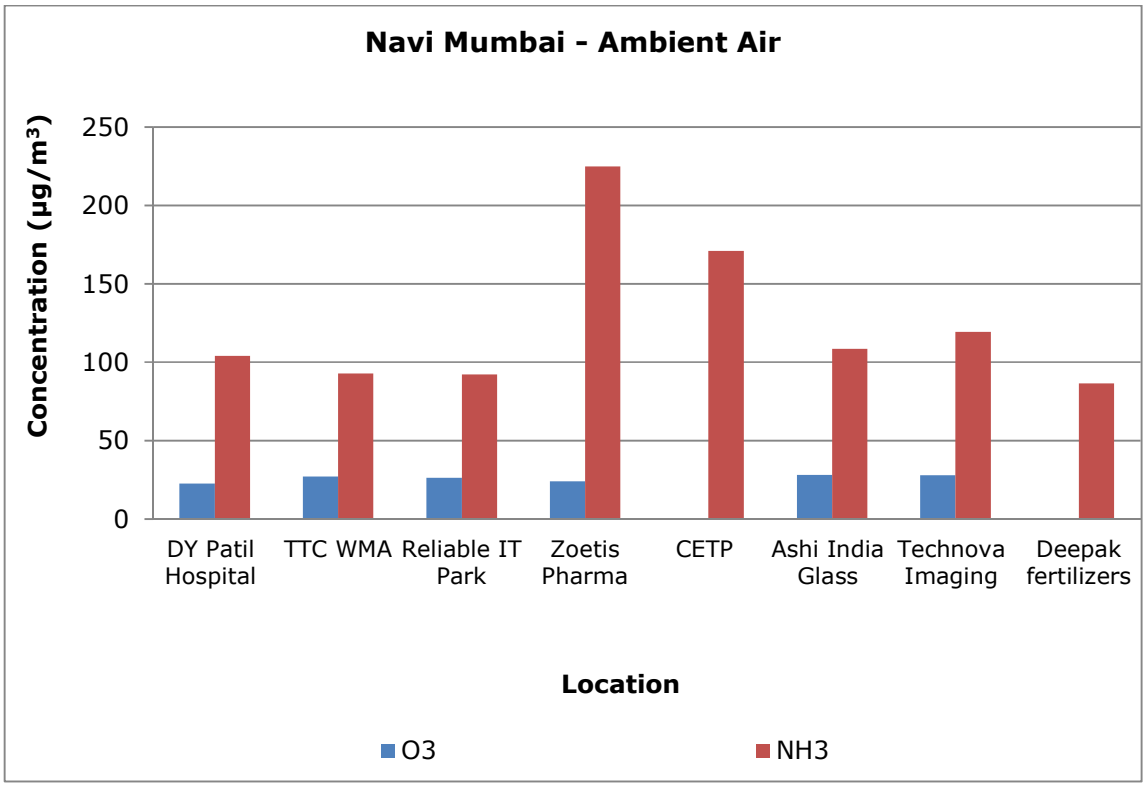
Parameters	Unit	Results	
		Zoetis Pharmaceuticals Research Pvt. Ltd.	Deepak Fertilizer and Petrochemicals
Trans-1,3-Dichloropropene	µg/m³	BLQ	BLQ
CIS 1,3-Dichloropropene	µg/m³	BLQ	BLQ
1,1,2-Trichloroethane	µg/m³	BLQ	BLQ
Tetrachloroethylene	µg/m³	1.14	BLQ
1,3,5-Trimethylbenzene	µg/m³	BLQ	BLQ
N-Butylbenzene	µg/m³	1.77	1.24
1,2,3-Trichlorobenzene	µg/m³	BLQ	0.58
Hexachlorobutadiene	µg/m³	BLQ	BLQ
1,2,4-Trichlorobenzene	µg/m³	1.12	2.02
2,2-Dichloropropane	µg/m³	BLQ	BLQ
Dibromomethane	µg/m³	BLQ	BLQ
Toluene	µg/m³	2.65	1.68
O-Xylene	µg/m³	0.51	BLQ
Bromoform	µg/m³	BLQ	BLQ
1,1,2,2-Tetrachloroethane	µg/m³	BLQ	BLQ
4-Chlorotoluene	µg/m³	BLQ	BLQ
1,1-Dichloroethylene	µg/m³	BLQ	BLQ
Trans-1,2-Dichloroethylene	µg/m³	BLQ	BLQ
1,1-Dichloroethane	µg/m³	BLQ	BLQ
CIS-1,2-Dichloroethylene	µg/m³	BLQ	BLQ
Bromochloromethane	µg/m³	BLQ	BLQ
1,1,1-Trichloroethane	µg/m³	BLQ	BLQ

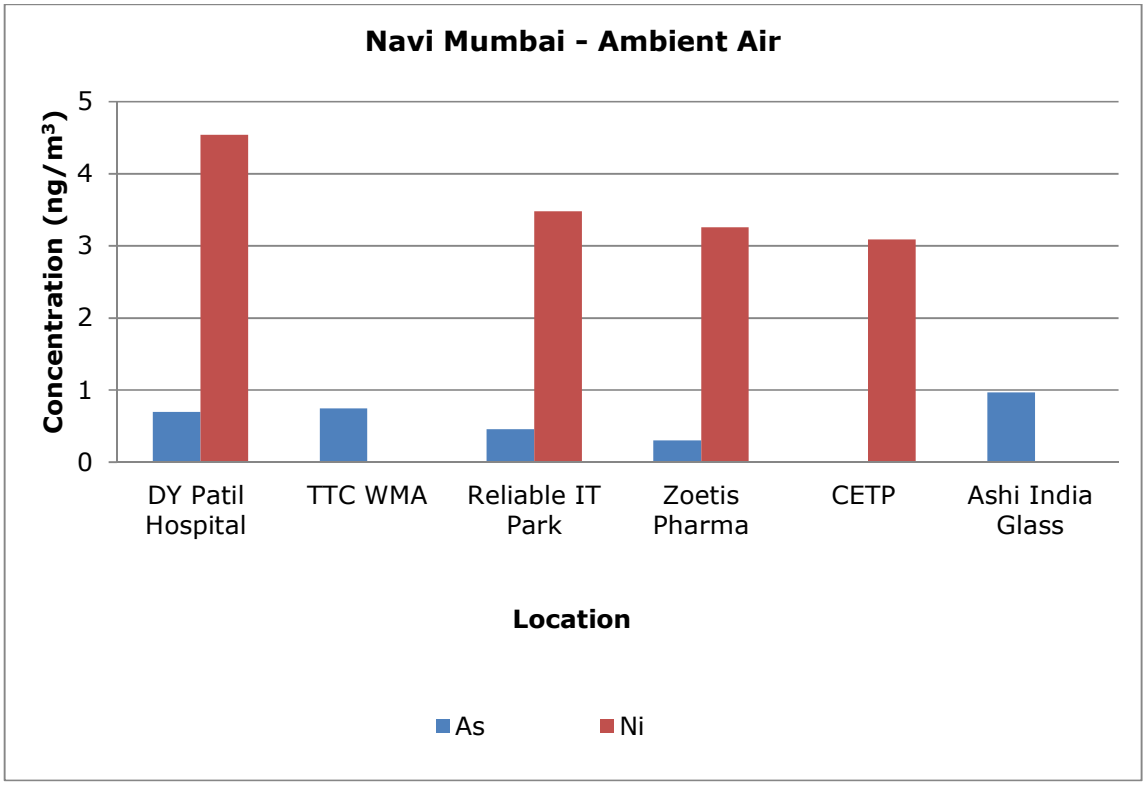
Graphs - Ambient Air Quality Monitoring in Navi Mumbai






Navi Mumbai - Ambient Air
Concentration (mg/m³)
5
4
3
2
1
0
DY Patil Hospital
TTC WMA
Reliable IT Park
Zoetis Pharma
CETP
Ashi India Glass
Technova Imaging
Deepak fertilizers
Location
CO (1h)
CO (8h)


Navi Mumbai - Ambient Air
Concentration (µg/m³)
250
200
150
100
50
0
DY Patil Hospital
TTC WMA
Reliable IT Park
Zoetis Pharma
CETP
Ashi India Glass
Technova Imaging
Deepak fertilizers
Location
O3
NH3


Navi Mumbai - Ambient Air
Concentration (ng/m³)
5
4
3
2
1
0
DY Patil Hospital
TTC WMA
Reliable IT Park
Zoetis Pharma
CETP
Ashi India Glass
Location
As
Ni

6. Water Environment

For studying the water environment of Navi Mumbai area, surface water was collected from Nallah, Lake and River. To understand the quality of treated effluent, samples were collected from following six industries - (i) Airoli Creek Taloja (ii) Vashi Creek (ii) CETP Outlet (iii) Siemens Nallah (iv) CBD Nallah (v) CETP Taloja Bridge (vi) Lek Village Ghot. The following points are observed through the analysis of water samples:

- All six water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH and suspended solids, are observed well within the limits in all the samples.
- Total Kjeldahl Nitrogen (TKN) and BOD concentration values were found to exceed the standard limit in all the samples.
- Concentration of Total Phosphorous (TP) is also found above standard limit in all the water samples.
- In fish bioassay, 67 %- 100% survival of fishes was achieved.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. were also observed either below the limit of quantification (BLQ) or below their standard limits.
- Parameters like Total Residual Chlorine, Cyanide, Fluoride, Sulphide, Dissolved Phosphate, Total Ammonical Nitrogen and Phenolic compounds, also meet the criteria as prescribed by CPCB.
- Organo Chlorine Pesticides, Polynuclear aromatic hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) are also observed below the limit of quantification in all the studied samples.

Table 6.1 Details of Sampling Location of Surface Water

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Airoli Creek at Airoli Bridge	N19^{0}08'09.00"	E72^{0}59'59.03"	17.01.2023	19.01.2023	21.01.2023
2.	Vashi Creek at Vashi Bridge	N19^{0}03'83.20"	E72^{0}58'68.20"	17.01.2023	19.01.2023	21.01.2023
3.	Siemens Nallah	N19°09'3.11"	E73° 0'18.78"	17.01.2023	19.01.2023	21.01.2023
4.	CBD Nallah	N19° 0'28.72"	E73° 1'29.24"	17.01.2023	19.01.2023	21.01.2023
5.	Kasardi River Near CETP Taloja Bridge	N19°05321593°	E73°11432839°	17.01.2023	19.01.2023	21.01.2023

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
6.	Lek Village Ghot	N19º0872947°	E73º1030953°	17.01.2023	19.01.2023	21.01.2023

Fig: Geographical Locations of Surface Water Sampling

Table 6.2 Results of Surface Water

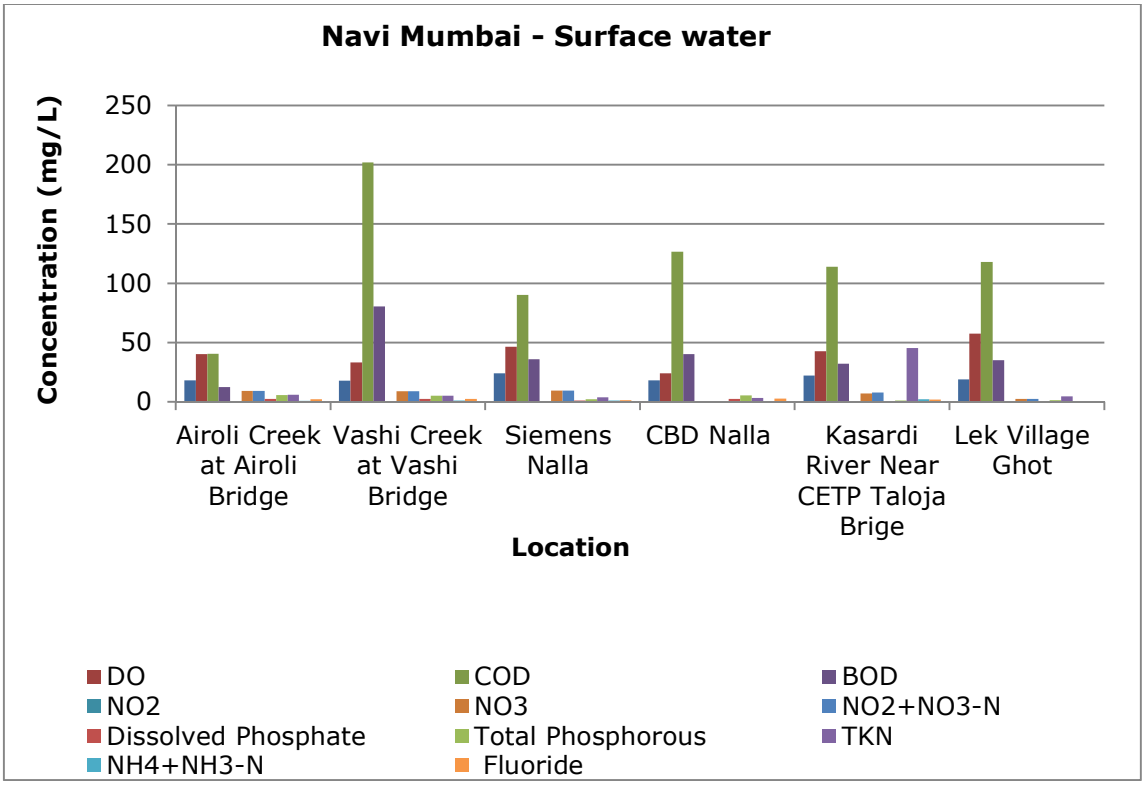
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Sanitary Survey		Generally clean neighbou rhood	Generally clean neighbou rhood	Generally clean neighbou rhood	Generally clean neighbou rhood	Generally clean neighbou rhood	Generally clean neighbou rhood
General Appearance		No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter
Transparency	m	0.53	0.47	0.50	0.43	0.43	0.47
Temperature	ºC	26	27	27	27	28	28
Colour	Hazen	1	2	2	1	1	2

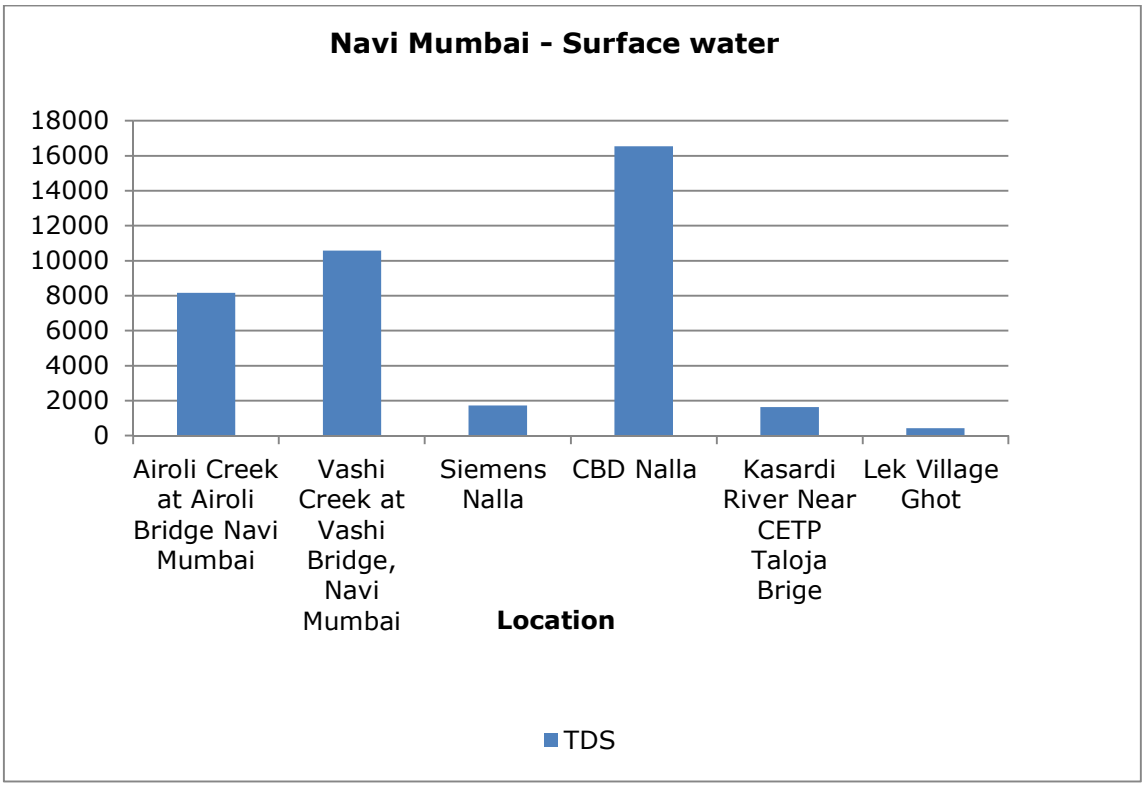
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	6.94	7.20	7.41	7.45	7.80	8.08
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	18	18	24	18	22	19
Total Dissolved Solids	mg/L	8160	10577	1722	16547	1634	419
Dissolved Oxygen (% Saturation)	%	40.00	33.33	46.33	24.00	42.67	57.67
Chemical Oxygen Demand	mg/L	166	520	199	431	114	118
Biochemical Oxygen Demand (3 days,27°C)	mg/L	48	210	63	149	32	35
Electrical Conductivity (at 25 °C)	µmho/cm	14230	18307	3073	28533	2917	745
Nitrite Nitrogen (as NO_2)	mg/L	0.14	0.13	BLQ	BLQ	0.57	BLQ
Nitrate Nitrogen (as NO_3)	mg/L	9.19	8.88	9.46	BLQ	7.23	2.66
(NO_2 + NO_3)-Nitrogen	mg/L	9.21	8.93	9.46	BLQ	7.80	2.66
Free Ammonia (as NH_3-N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	2.03	2.40	1.23	2.80	1.73	0.57
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	2.57	2.39	1.00	2.48	0.54	0.44
Sodium Adsorption Ratio	-	48.70	54.83	8.15	35.80	10.15	2.19

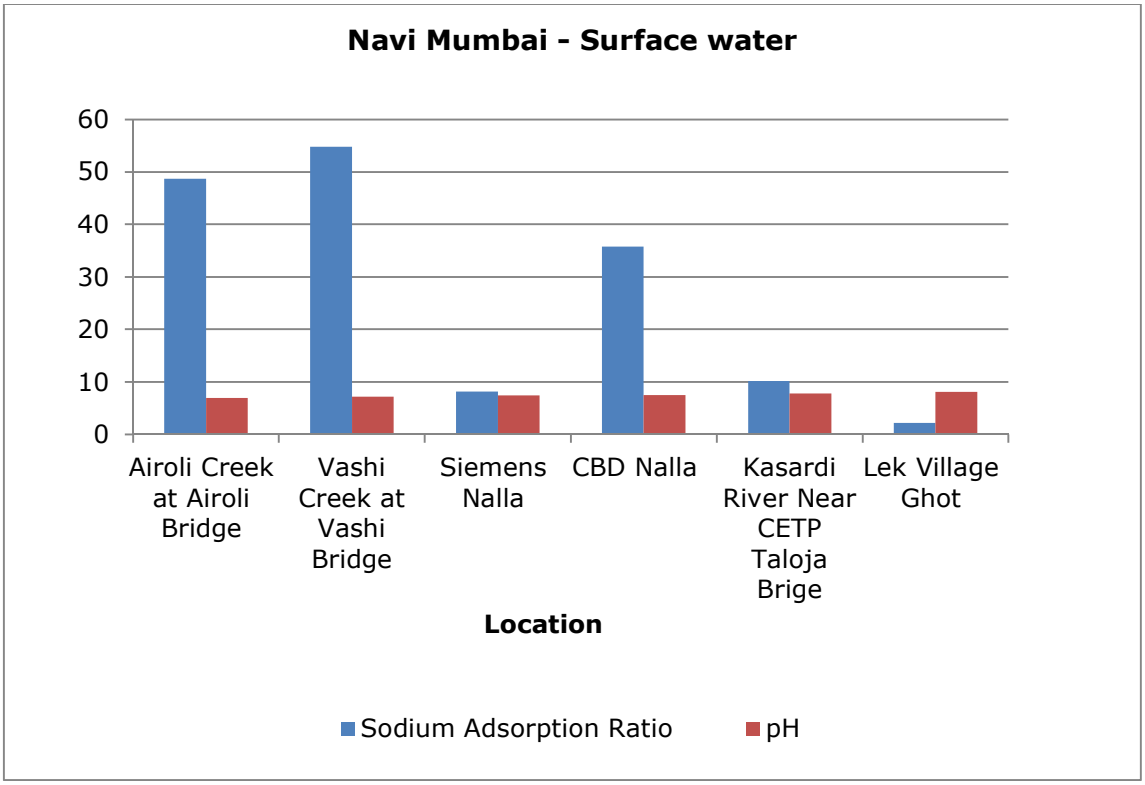
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Total Coliforms	MPN Index/ 100 ml	723	1140	666	657	1183	650
Faecal Coliforms	MPN Index/ 100 ml	548	621	206	485	975	343
Total Phosphate (as P)	mg/L	5.55	5.13	2.03	5.27	1.11	1.26
Total Kjeldahl Nitrogen (as N)	mg/L	5.96	5.05	3.92	3.36	45.33	4.67
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	0.74	1.08	0.91	0.52	2.05	0.35
Phenols (as C_6H_5OH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Anionic Detergents (as MBAS Calculated as LAS, mol.wt.288.38)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Organo Chlorine Pesticides	µg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polynuclear aromatic hydrocarbons (as PAH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polychlorinated Biphenyls (PCB)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Zinc (as Zn)	mg/L	BLQ	0.14	BLQ	BLQ	BLQ	BLQ
Nickel (as Ni)	mg/L	0.01	0.02	BLQ	BLQ	0.02	0.01
Copper (as Cu)	mg/L	BLQ	0.10	BLQ	BLQ	BLQ	BLQ
Hexavalent Chromium (as Cr^{6+})	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	BLQ	0.03	BLQ	BLQ	BLQ	BLQ
Total Arsenic (as As)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Lead (as Pb)	mg/L	BLQ	0.04	BLQ	BLQ	BLQ	BLQ

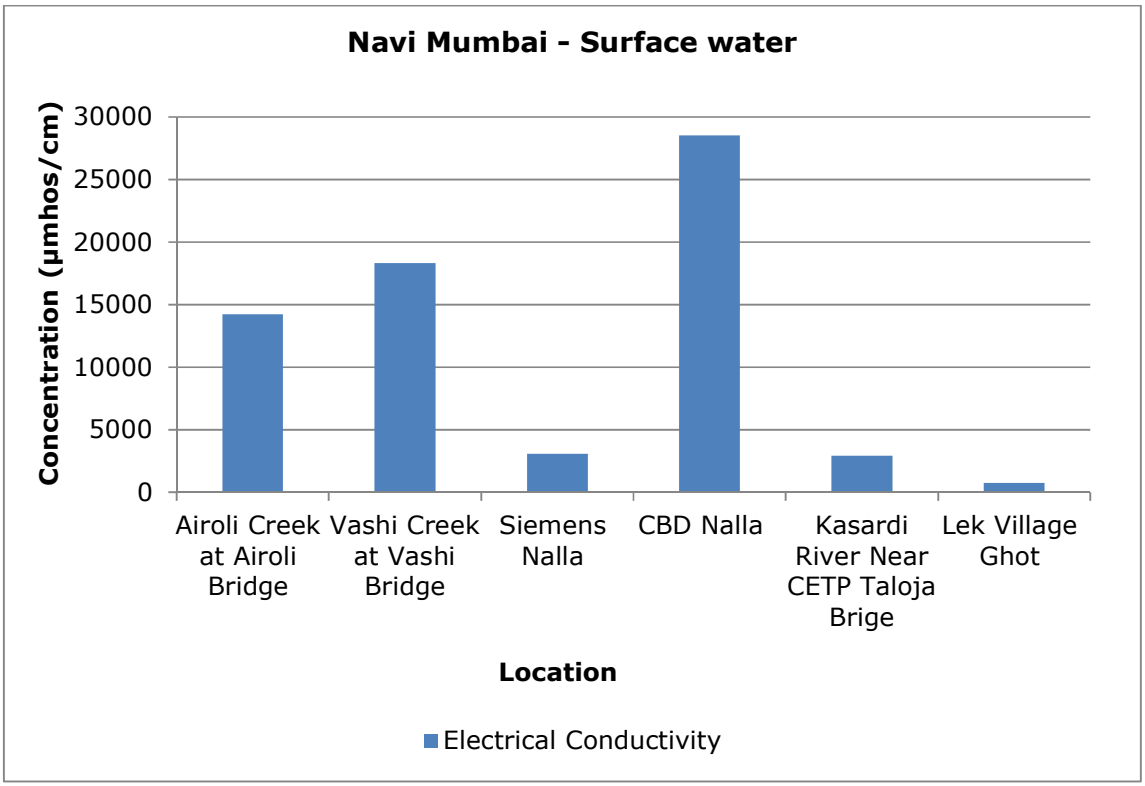
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Cadmium (as Cd)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Mercury (as Hg)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Manganese (as Mn)	mg/L	0.11	0.28	0.11	0.22	0.12	0.10
Iron (as Fe)	mg/L	0.33	4.88	1.07	1.53	0.26	0.44
Vanadium (as V)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Selenium (as Se)	mg/L	0.01	0.01	0.01	BLQ	BLQ	BLQ
Boron (as B)	mg/L	1.46	1.81	0.56	2.14	0.52	0.11
Total Nitrogen	mg/L	15.20	13.98	6.33	12.93	53.13	5.89
Bioassay Test on fish	% survival	67	67	67	67	67	100

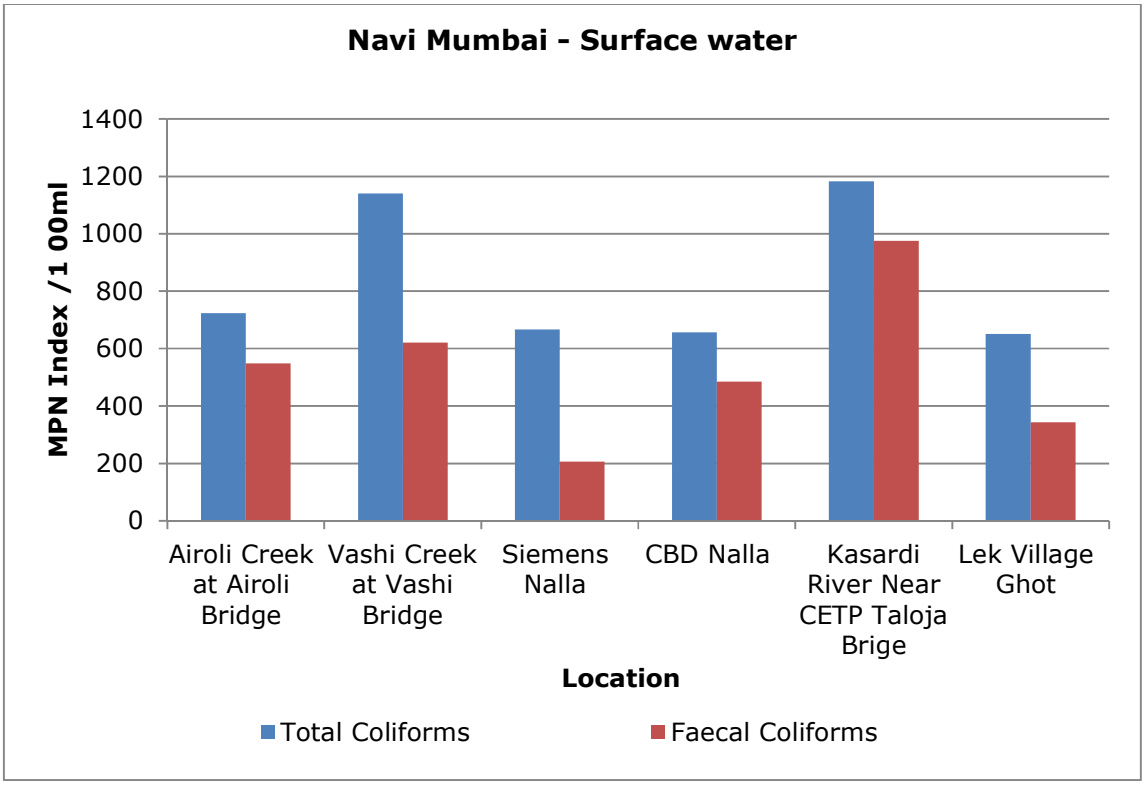
Graphs - Surface Water Quality of Navi Mumbai

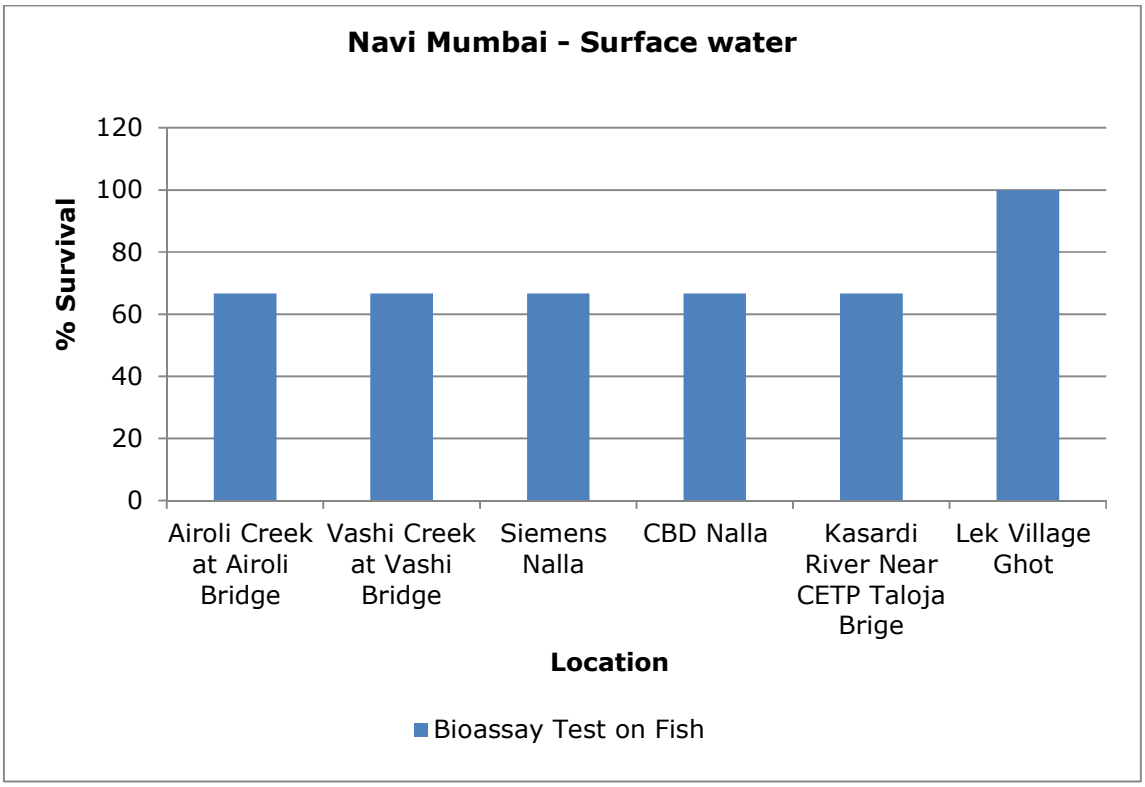





Navi Mumbai - Surface water
60
50
40
30
20
10
0
Airoli Creek at Airoli Bridge
Vashi Creek at Vashi Bridge
Siemens Nalla
CBD Nalla
Kasardi River Near CETP Taloja Brige
Lek Village Ghot
Location
Sodium Adsorption Ratio
pH


Navi Mumbai - Surface water
Concentration (µmhos/cm)
30000
25000
20000
15000
10000
5000
0
Airoli Creek at Airoli Bridge
Vashi Creek at Vashi Bridge
Siemens Nalla
CBD Nalla
Kasardi River Near CETP Taloja Brige
Lek Village Ghot
Location
Electrical Conductivity


Navi Mumbai - Surface water
MPN Index /1 00ml
1400
1200
1000
800
600
400
200
0
Airoli Creek at Airoli Bridge
Vashi Creek at Vashi Bridge
Siemens Nalla
CBD Nalla
Kasardi River Near CETP Taloja Brige
Lek Village Ghot
Location
Total Coliforms
Faecal Coliforms


Navi Mumbai - Surface water
% Survival
120
100
80
60
40
20
0
Airoli Creek at Airoli Bridge
Vashi Creek at Vashi Bridge
Siemens Nalla
CBD Nalla
Kasardi River Near CETP Taloja Brige
Lek Village Ghot
Location
Bioassay Test on Fish

7. Land Environment

For studying the land Environment of Navi Mumbai area, ground water was collected from Bore well. Dug well, and Hand Pump. A total of 6 samples were collected from i) Dugwell at Turbhe Gaon (ii) MSW Dumping Ground (iii) MSW TTC Area (iv) TTC WMA (v) TTC Plot no. 142 MIDC (vi) Mumbai Waste Management Ltd. (MWML) site.

Six ground water samples were collected from MIDC Navi Mumbai region.

- All the water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, suspended solids, TDS, electrical conductivity, BOD, and COD are also observed well within the limits in all the collected samples.
- 80-100% survival was achieved in Fish Bioassay.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. were also observed either below the limit quantification or below their standard limits.
- Parameters like Total Residual Chlorine, Cyanide, Fluoride, Sulphide, Dissolved Phosphate, Total Ammonical Nitrogen and Phenolic compounds, also met the criteria as prescribed by CPCB.
- Organo Chlorine Pesticides, Polynuclear aromatic hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) were below the limit quantification in all studied samples.

Table 7.1 Details of Sampling Location of Ground Water

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Dug Well at Turbhe Gaon	N19°04'16.30"	E 73°0'34.09"	17.01.2023	19.01.2023	21.01.2023
2.	Navi Mumbai MSW Dumping Ground Borewell Water Turbhe	N19^{0}04'42.97"	E73^{0}01'36.71"	17.01.2023	19.01.2023	21.01.2023
3.	MSW, TTC Area Borewell	N19^{0}04'40.94"	E73^{0}08'15.11"	17.01.2023	19.01.2023	21.01.2023
4.	TTC WMA Site Borewell	N19^{0}06'31.05"	E73^{0}01'49.67"	17.01.2023	19.01.2023	21.01.2023
5.	TTC Plot no. 142 Borewell	N19^{0}05'46.58"	E73^{0}01'27.10"	17.01.2023	19.01.2023	21.01.2023
6.	Mumbai Waste Management limited Borewell MIDC Taloja	N19^{0}05'48.65"	E73^{0}06'56.03"	17.01.2023	19.01.2023	21.01.2023

Fig: Geographical Locations of Groundwater Sampling in Navi Mumbai

Table 7.2 Results of Ground Water

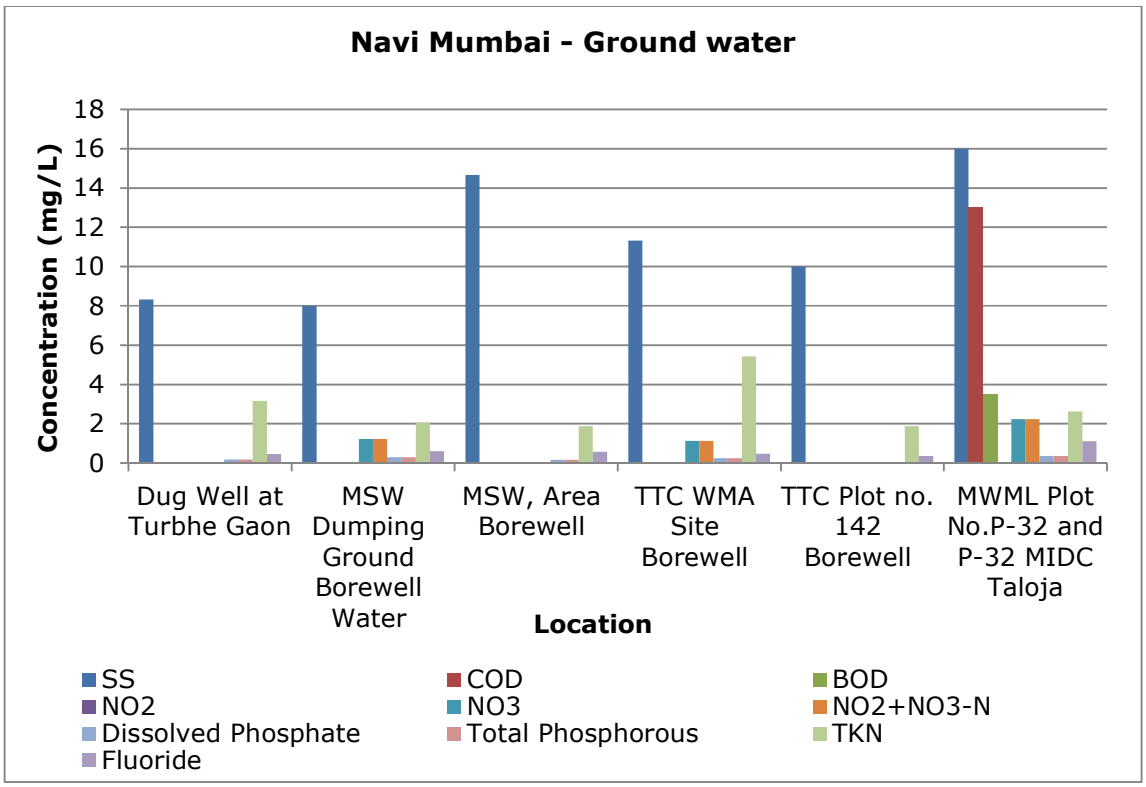
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	**Navi Mumbai MSW Dumping Ground Borewell Water Turbhe Navi Mumbai**	**MSW, Area Borewell Navi Mumbai**	**TTC WMA Site Borewell**	**TTC Plot no. 142 Borewell**	**Mumbai Waste Management Limited Plot No.P-32 and P-32 Part MIDC, Taloja**
Sanitary Survey	-	Generally clean neighbourhood	Generally clean neighbourhood	Generally clean neighbourhood	Generally clean neighbourhood	Generally clean neighbourhood	Generally clean neighbourhood
General Appearance	-	No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter
Transparency	m	0.50	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Temperature	°C	28	28	28	27	28	27
Colour	Hazen	1	1	1	1	1	1
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	8.28	7.81	7.78	7.79	7.89	8.37

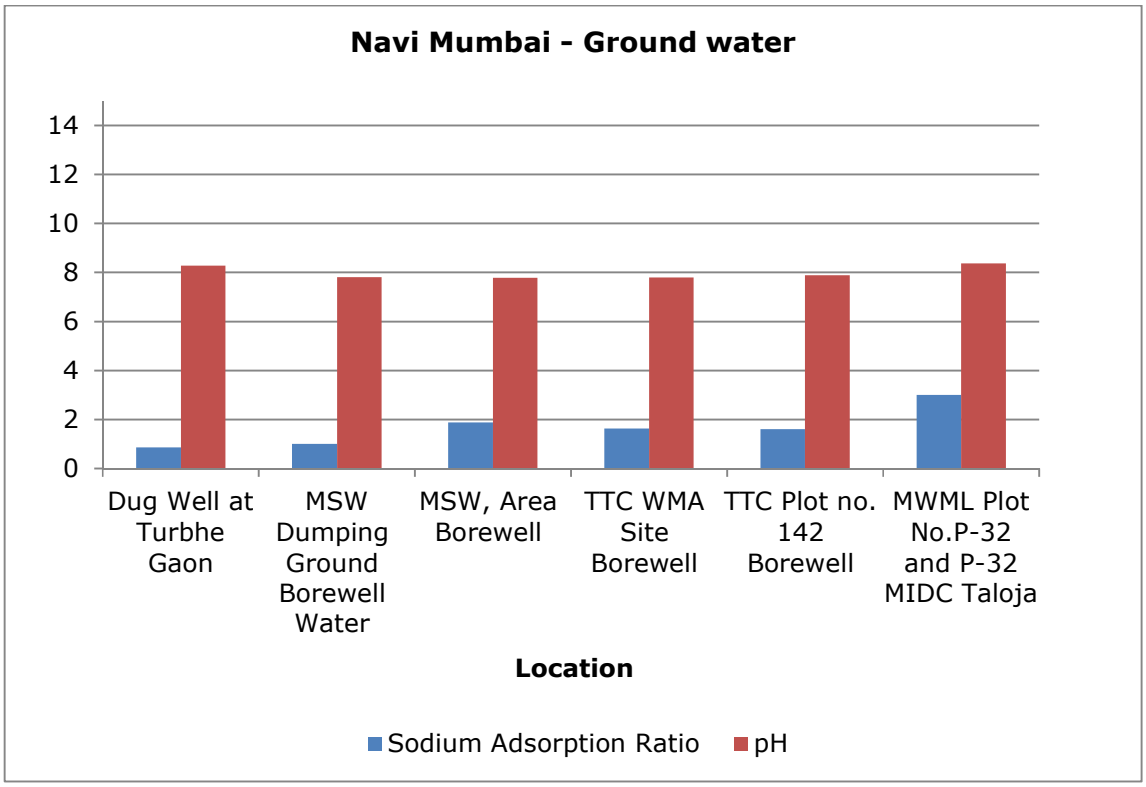
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	Navi Mumbai MSW Dumping Ground Borewell Water Turbhe Navi Mumbai	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	Mumbai Waste Management Limited Plot No.P-32 and P-32 Part MIDC, Taloja
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	8	8	15	11	10	16
Total Dissolved Solids	mg/L	203	359	339	287	239	785
Chemical Oxygen Demand	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	13
Biochemical Oxygen Demand (3 days,27°C)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	4
Electrical Conductivity (at 25 °C)	µmho/cm	363	640	604	513	425	1400
Nitrite Nitrogen (as NO_2)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Nitrate Nitrogen (as NO_3)	mg/L	BLQ	1.22	BLQ	1.12	BLQ	2.23
(NO_2 + NO_3)-Nitrogen	mg/L	BLQ	1.22	BLQ	1.12	BLQ	2.23
Free Ammonia (as NH_3-N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	0.45	0.60	0.57	0.47	0.37	1.10
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	0.18	0.29	0.17	0.24	BLQ	0.37
Sodium Adsorption Ratio	-	0.87	1.01	1.87	1.63	1.61	3.00
Total Coliforms	MPN Index/ 100 ml	865	324	28	807	611	244

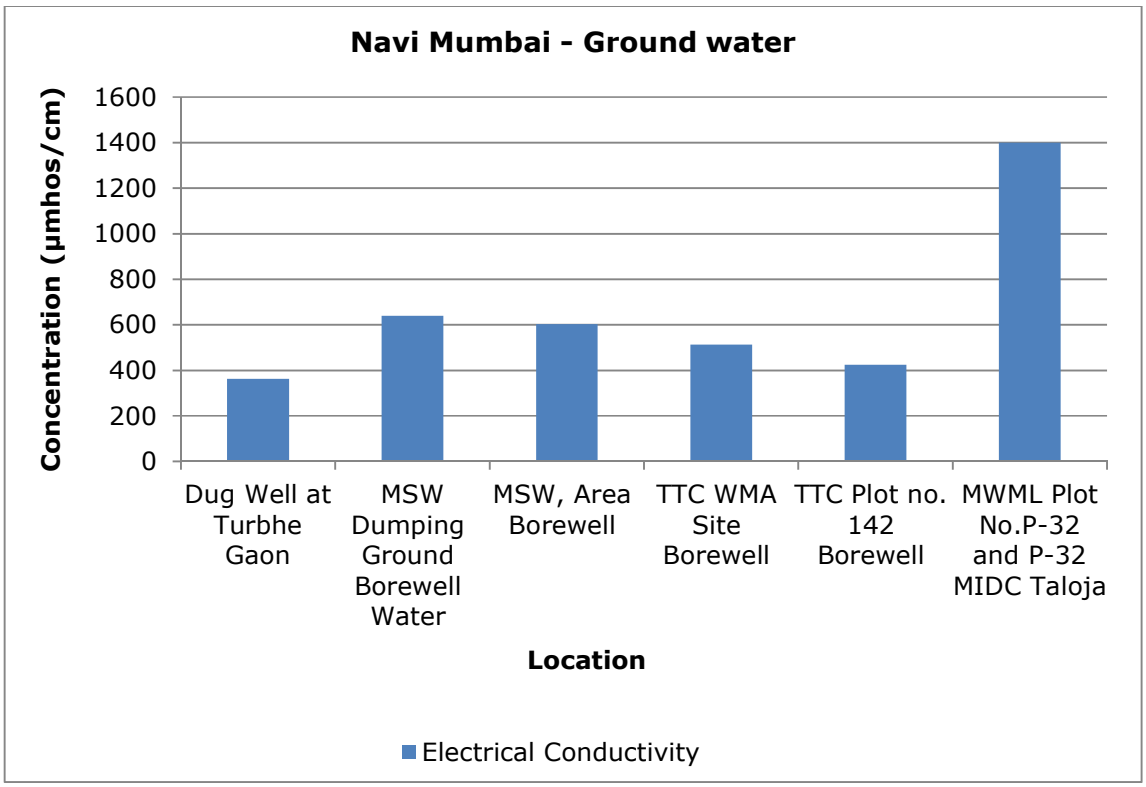
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	Navi Mumbai MSW Dumping Ground Borewell Water Turbhe Navi Mumbai	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	Mumbai Waste Management Limited Plot No.P-32 and P-32 Part MIDC, Taloja
Faecal Coliforms	MPN Index/ 100 ml	807	277	15	804	807	285
Total Phosphate (as P)	mg/L	0.18	0.29	0.17	0.24	BLQ	0.37
Total Kjeldahl Nitrogen (as N)	mg/L	3.17	2.05	1.87	5.42	1.87	2.61
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	0.23	0.49	0.37	0.74	0.48	0.49
Phenols (as C_6H_5OH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Anionic Detergents (as MBAS Calculated as LAS, mol.wt.288.38)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Organo Chlorine Pesticides	µg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polynuclear aromatic hydrocarbons (as PAH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polychlorinated Biphenyls (PCB)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Zinc (as Zn)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Nickel (as Ni)	mg/L	0.01	0.01	BLQ	0.01	BLQ	0.02
Copper (as Cu)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Hexavalent Chromium (as Cr^{6+})	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Arsenic (as As)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Lead (as Pb)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

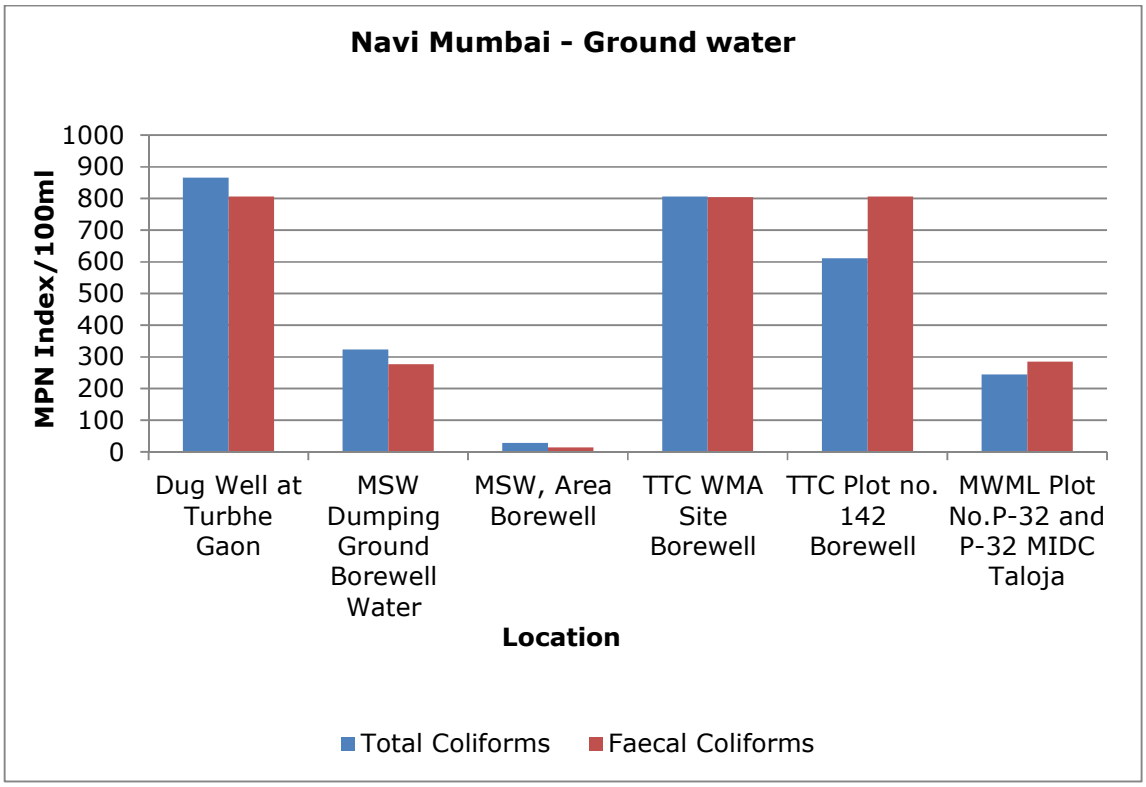
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	Navi Mumbai MSW Dumping Ground Borewell Water Turbhe Navi Mumbai	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	Mumbai Waste Management Limited Plot No.P-32 and P-32 Part MIDC, Taloja
Cadmium (as Cd)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Mercury (as Hg)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Manganese (as Mn)	mg/L	0.10	0.24	0.13	0.16	0.15	0.41
Iron (as Fe)	mg/L	0.21	0.11	0.14	0.09	0.16	0.17
Vanadium (as V)	mg/L	0.01	BLQ	BLQ	0.03	0.03	0.02
Selenium (as Se)	mg/L	BLQ	0.01	BLQ	0.01	BLQ	0.01
Boron (as B)	mg/L	3.81	2.85	2.49	6.42	2.57	4.84
Total Nitrogen	mg/L	BLQ	BLQ	0.19	0.24	0.14	0.18
Bioassay Test on fish	% survival	87	80	93	100	100	100

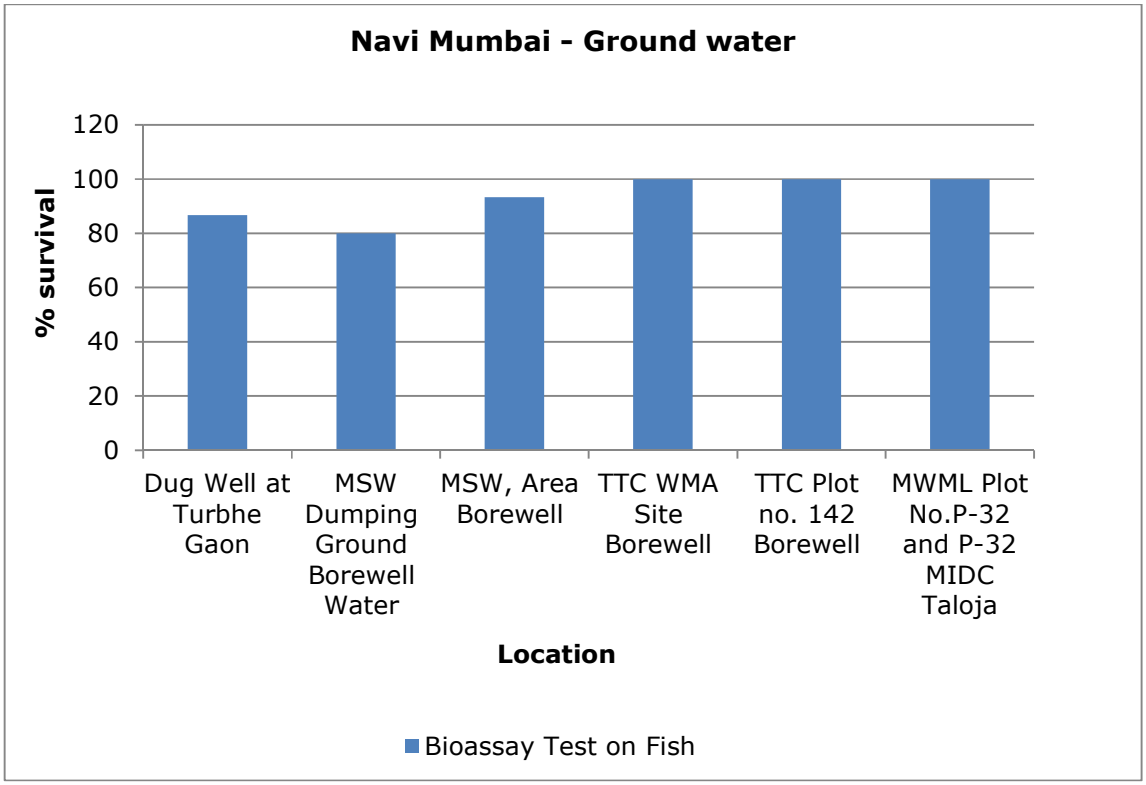
Graphs - Ground Water Quality of Navi Mumbai






Navi Mumbai - Ground water
Concentration (µmhos/cm)
1600
1400
1200
1000
800
600
400
200
0
Dug Well at Turbhe Gaon
MSW Dumping Ground Borewell Water
MSW, Area Borewell
TTC WMA Site Borewell
TTC Plot no. 142 Borewell
MWML Plot No.P-32 and P-32 MIDC Taloja
Location
Electrical Conductivity


Navi Mumbai - Ground water
MPN Index/100ml
1000
900
800
700
600
500
400
300
200
100
0
Dug Well at Turbhe Gaon
MSW Dumping Ground Borewell Water
MSW, Area Borewell
TTC WMA Site Borewell
TTC Plot no. 142 Borewell
MWML Plot No.P-32 and P-32 MIDC Taloja
Location
Total Coliforms
Faecal Coliforms


Navi Mumbai - Ground water
120
100
80
60
40
20
0
% survival
Dug Well at Turbhe Gaon
MSW Dumping Ground Borewell Water
MSW, Area Borewell
TTC WMA Site Borewell
TTC Plot no. 142 Borewell
MWML Plot No.P-32 and P-32 MIDC Taloja
Location
Bioassay Test on Fish

C: Receptor

Component C (Impact on Human Health) 10	
Main - 10	
% increase in cases	**Marks**
<5%	**0**
5-10%	**5**
>10%	**10**

- % increase is evaluated based on the total no. of cases recorded during two consecutive years.
- For Air Environment, total no. of cases related to Asthma, Bronchitis, Cancer, Acute respiratory infections etc. are to be considered.
- For surface water/ ground water Environment, cases related to Gastroenteritis, Diarrhoea, renal (kidney) malfunction, cancer etc are to be considered.
- For the above evaluation, the previous 5 years records of 3-5 major hospitals of the area shall be considered.

Annexure – I Health Related Data enclosed.

9. CEPI Score

Comprehensive Environmental Pollution Index (CEPI) is intended to act as early warning tool which helps in categorization of industrial clusters/ areas in terms of priority of needing attention. The CEPI score have been calculated based on CPCB Letter No. B-29012/ESS (CPA)/2015-16 dated 26th April 2016. The scoring system involves an algorithm that considers the basic selection criteria. It is proposed to develop the CEPI based on Sources of pollution, real time observed values of the pollutants in the ambient air, surface water and ground water in & around the industrial cluster and health related statistics.

Table 8.1 CEPI score of the Post monsoon season 2023

	A1	A2	A	B	C	D	CEPI
Air Index	4.00	4.00	16.00	0.00	10.00	10.00	36.00
Water Index	1.50	4.00	6.00	34.75	10.00	0.00	50.75
Land Index	1.50	4.00	6.00	0.00	10.00	0.00	16.00
						Aggregated CEPI	**53.59**

Table 8.2 Comparison of CEPI Scores

Year	Air Index	Water Index	Land Index	CEPI
CEPI score March 2023	36.00	50.75	16.00	**53.59**
CEPI Score June 2021	35.00	48.25	39.25	**55.36**
CEPI Score March 2021	42.75	43.75	36.00	**52.40**
CEPI score March 2020	50.80	17.80	25.30	**53.00**
CEPI score June 2019	46.25	30.00	25.50	**50.36**
CEPI score March 2019	40.0	32.5	22.5	**44.39**
CEPI score June 2018	40.0	22.0	13.5	**41.78**
CEPI score March 2018	48.0	53.75	56.25	**67.54**
CPCB CEPI score March 2018	56.00	63.00	16.00	**66.32**

CEPI Score Calculation:

Navi Mumbai
Ambient Air Analysis Report

Pollutant	Group	A1	A2	A (A1 X A2)
As	C	3	Large	
PM_{10}	B	0.5		
$PM_{2.5}$	B	0.5		
		4	**4**	**16**

Pollutant	Avg (1)	Std (2)	EF (3) [(3)= (1)/(2)]	No. of samples Exceeding (4)	Total no. of samples (5)	SNLF Value (6) [(6)=(4)/(5)x(3)]	SNLF score (B)	
As	0.4	6	0.07	0	8	0.00	L	0
PM_{10}	63.5	100	0.63	0	8	0.00	L	0
$PM_{2.5}$	16.8	60	0.28	0	8	0.00	L	0
B score = (B1+B2+B3)							**B**	**0**

C	**10**	**>10 %**
D	**10**	**A-A-IA**

Air CEPI Score	(A+B+C+D)	36.00

Water Quality Analysis Report

Pollutant	Group	A1	A2	A (A1 X A2)
TN	A	1	Large	
TDS	A	0.25		
Zn	A	0.25		
		1.5	**4**	**6**

Pollutant	Avg (1)	Std (2)	EF (3) [(3)= (1)/(2)]	No. of samples Exceeding (4)	Total no. of samples (5)	SNLF Value (6) [(6)=(4)/(5)x(3)]	SNLF score (B)	
TDS	6509	2000	3.25	3	6	1.63	C	30
TN	17.91	15	1.19	2	6	0.40	M	4.75
Zn	0.14	0.3	0.46	0	6	0.00	L	0
B score = (B1+B2+B3)							**B**	**34.75**

C	**10**	**>10 %**
D	**0**	**A-A-A**

Water CEPI Score	**(A+B+C+D)**	**50.75**

Ground Water Quality Analysis Report

Pollutant	**Group**	**A1**	**A2**	**A (A1 X A2)**
TN	A	1	Large	
Fe	A	0.25		
TDS	A	0.25		
		1.5	**4**	**6**

Pollutant	**Avg (1)**	**Std (2)**	**EF (3) [(3)= (1)/(2)]**	**No. of samples Exceedin g (4)**	**Total no. of sampl es (5)**	**SNLF Value (6) [(6)=(4)/(5)x(3)]**	**SNLF score (B)**	
TN	3.83	45	0.09	0	6	0.00	L	0
Fe	0.15	0.3	0.50	0	6	0.00	L	0
TDS	368.89	2000	0.18	0	6	0.00	L	0
B score = (B1+B2+B3)							**B**	**0**

C	**10**	**>10%**
D	**0**	**A-A-A**

Land CEPI Score	**(A+B+C+D)**	**16.00**

Water CEPI Score (im) **50.75**

Air CEPI Score (i2) **36.00**

Land Score (i3) **16.00**

Aggregated CEPI Score = **im + {(100-im)*i2/100)*i3/100)}**

where, im = maximum sub index; and i2 and i3 are sub indices for other media

CEPI Score **53.59**

10. Conclusion

Ambient Air Quality

- In the present study, 08 AAQ stations were identified in the CEPI impact area to cover both upwind and cross wind directions and AAQ survey was conducted.
- All air quality parameters are observed well within the limits as per NAAQS.
- Concentration of PM10 is observed in the range of 53.33 µg/m^3 to 82.67 µg/m^3 and PM2.5 in the range of 13.67 to 21.0 µg/m^3 at the studied locations.
- In the CEPI score calculated for Air Environment by CPCB in March 2018, the concentration of PM_{10} has exceeded at all the studied locations and which contributed to higher air index (56.00). However, in the present report, concentration of both PM10 and PM2.5 are found below permissible levels resulted in less exceedance factor, hence lower air index (36.00).

Surface Water Quality

- To understand the quality of treated effluent, samples were collected from six industries
- Higher concentration of BOD and Total phosphates was observed in the surface water samples collected which may be due to domestic wastewater, sewage, other localized activities.
- All the industries in Navi Mumbai region are either reusing the treated trade effluent as sewage in their process or gardening.
- In the CEPI score calculated for Water Environment by CPCB in March (post monsoon) 2018, concentration values of total phosphorous were higher and exceeded at all the studied locations as observed in the present study also.

Ground Water Quality

- Six ground water samples were collected from different Dug well, well and Bore well in the region.
- Ground water of the studied regions was found to be safe for drinking with a very low concentration of TDS, TKN and iron, chromium and other general as well as carcinogenic parameters.
- In the CEPI score calculated for Land Environment by CPCB in March (post monsoon) 2018 also there is no critical pollutant exceeding in any water sample collected.

CEPI Score

- The CEPI Score post monsoon season is 53.59.
- During calculation of CEPI score, water Index is calculated highest with 50.75, followed by the Air Index 36.00 and Land index as 16. The parameters of surface water and ground water in Navi

Mumbai region is well within the limits. Hence, aggregated CEPI score is calculated as 53.59, which is lower than the CPCB CEPI score 2018 post monsoon season, which was 66.32.

- In CEPI score of CPCB 2018 (post monsoon), the air index and water Index was higher as compared to the present (post monsoon 2023) indices.
- In comparison with the CEPI Score of 2021 (post monsoon), there is a decrease in the land Index, but the Water Index and the Air index increased this year.
- As per the CPCB CEPI calculation revised in 2016, Health statistics represented by Receptor C in CEPI Calculation, also plays an important role.
- For analysing the health data collected from hospitals, more than 10% increase in air and water borne disease cases is observed in the consecutive years of 2020-2021 and 2021-2022. Hence score for receptor C is considered as 10 for all three environments.
- Collective efforts of regional office of MPCB, NMMC, administration and environmental organizations are resulting in significant reduction in pollution level.
- Efforts taken to reduce the pollution level is represents factor D in CEPI Calculation, which also affects the overall CEPI score.
- The present study is the compilation of post monsoon season, which results in dilution of environmental samples resulting in lower pollution load, hence also affects the total score.
- In conclusion, approximately 20% decrease in CEPI score is observed from 66.32 in 2018 to 53.59 in 2023.

11. Efforts taken by MPCB to Control and Reduce Environmental Pollution Index

- Drive against open burning of biomass, crop residue, garbage, leaves, etc.
- Organic Waste Compost Machines Malls, Infrastructure projects, Large scale hospitals & Hotels has installed OWC.
- Waste collection and segregation centres: Provided by NMMC at all wards.
- Construction of Common Effluent Treatment Plant (CETP): 1 CETP of 27 MLD capacity is already operational and complied.
- Installation of CEMS installed for Air and Water in Large and Medium scale RED category industries: 63 Nos. of unit has installed CEMS & connected to CETP server.
- Arrangement of scientific collection and treatment of sewage generated: 04 Nos of STP having total capacity as 256.5 MLD with adequate capacity of collection sumps are provided by NMMC.
- Installation of CAAQMS station: Total 4 Nos. (1 old + 3 new) of CAAQMS stations are operational.
- Number of Monitoring stations under National Water Quality Monitoring Programme (NWMP): 1 (Vashi Creek at Vashi Bridge).
- Steps are taken for industrial area/other units to recycle 100% treated effluent to achieve Zero Liquid Discharge (ZLD): 11 Nos of Industries has adapted ZLD.
- Steps are taken to reduce dust emission: Concretization of Roads and twice daily sweeping of Roads by NMMC authority. Presently NMMC has proccured2 Nos. of fogging machines. NMMC is already having 6 Nos. of mechanical sweeping machines.
- Around 1 lakh trees are planted in last one year (2021-2022).
- Directions issued to the industries to switch over on clean fuel.

Continuous Ambient Air Quality Monitoring Station (CAAQMS)	**Ambient Air Quality Monitoring (AAQM) Van**

12. Photographs

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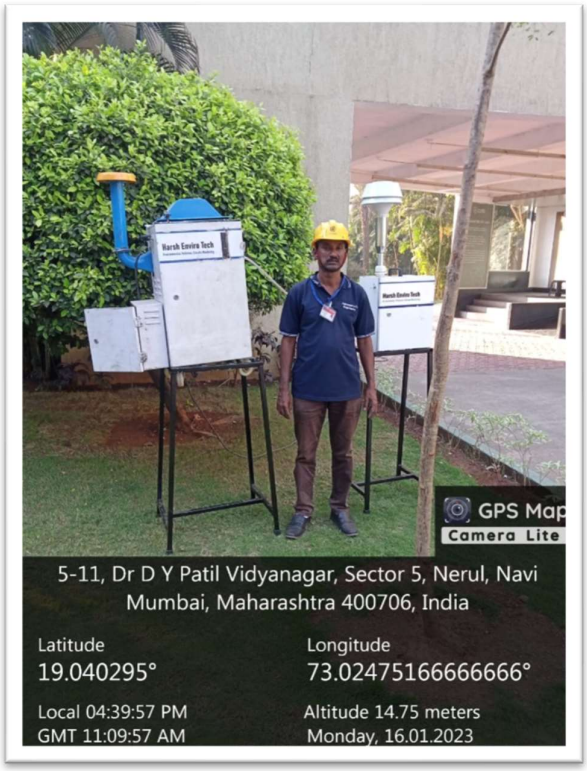
<td> 
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<td>Ambient Air Sampling at Ashi India Glass</td>
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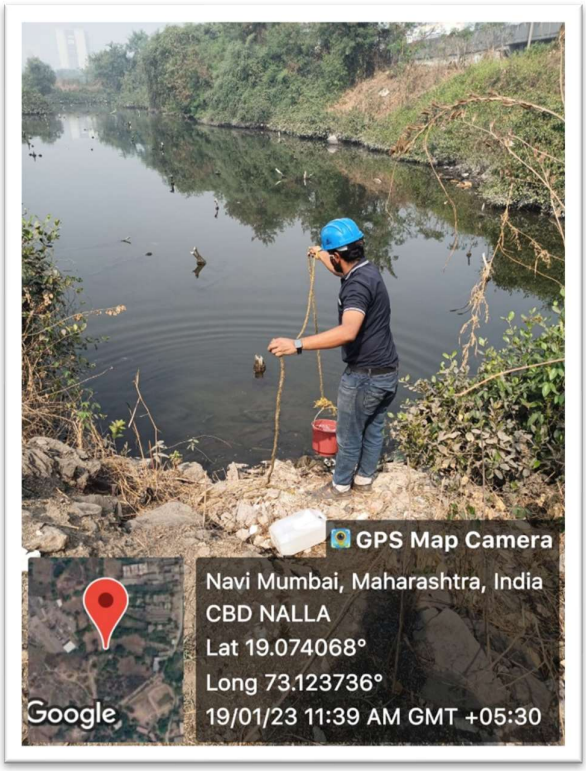
<td> 
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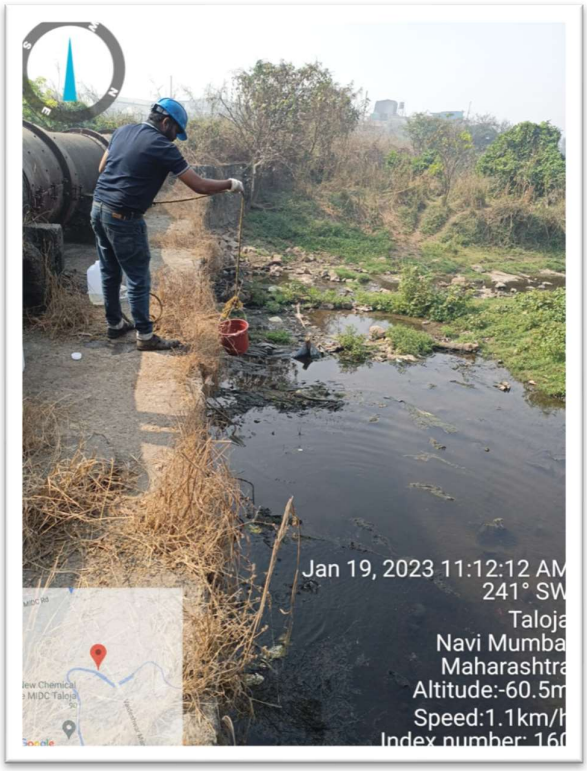
<td> 
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<td>Surface Water Sampling – CBD Nallah</td>
<td>Surface Water Sampling – Kasardi River near CETP Taloja</td>
</tr>
</table>

Groundwater Sampling – TTC WMA Borewell

Groundwater Sampling – MWML

Groundwater Sampling – TTC plot no. 142

Groundwater Sampling – Dug well Turbhe

HEALTH STATISTICS

Required for Comprehensive Environmental Pollution Index (CEPI) Study by Maharashtra Pollution Control Board (MPCB)

Name of the Polluted Industrial Area (PIA)	NAVI MUMBAI
Name of the major health center/ organization	E.S.I.S Hospital
Name and designation of the Contact person	
Address	

S No.	Diseases	No. of Patients Reported	
		2022 (Jan-Dec)	2021 (Jan-Dec)
AIRBORNE DISEASES			
1.	Asthma	516	218
2.	Acute Respiratory Infection	484	204
3.	Bronchitis	218	84
4.	Cancer	109	88
WATERBORNE DISEASES			
1.	Gastroenteritis	184	17
2.	Diarrhea	148	68
3.	Renal diseases	425	312
4.	Cancer	179	116

Date:

Signature

MEDICAL SUPERINTENDENT
E.S.I.S. HOSPITAL, VASHI,
Navi Mumbai-400703

नवी मुंबई
महानगरपालिका
1ला माळा, प्रशासकिय विभाग, सार्वजनिक रुग्णालय वाशी, नवी मुंबई 400703 .
दूरध्वनी क्र : 2899901,02,03

Navi Mumbai
Municipal Corporation
1st FLOOR, ADMINISTRATIVE OFFICE,
GENERAL HOSPITAL VASHI
NAVI MUMBAI – 400703.
TEL. No. : 27899901,02,03

बेटी बचाओ
save the girl child

जा.क्र. नमुंमपा/सा.रु.वाशी/ 499 /2023
दि. 01 / 02 / 2023

प्रति,

मा.उप-प्रादेशिक अधिकारी,
महाराष्ट्र प्रदुषण नियंत्रण मंडळ,नवी मुंबई

विषय- रुग्णालयातील आरोग्यविषयक रुग्णांचे विविध आजारांची माहीती बाबत.
संदर्भ - १) MPCB/SRONM-1/230117-FTS-0172

महोदय,

उपरोक्त संदर्भिय पत्रान्वये रुग्णालयातील आरोग्यविषयक रुग्णांचे विविध आजारांची माहीती मागविण्यात आलेली आहे. त्याअनुसार सदरची माहिती खालीलप्रमाणे आहे.

अ.क्र.	Disease	No Of Patient Reported	
		2022(Jan To Dec)	2021(Jan To Dec)
AIRBORN DISESSES			
1	Asthma	382	202
2	Acute Respiratory Infection	1109	562
3	Bronchitis	215	124
4	Cancer	39	35
WATERBORN DISESSES			
1	Gastroenteritis	206	151
2	Diarrhea	282	143
3	Renal Diseases	157	146
4	Cancer	———	———

(डॉ. प्रशांत जवादे)
वैद्यकिय अधिक्षक
सार्वजनिक रुग्णालय, वाशी
नवी मुंबई महानगरपालिका
सेक्टर १०ए, वाशी, नवी मुंबई