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

TARAPUR

Post Monsoon (December 2022 to February 2023)

Maharashtra Pollution Control Board

Kalptaru Point, Sion East, Mumbai – 400 022

Index

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

Tarapur 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. Concentration values of BOD, COD and Total Kjeldahl Nitrogen (TKN) were found above the standard limits in the surface water monitoring. Land index is represented by ground water in the CEPI. Ground water parameters were observed 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 Tarapur region as per the revised guidelines of CEPI (2016) was 93.69 (Air Index–72, Water Index-89 and Land Index–59.25). However, in the present study, the aggregated CEPI score of Tarapur region of post-monsoon season (March, 2023) calculated as 66.94. Based on the study, present CEPI score is calculated on the basis of sub index of Air-21.00, Water Index-63.00 and Land Index–50.75). 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 regional office of MPCB in past few years to mitigate the pollution. As regional office of MPCB has taken various initiatives like installation of CAAQMS, CETPs, online VOC analysers etc. in the past few years to control and mitigate the 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 Tarapur industrial clusters come down from a critical level of pollution to the severe level of pollution with reference to the respective environmental components. Approximately 28.5% decrease in CEPI score is observed from 93.69 in 2018 to 66.94 in 2023 during the post monsoon season study.

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 programs 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 Tarapur region, which is an industrial town located some 45 km north of Virar, on the Western Railway line of Mumbai Suburban Division (Mumbai Suburban Railway). The important river flowing through the region are Surya. This river is important drinking water resources of the region. Unlike other industrial estates, this industrial estate has a pleasant look due to the roads crossing at right angles and lots of small gardens adjacent to the boundary walls of the industrial units. Tarapur accounts for about 23 highly polluting 17 category industries and 59 red category industries, 53 orange category industries and 66 green category industries of various category engaged in the manufacturing of chemicals, dyes, dye-intermediates, Bulk drugs,

pharmaceuticals, Textile auxiliaries, Pesticides, Petrochemicals, Iron and steel, 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 also based on the revised CEPI version 2016. The results of the application of the Comprehensive Environmental Pollution Index (CEPI) to selected industrial clusters 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 the 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. Tarapur 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 Tarapur, 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 Tarapur

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-

Sampling Criteria	Total Sites	Monitoring Parameters
		Dichloroethylene, Bromochloromethane, 1,1,1-Trichloroethane
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	

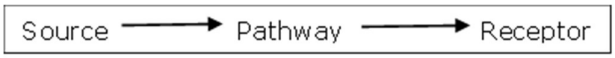
Table 3.2 Frequency of Sampling

	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

	Parameter	Round of Sampling	Frequency in Each Round
4.	Nitrogen Dioxide (NO_2)	03	6 Shifts of 4 hrs each
5.	Ammonia (NH_3)	03	6 Shifts of 4 hrs each
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 Tarapur 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 Tarapur eight locations have been monitored of checking the Ambient Air Quality (AAQ) in triplicate from 23rd Jan., 2023 to 27th Jan., 2023. The concentration of all the parameters at all studied locations is observed well within the limits. Volatile Organic Compounds (VOCs) were monitored at 2 locations namely Kokuyo Camlin Ltd. and Lupin 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.	Kokuyo Camlin Ltd.	19.798036°N	72.737654°E	23.01.2023	25.01.2023	27.01.2023
2.	D Docor Export Pvt. Ltd.	19.789417°N	72.752577°E	23.01.2023	25.01.2023	27.01.2023
3.	Sumitomo Chemical India Pvt. Ltd.	19.790828°N	72.718491°E	23.01.2023	25.01.2023	27.01.2023
4.	MPCB SRO Office	19.8098767°N	72.7435753°E	23.01.2023	25.01.2023	27.01.2023
5.	Loba Chemical Pvt Ltd	19.809545°N	72.734732°E	23.01.2023	25.01.2023	27.01.2023
6.	Unitec Fibres Pvt Ltd	19.804582°N	72.729414°E	23.01.2023	25.01.2023	27.01.2023
7.	Lupin Ltd	19.79615°N	72.720105°E	23.01.2023	25.01.2023	27.01.2023
8.	MPIL Steel Structure Ltd	19.797829°N	72.746503°E	23.01.2023	25.01.2023	27.01.2023

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.	Kokuyo Camlin Ltd.	19.798036°N	72.737654°E	23.01.2023	25.01.2023	27.01.2023

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
2.	Lupin Ltd	19.79615°N	72.720105°E	23.01.2023	25.01.2023	27.01.2023

Fig: Geographical Locations of Ambient Air Quality Sampling

Fig: Geographical Locations of VOCs Monitoring

Table 5.3 Ambient Air Quality Monitoring Results

Parameters	Unit	Results			
		Kokuyo Camlin Ltd.	D Docor Export Pvt. Ltd.	Sumitomo Chemical India Pvt. Ltd	MPCB SRO Office
Sulphur Dioxide (SO_2)	µg/m^3	12.05	6.59	6.23	12.87
Nitrogen Dioxide (NO_2)	µg/m^3	7.39	12.60	9.85	25.90
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	88	85	61	67
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	24	24	18	20
Ozone (O_3)	µg/m^3	20.20	24.90	BLQ	19.80
Lead (Pb)	µg/m^3	0.03	0.03	0.03	BLQ
Carbon Monoxide (CO) (1h)	mg/m^3	1.31	1.48	1.57	1.42
Carbon Monoxide (CO) (8 h)	mg/m^3	1.53	1.79	1.76	1.74
Ammonia (NH_3)	µg/m^3	30.97	25.90	25.10	26.70
Benzene (C_6H_6)	µg/m^3	3.00	3.08	3.27	3.26
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	0.57	0.65	0.33	BLQ
Nickel (Ni)	ng/m^3	3.99	3.45	BLQ	BLQ

Parameters	Unit	Results			
		Loba Chemical Pvt Ltd.	Unitec Fibres Pvt Ltd.	Lupin Ltd.	MPIL Steel Structure Ltd.
Sulphur Dioxide (SO_2)	µg/m^3	13.30	9.83	6.23	12.87
Nitrogen Dioxide (NO_2)	µg/m^3	13.80	17.59	9.85	25.90
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	75	89	61	67
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	19	23	18	20
Ozone (O_3)	µg/m^3	BLQ	30.00	BLQ	19.80
Lead (Pb)	µg/m^3	BLQ	BLQ	0.03	BLQ

Parameters	Unit	Results			
		Loba Chemical Pvt Ltd.	Unitec Fibres Pvt Ltd.	Lupin Ltd.	MPIL Steel Structure Ltd.
Carbon Monoxide (CO) (1h)	mg/m^3	1.56	1.56	1.57	1.42
Carbon Monoxide (CO) (8 h)	mg/m^3	1.94	1.97	1.76	1.74
Ammonia (NH_3)	$\mu g/m^3$	55.40	25.85	25.10	26.70
Benzene (C_6H_6)	$\mu g/m^3$	2.78	3.51	3.27	3.26
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	BLQ	0.66	0.33	BLQ
Nickel (Ni)	ng/m^3	BLQ	BLQ	BLQ	BLQ

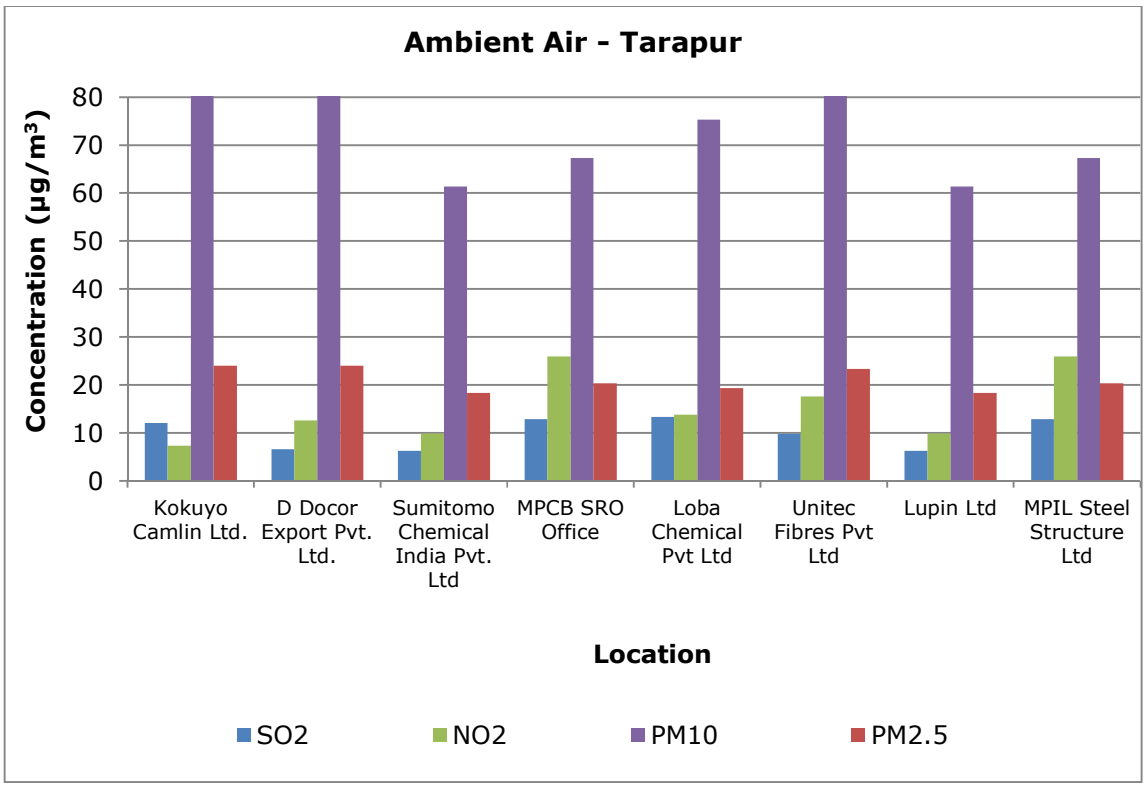
Table 5.4 Volatile Organic Compounds (VOCs) in Ambient Air Results

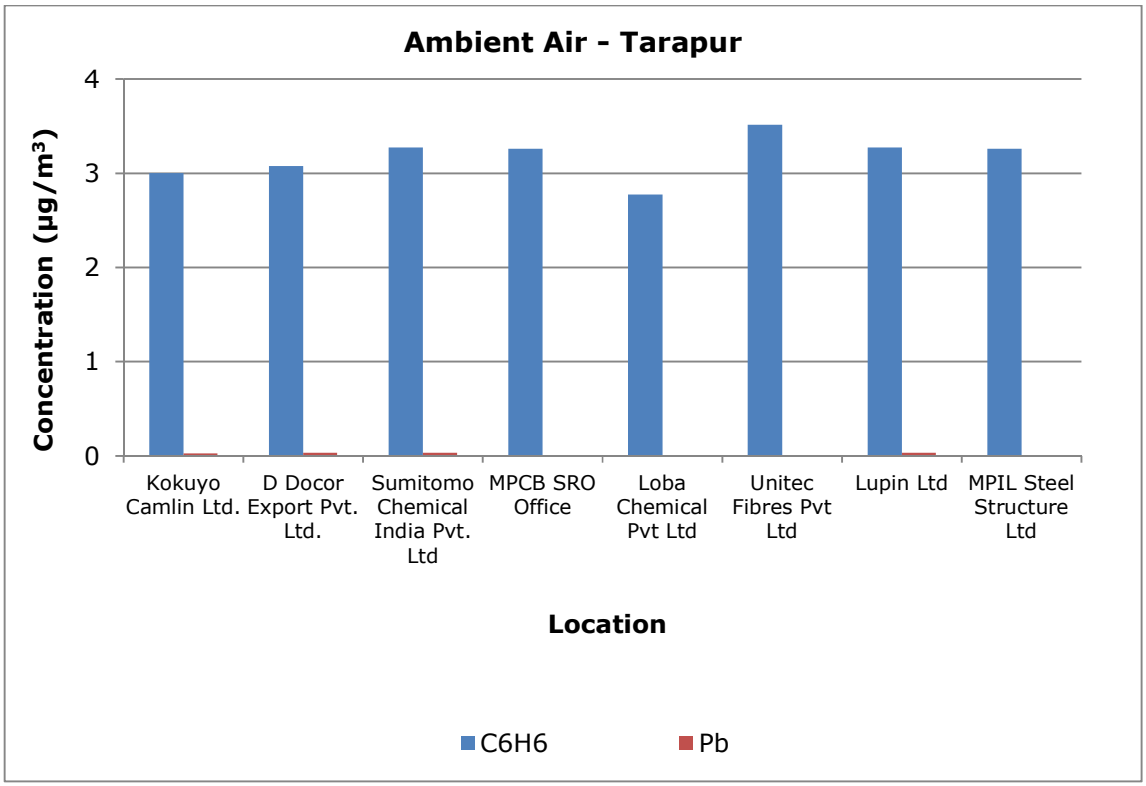
Parameters	Unit	Results	
		Kokuyo Camlin Ltd.	Lupin Ltd.
Dichloromethane	$\mu g/m^3$	BLQ	BLQ
Chloroform	$\mu g/m^3$	BLQ	BLQ
Carbon Tetrachloride	$\mu g/m^3$	BLQ	BLQ
Trichloroethylene	$\mu g/m^3$	BLQ	BLQ
Bromodichloromethane	$\mu g/m^3$	BLQ	BLQ
1,3-Dichloropropane	$\mu g/m^3$	BLQ	BLQ
1,4-Dichlorobenzene	$\mu g/m^3$	0.79	BLQ
1,3-Dichlorobenzene	$\mu g/m^3$	0.88	BLQ
1,2-Dichlorobenzene	$\mu g/m^3$	BLQ	BLQ
1,2-Dibromo-3-Chloropropane	$\mu g/m^3$	BLQ	BLQ
Napthalene	$\mu g/m^3$	6.15	BLQ
Bromobenzene	$\mu g/m^3$	BLQ	BLQ
1,2,4-Trimethylbenzene	$\mu g/m^3$	BLQ	BLQ
2-Chlorotoluene	$\mu g/m^3$	BLQ	BLQ
Tert-Butylbenzene	$\mu g/m^3$	BLQ	BLQ
SEC-Butylbenzene	$\mu g/m^3$	BLQ	BLQ
P-Isopropyltoluene	$\mu g/m^3$	0.82	BLQ

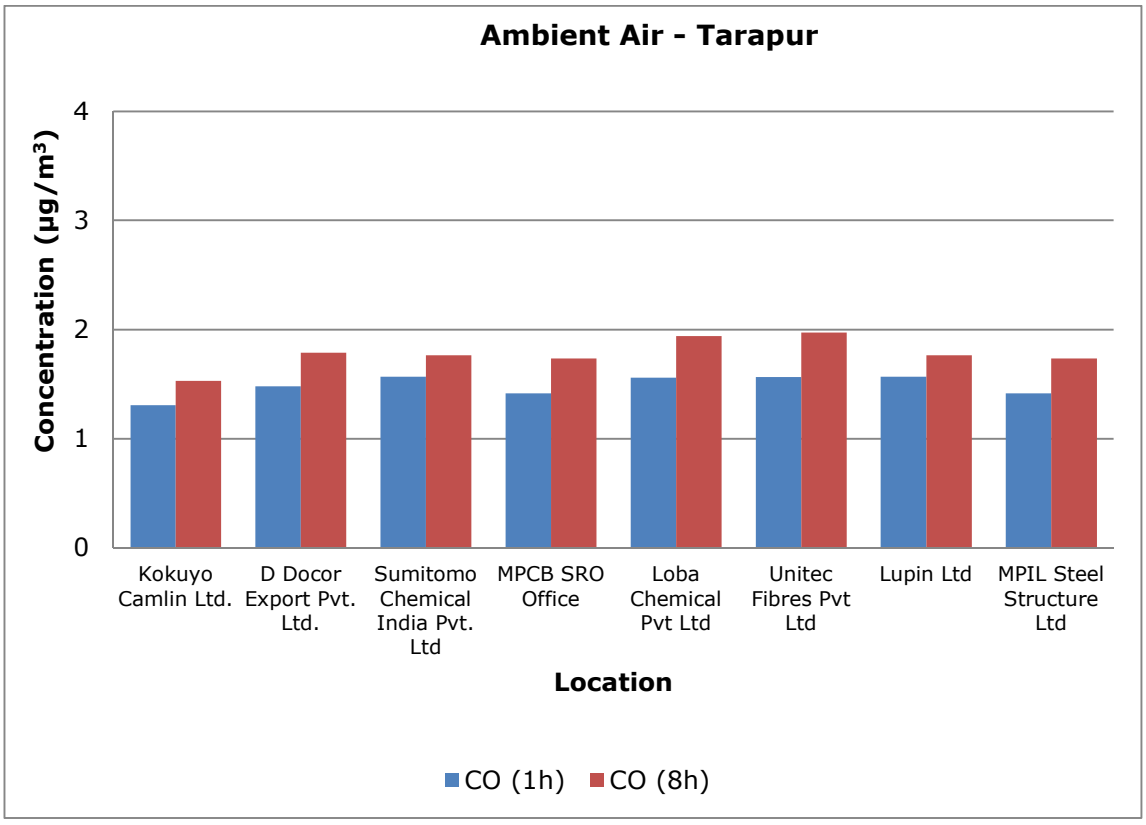
Parameters	Unit	Results	
		Kokuyo Camlin Ltd.	Lupin Ltd.
M-Xylene	µg/m³	BLQ	BLQ
P-Xylene	µg/m³	BLQ	BLQ
Styrene	µg/m³	BLQ	BLQ
Cumene	µg/m³	BLQ	BLQ
1,2,3-Trichloropropane	µg/m³	BLQ	BLQ
N-Propylbenzene	µg/m³	BLQ	BLQ
Dibromochloromethane	µg/m³	BLQ	BLQ
1,2-Dibromoethane	µg/m³	BLQ	BLQ
Chlorobenzene	µg/m³	BLQ	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
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	BLQ	BLQ
1,3,5-Trimethylbenzene	µg/m³	BLQ	BLQ
N-Butylbenzene	µg/m³	BLQ	BLQ
1,2,3-Trichlorobenzene	µg/m³	BLQ	BLQ
Hexachlorobutadiene	µg/m³	BLQ	BLQ
1,2,4-Trichlorobenzene	µg/m³	BLQ	BLQ
2,2-Dichloropropane	µg/m³	BLQ	BLQ
Dibromomethane	µg/m³	BLQ	BLQ
Toluene	µg/m³	0.52	BLQ
O-Xylene	µg/m³	BLQ	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

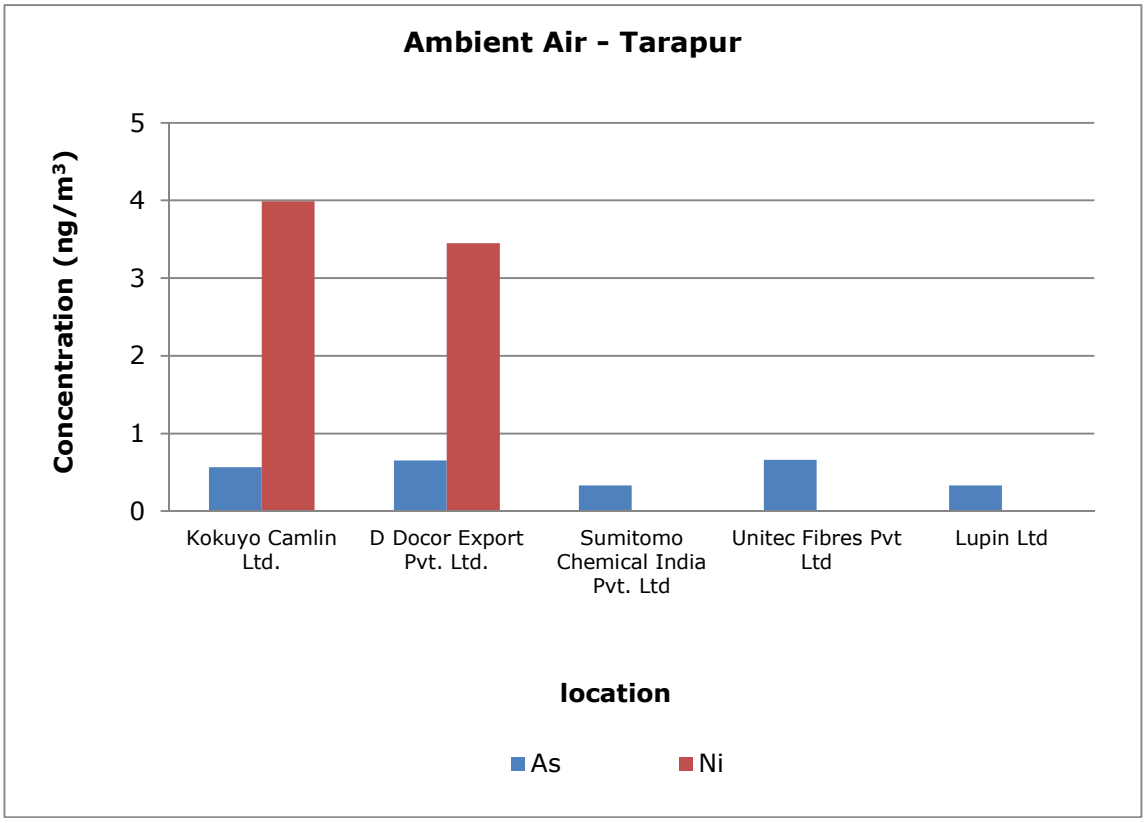
Parameters	Unit	Results	
		Kokuyo Camlin Ltd.	Lupin Ltd.
1,1-Dichloroethane	µg/m³	BLQ	BLQ
CIS-1,2-Dichloroethylene	µg/m³	BLQ	BLQ
Bromochloromethane	µg/m³	BLQ	BLQ
1,1,1-Trichloroethane	µg/m³	BLQ	BLQ

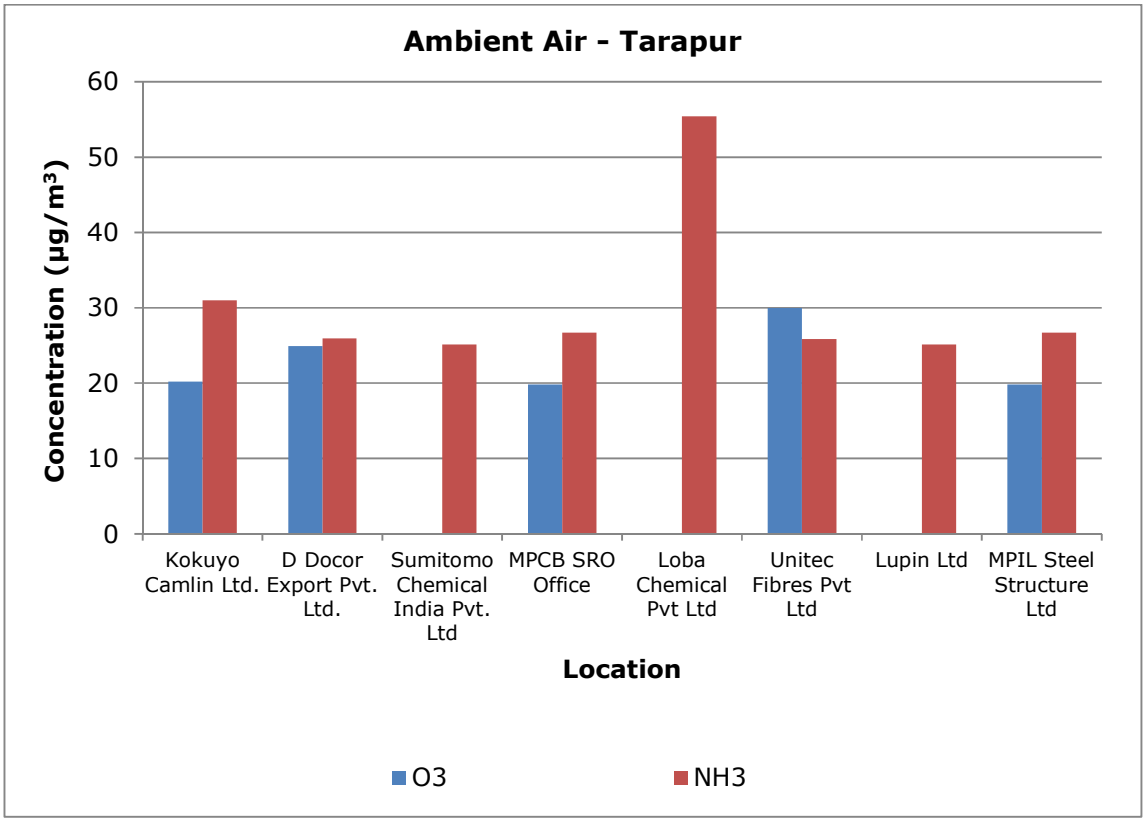
Graphs Ambient Air Quality Monitoring of Tarapur






Ambient Air - Tarapur
Concentration (µg/m³)
4
3
2
1
0
Kokuyo Camlin Ltd.
D Docor Export Pvt. Ltd.
Sumitomo Chemical India Pvt. Ltd
MPCB SRO Office
Loba Chemical Pvt Ltd
Unitec Fibres Pvt Ltd
Lupin Ltd
MPIL Steel Structure Ltd
Location
CO (1h)
CO (8h)


Ambient Air - Tarapur
Concentration (ng/m³)
5
4
3
2
1
0
Kokuyo Camlin Ltd.
D Docor Export Pvt. Ltd.
Sumitomo Chemical India Pvt. Ltd
Unitec Fibres Pvt Ltd
Lupin Ltd
location
As
Ni


Ambient Air - Tarapur
Concentration (µg/m³)
60
50
40
30
20
10
0
Kokuyo Camlin Ltd.
D Docor Export Pvt. Ltd.
Sumitomo Chemical India Pvt. Ltd
MPCB SRO Office
Loba Chemical Pvt Ltd
Unitec Fibres Pvt Ltd
Lupin Ltd
MPIL Steel Structure Ltd
Location
O3
NH3

6. Water Environment

For studying the water environment of Tarapur area, surface water was collected from Nallah, Lake and River. To understand the quality of treated effluent, samples were collected from six locations.

- All six water samples collected were found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, electrical conductivity and suspended solids are also observed well within the limits in all the samples.
- Concentration of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Kjeldahl Nitrogen (TKN) is found to exceed the acceptable limits at all the studied locations.
- In fish bioassay, 53-100% survival of fishes was achieved. Only the water sample collected from overflow of sump no.1 showed 100% fish survival.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. were also observed either below the limit of quantification.
- Parameters like Total Residual Chlorine, Nitrogen, 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) are also observed below the limit of quantification (BLQ) 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.	BPT Navapur out Fall	19.790747°N	72.743416°E	12.01.2023	14.01.2023	16.01.2023
2.	Over Flow of Sump No-1	19.785157°N	72.738008°E	12.01.2023	14.01.2023	16.01.2023
3.	Nallah Near sump 2 Tarapur CETP	19.805635°N	72.724122°E	12.01.2023	14.01.2023	16.01.2023
4.	Open Drain Near Sump 3 Node	19.782267°N	72.721677°E	12.01.2023	14.01.2023	16.01.2023
5.	Nallah to Dandi	19.79258°N	72.690175°E	12.01.2023	14.01.2023	16.01.2023
6.	Nallah Carrying Domestic Sewage at Saravali	19.770204°N	72.751514°E	12.01.2023	14.01.2023	16.01.2023

Fig: Geographical Locations of Surface Water Sampling

Table 6.2 Results of Surface Water

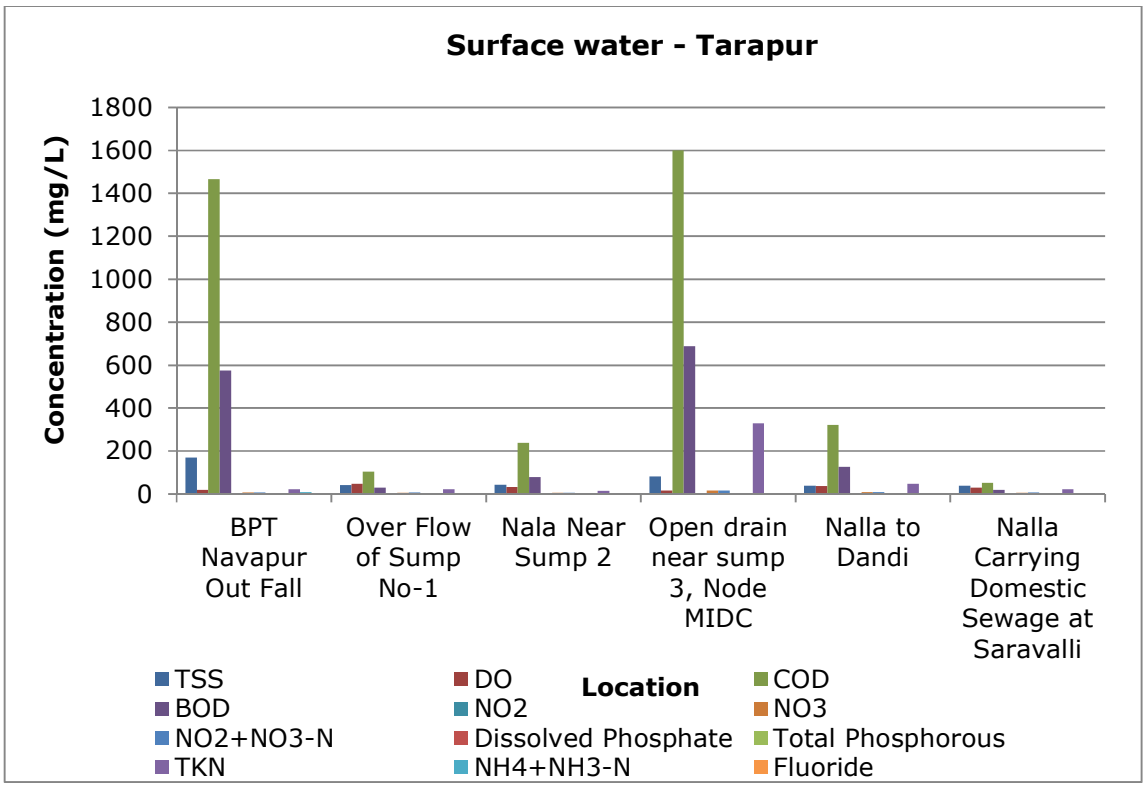
Parameters	Unit	Results					
		BPT Navapur Out Fall	**Over Flow of Sump No-1**	**Nallah Near Sump- 2**	**Open drain near sump- 3**	**Nallah to Dandi**	**Nalla Carrying Domestic Sewage at Saravalli**
Sanitary Survey	-	Generally clean neighbou rhood	Generally clean neighbou rhood	Reasonab ly clean neighbou rhood	Reasonab ly clean neighbou rhood	Reasonab ly clean neighbou rhood	Reasona bly 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	-	0.50	0.50	0.60	0.60	0.50
Temperature	^{o}C	27	27	27	27	27	26
Colour	Hazen	BLQ	7	3	15	3	5
Smell	-	Not Agreeabl e	Disagree able	Disagree able	Disagree able	Disagree able	Disagree able
pH	-	7.55	7.53	7.46	6.69	7.22	8.11
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

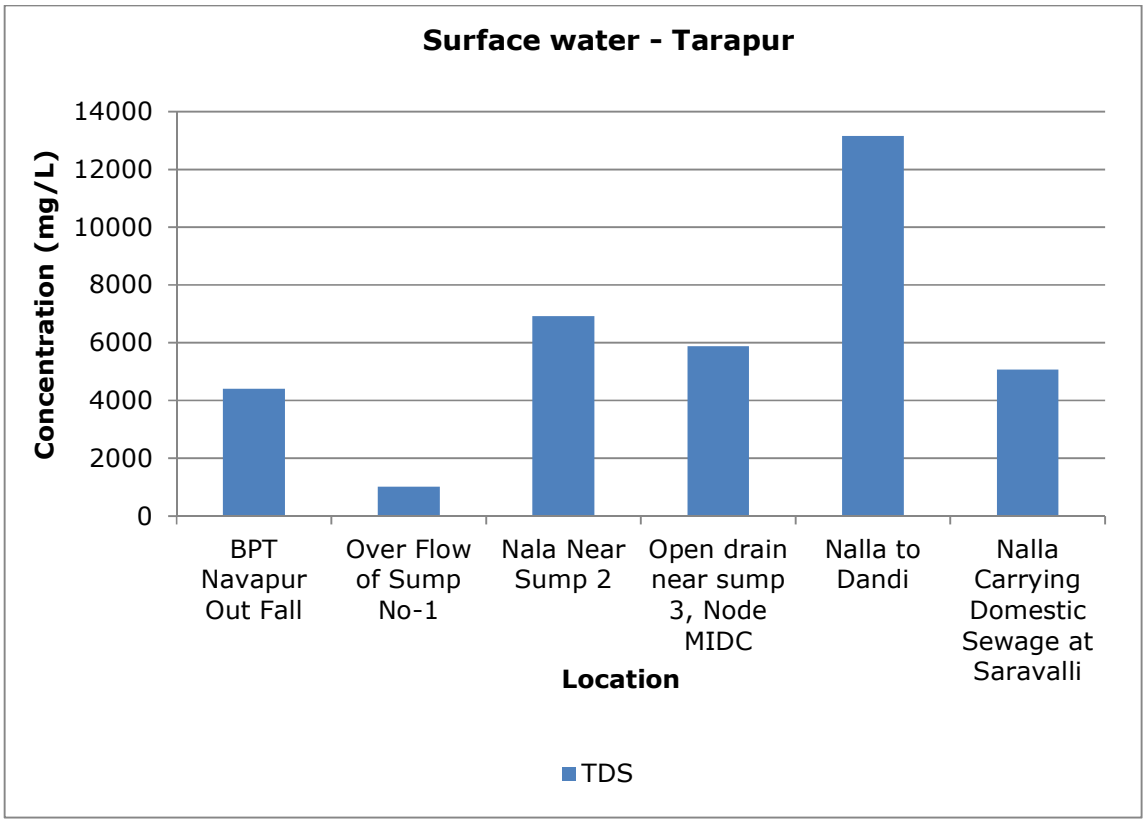
Parameters	Unit	Results					
		BPT Navapur Out Fall	Over Flow of Sump No-1	Nallah Near Sump- 2	Open drain near sump- 3	Nallah to Dandi	Nalla Carrying Domestic Sewage at Saravalli
Suspended Solids	mg/L	170	41	43	81	39	39
Total Dissolved Solids	mg/L	4405	1009	6918	5871	13151	5075
Dissolved Oxygen (% Saturation)	%	19.33	47.33	31.67	17.00	37.33	28.67
Chemical Oxygen Demand	mg/L	1467	104	238	1600	323	52
Biochemical Oxygen Demand (3 days,27°C)	mg/L	575	30	79	688	126	19
Electrical Conductivity (at 25 °C)	µmho/cm	7863	1796	11970	10353	22698	8820
Nitrite Nitrogen (as NO_2)	mg/L	0.46	0.89	0.05	0.96	0.64	1.42
Nitrate Nitrogen (as NO_3)	mg/L	6.93	5.86	5.56	16.46	8.06	6.15
(NO_2 + NO_3)-Nitrogen	mg/L	7.39	6.45	5.57	17.09	8.27	7.56
Free Ammonia (as NH_3-N)	mg/L	0.14	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	0.08	BLQ	0.06	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	2.43	1.37	1.33	2.20	2.10	1.73
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	1.04	0.20	1.75	1.86	1.38	1.13
Sodium Adsorption Ratio	-	31.97	3.11	16.50	10.91	32.51	29.66
Total Coliforms	MPN Index/ 100 ml	285	723	313	631	174	370
Faecal Coliforms	MPN Index/ 100 ml	43	680	193	1893	133	161

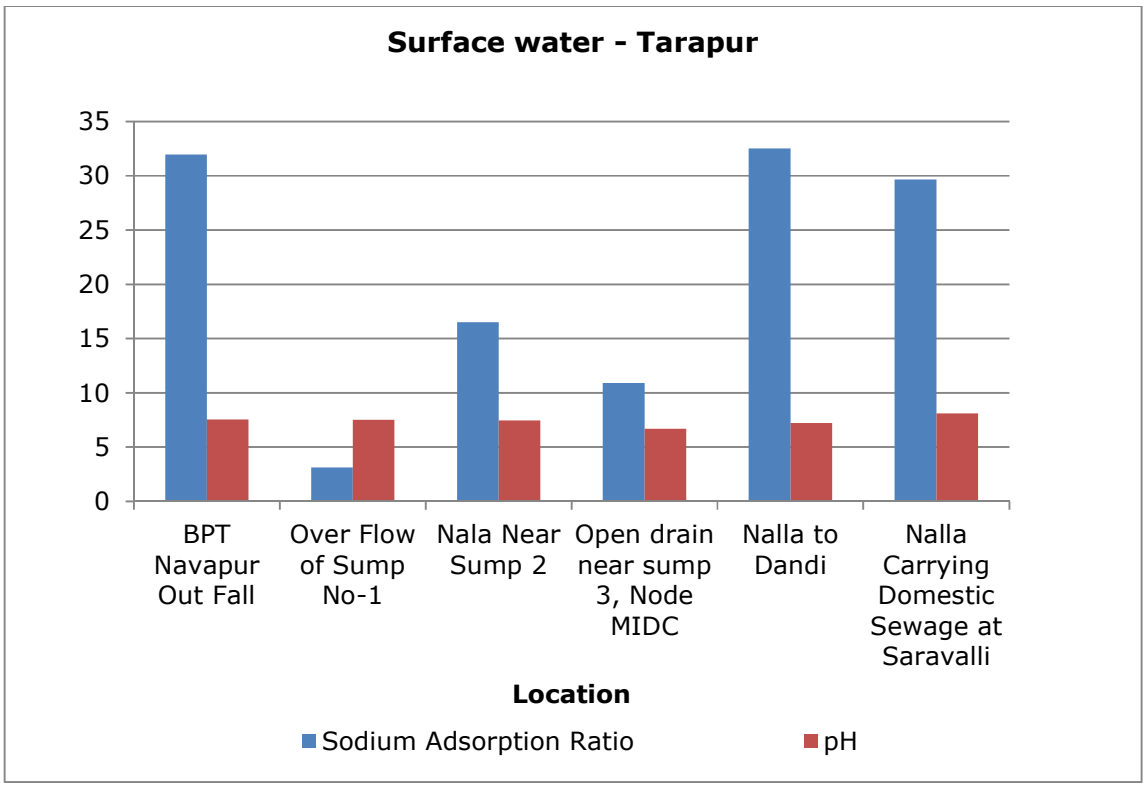
Parameters	Unit	Results					
		BPT Navapur Out Fall	Over Flow of Sump No-1	Nallah Near Sump- 2	Open drain near sump- 3	Nallah to Dandi	Nalla Carrying Domestic Sewage at Saravalli
Total Phosphate (as P)	mg/L	2.79	0.40	3.74	4.04	2.28	0.85
Total Kjeldahl Nitrogen (as N)	mg/L	22.60	22.01	14.94	328.87	46.93	22.67
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	8.36	1.49	0.68	2.96	1.65	0.75
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	0.09	0.08	0.25	0.39	0.06	BLQ
Nickel (as Ni)	mg/L	0.11	0.53	1.26	4.04	0.17	0.25
Copper (as Cu)	mg/L	0.10	0.04	0.05	0.19	BLQ	BLQ
Hexavalent Chromium (as Cr^{6+})	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	0.05	0.33	0.12	0.23	BLQ	BLQ
Total Arsenic (as As)	mg/L	0.01	0.01	BLQ	0.01	0.01	0.01
Lead (as Pb)	mg/L	BLQ	BLQ	0.01	BLQ	BLQ	BLQ
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	0.30	0.47	0.89	0.80	0.55	0.69

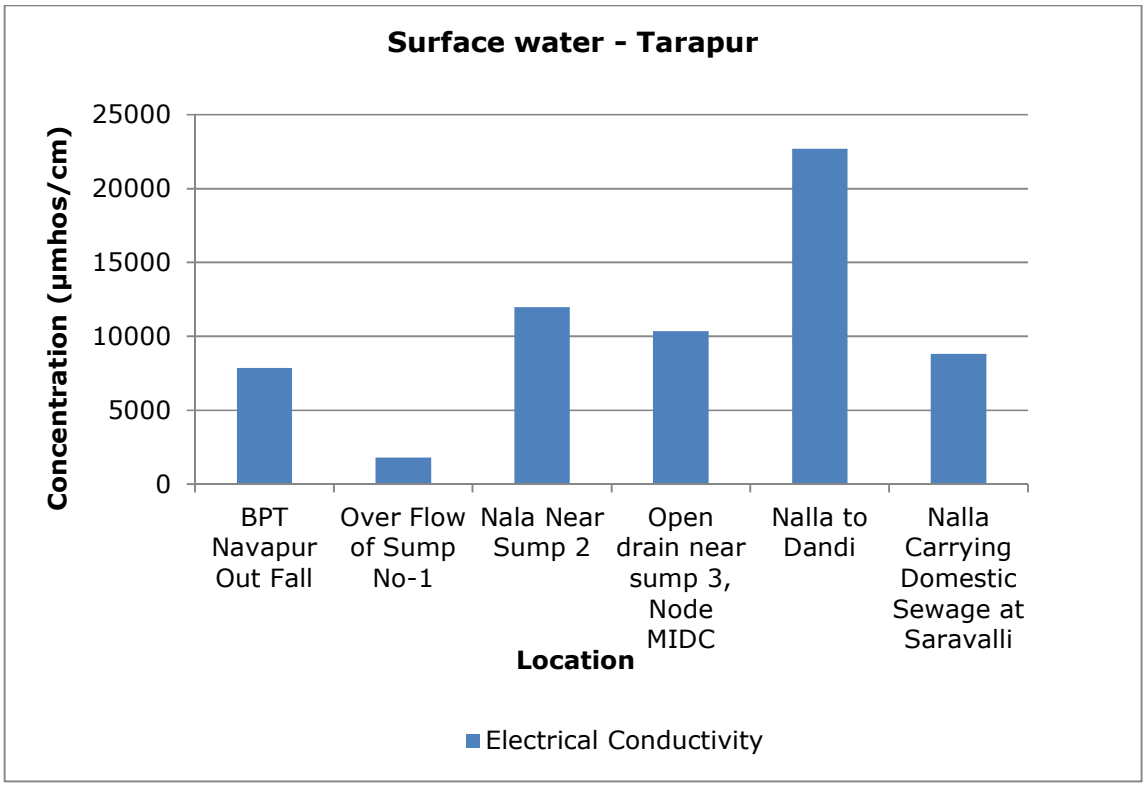
Parameters	Unit	Results					
		BPT Navapur Out Fall	Over Flow of Sump No-1	Nallah Near Sump- 2	Open drain near sump- 3	Nallah to Dandi	Nalla Carrying Domestic Sewage at Saravalli
Iron (as Fe)	mg/L	1.82	2.92	3.11	3.64	0.39	0.58
Vanadium (as V)	mg/L	0.02	0.02	0.04	0.03	BLQ	BLQ
Selenium (as Se)	mg/L	0.04	0.01	0.02	0.02	0.02	0.02
Boron (as B)	mg/L	0.88	0.43	1.28	2.79	1.80	0.95
Total Nitrogen	mg/L	30.00	28.06	20.48	345.73	82.73	29.23
Bioassay Test on fish	% survival	80	100	67	60	53	83

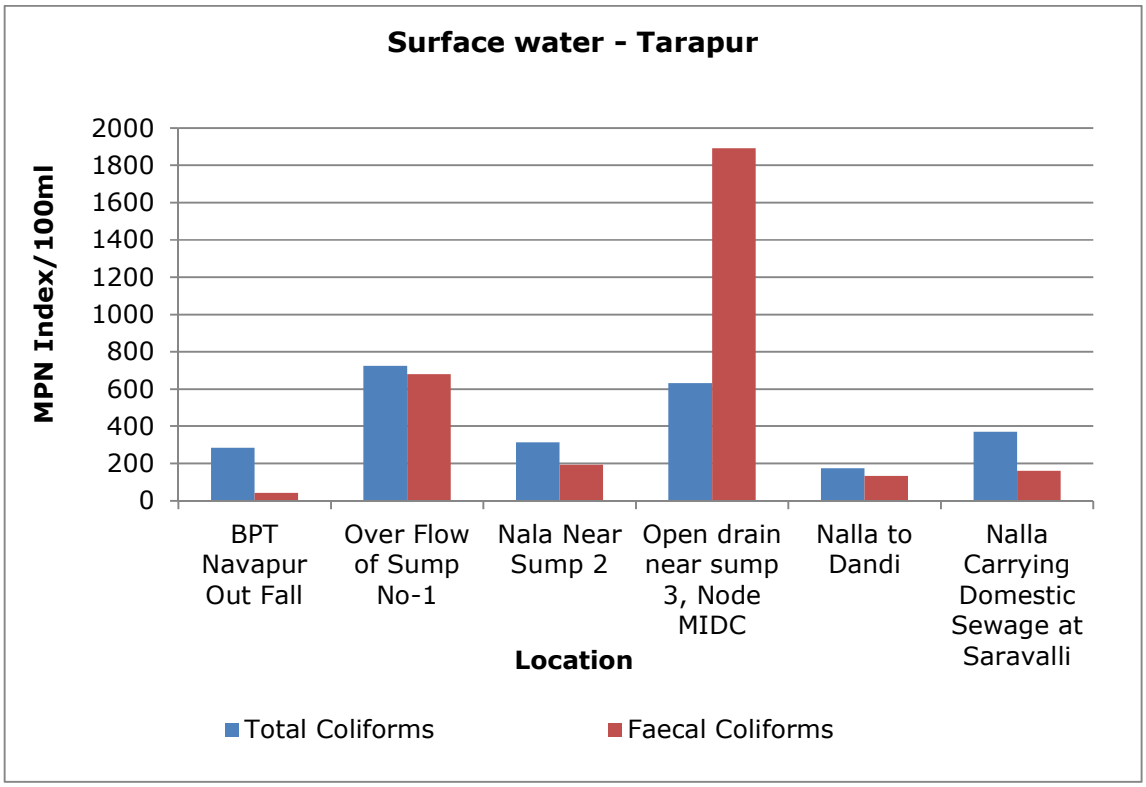
Graphs - Surface Water Quality of Tarapur

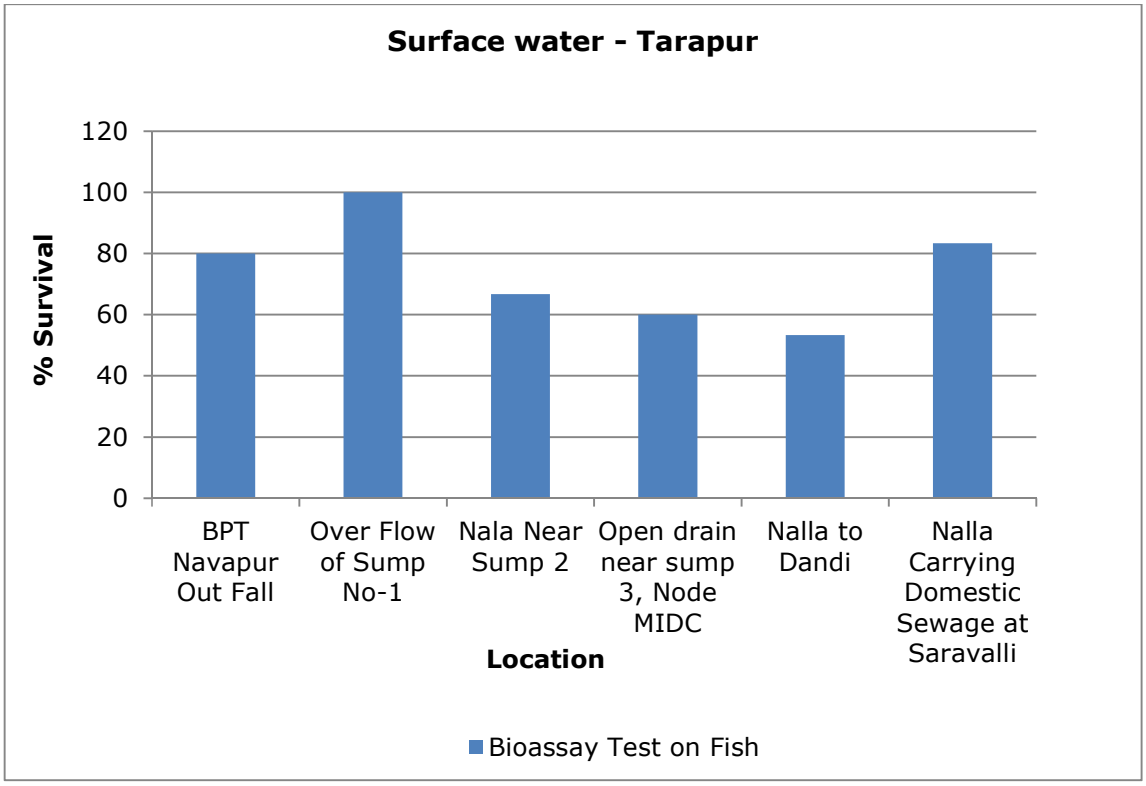





Surface water - Tarapur
35
30
25
20
15
10
5
0
BPT Navapur Out Fall
Over Flow of Sump No-1
Nala Near Sump 2
Open drain near sump 3, Node MIDC
Nalla to Dandi
Nalla Carrying Domestic Sewage at Saravalli
Location
Sodium Adsorption Ratio
pH


Surface water - Tarapur
Concentration (µmhos/cm)
25000
20000
15000
10000
5000
0
BPT Navapur Out Fall
Over Flow of Sump No-1
Nala Near Sump 2
Open drain near sump 3, Node MIDC
Nalla to Dandi
Nalla Carrying Domestic Sewage at Saravalli
Location
Electrical Conductivity


Surface water - Tarapur
MPN Index/100ml
2000
1800
1600
1400
1200
1000
800
600
400
200
0
BPT Navapur Out Fall
Over Flow of Sump No-1
Nala Near Sump 2
Open drain near sump 3, Node MIDC
Nalla to Dandi
Nalla Carrying Domestic Sewage at Saravalli
Location
Total Coliforms
Faecal Coliforms


Surface water - Tarapur
% Survival
120
100
80
60
40
20
0
BPT Navapur Out Fall
Over Flow of Sump No-1
Nala Near Sump 2
Open drain near sump 3, Node MIDC
Nalla to Dandi
Nalla Carrying Domestic Sewage at Saravalli
Location
Bioassay Test on Fish

7. Land Environment

For studying the land Environment of Tarapur area, ground water was collected from Bore well. Dug well, and Hand Pump. A total of 6 samples were collected and analysed to check the concentration of different parameters.

Six ground water samples were collected from Tarapur region.

- All the water samples collected were acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, suspended solids, BOD, and COD were also well within the limits in all six samples collected.
- Four water samples out of six showed achieved 100% survival in Fish Bioassay.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. are also observed either below the limit of quantification 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 below the limit of 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.	Handpump water, besides sai complex	19.80961°N	72.74466°E	12.01.2023	14.01.2023	16.01.2023
2.	Dhodi Pooja Borewell Water	19.79777°N	72.752702°E	12.01.2023	14.01.2023	16.01.2023
3.	Open well, near nalla Sump 1	19.785158°N	72.738027°E	12.01.2023	14.01.2023	16.01.2023
4.	Borewell at Shivaji Nagar, Boisar Tarapur	19.804566°N	72.753556°E	12.01.2023	14.01.2023	16.01.2023
5.	Gharat	19.811848°N	72.740713°E	12.01.2023	14.01.2023	16.01.2023
6.	Ramji Nagar, Tarapur	19.782236°N	72.723859°E	12.01.2023	14.01.2023	16.01.2023

Fig: Geographical Locations of Ground Water Sampling

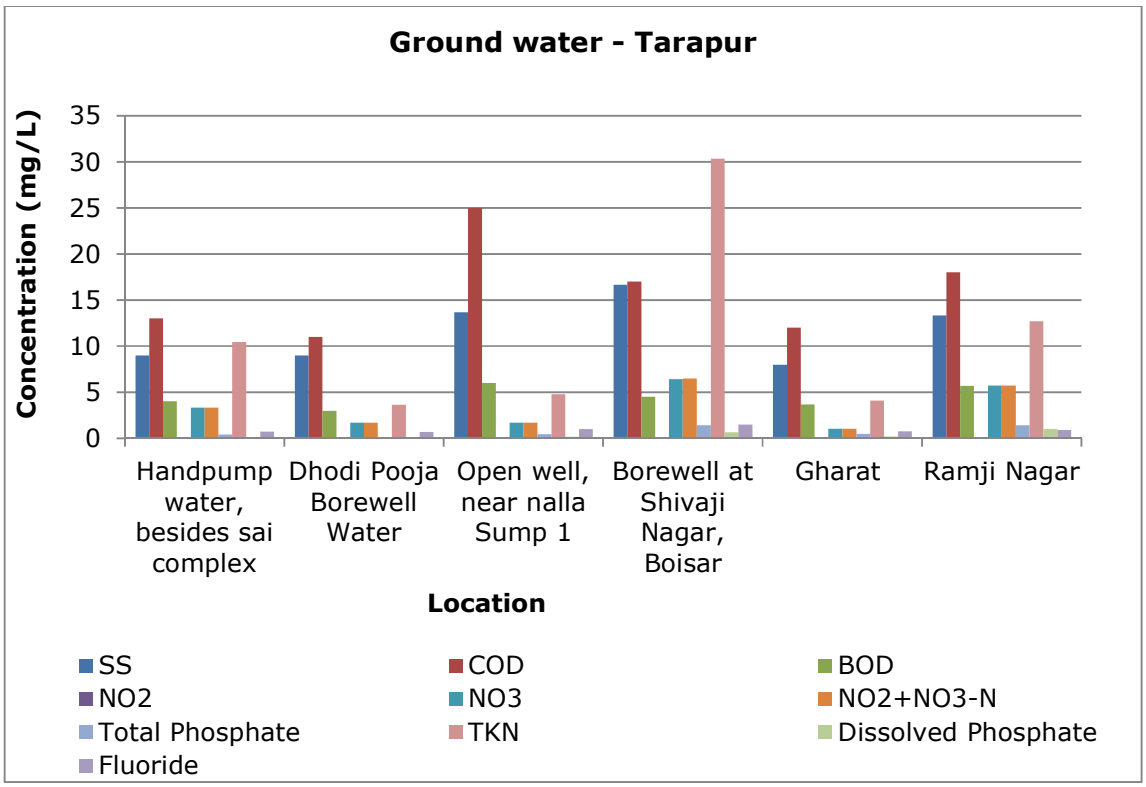
Table 7.2 Results of Ground Water

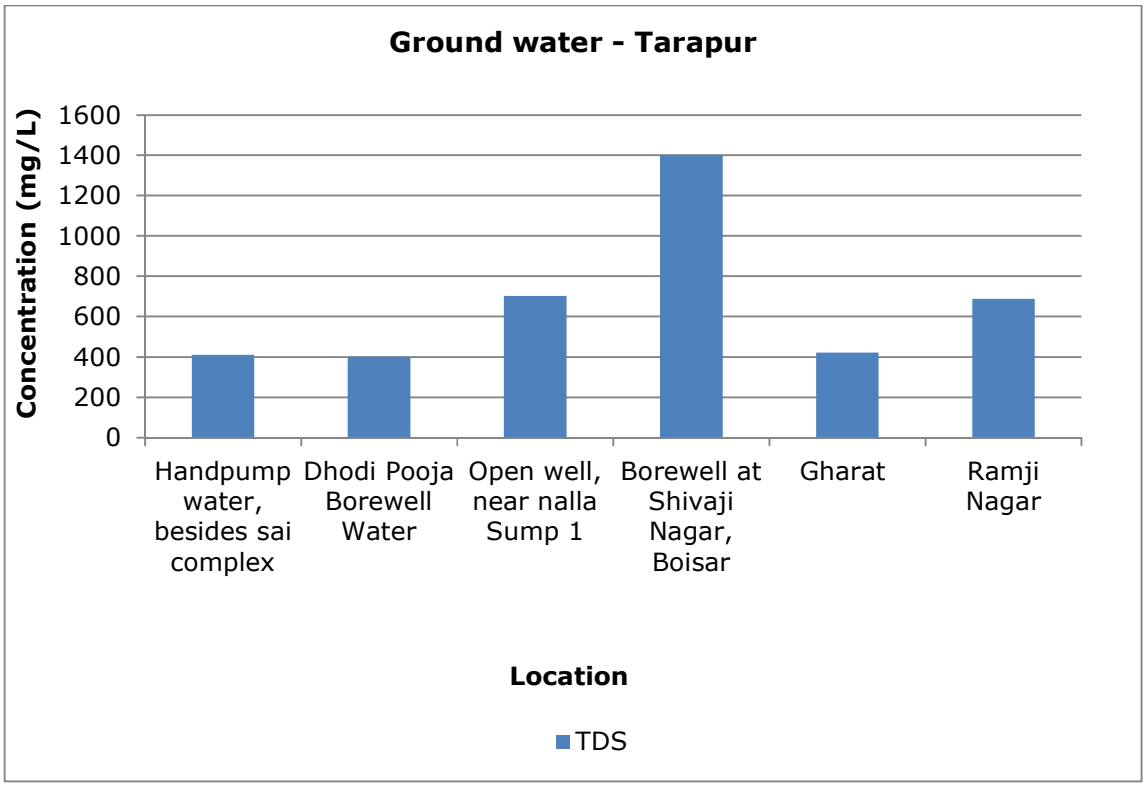
Parameters	Unit	Results					
		Handpump water, besides sai complex	**Dhodi Pooja Borewell Water**	**Open well, near nallah Sump 1**	**Borewell at Shivaji Nagar, Boisar**	**Gharat**	**Ramji Nagar**
Sanitary Survey	-	Generally clean neighbourhood	Generally clean neighbourhood	Generally clean neighbourhood	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	Not Applicable	Not Applicable	0.60	Not Applicable	0.50	0.50
Temperature	°C	27	27	28	27	27	27
Colour	Hazen	1	1	1	2	1	1
Smell	-	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
pH	-	8.14	8.14	8.34	7.84	8.04	7.76
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	9	9	14	17	8	13
Total Dissolved Solids	mg/L	411	401	703	1403	421	689

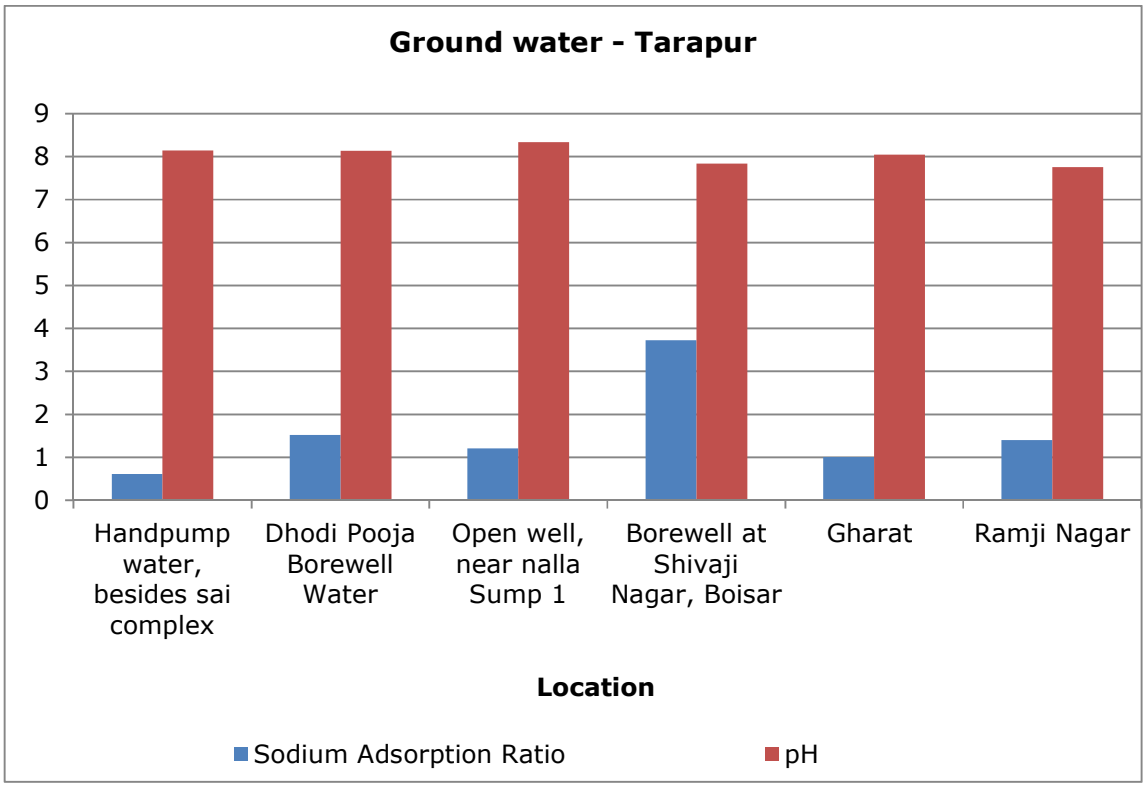
Parameters	Unit	Results					
		Handpump water, besides sai complex	Dhodi Pooja Borewell Water	Open well, near nallah Sump 1	Borewell at Shivaji Nagar, Boisar	Gharat	Ramji Nagar
Chemical Oxygen Demand	mg/L	13	11	25	17	12	18
Biochemical Oxygen Demand (3 days,27°C)	mg/L	4	3	6	5	4	6
Electrical Conductivity (at 25 °C)	µmho/cm	735	715	1223	2503	751	1230
Nitrite Nitrogen (as NO_2)	mg/L	BLQ	BLQ	BLQ	0.08	BLQ	0.03
Nitrate Nitrogen (as NO_3)	mg/L	3.31	1.68	1.69	6.42	1.05	5.72
(NO_2 + NO_3)-Nitrogen	mg/L	3.31	1.68	1.69	6.49	1.05	5.72
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	0.70	0.67	1.00	1.50	0.73	0.90
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	0.11	BLQ	0.16	0.66	0.18	1.01
Sodium Adsorption Ratio	-	0.61	1.51	1.21	3.72	1.00	1.41
Total Coliforms	MPN Index/ 100 ml	190	217	168	170	57	38
Faecal Coliforms	MPN Index/ 100 ml	103	202	164	98	51	36
Total Phosphate (as P)	mg/L	0.41	0.12	0.46	1.42	0.49	1.44
Total Kjeldahl Nitrogen (as N)	mg/L	10.44	3.64	4.80	30.33	4.11	12.69
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	0.27	0.44	0.34	0.70	0.26	0.35

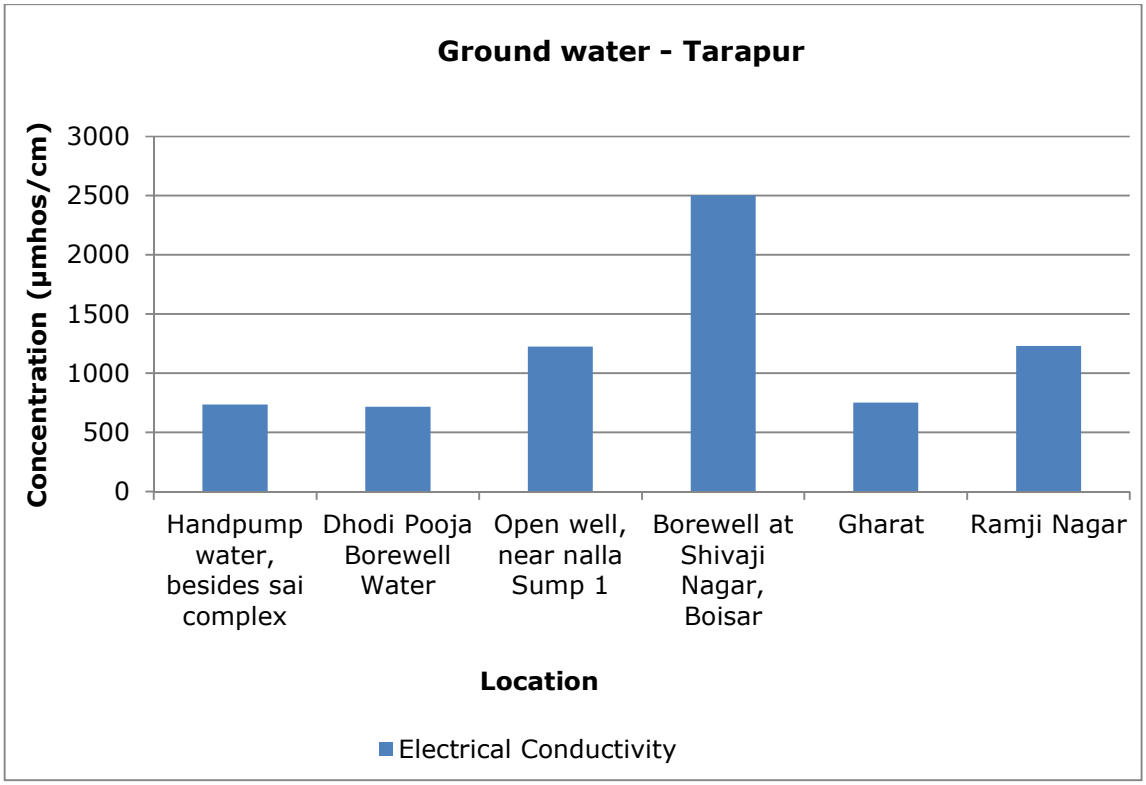
Parameters	Unit	Results					
		Handpump water, besides sai complex	Dhodi Pooja Borewell Water	Open well, near nallah Sump 1	Borewell at Shivaji Nagar, Boisar	Gharat	Ramji Nagar
Phenols (as C_6H_5OH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Anionic Detergents (as MBAS Calculated as LAS, mol.wt.288.38)	mg/L	BLQ	BLQ	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	0.11	BLQ	BLQ
Nickel (as Ni)	mg/L	0.26	BLQ	BLQ	0.05	BLQ	0.03
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	0.01	BLQ	BLQ
Lead (as Pb)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
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	BLQ	0.34	BLQ	0.82	BLQ	0.93
Iron (as Fe)	mg/L	0.48	0.14	0.07	0.31	0.08	0.39
Vanadium (as V)	mg/L	0.02	0.03	0.05	0.03	0.04	0.04
Selenium (as Se)	mg/L	0.01	0.01	0.01	0.02	0.01	0.06
Total Nitrogen	mg/L	BLQ	0.15	0.21	0.26	BLQ	0.36
Boron (as B)	mg/L	13.77	4.69	6.82	36.80	5.10	15.14
Bioassay Test on fish	% survival	100	100	97	100	100	83

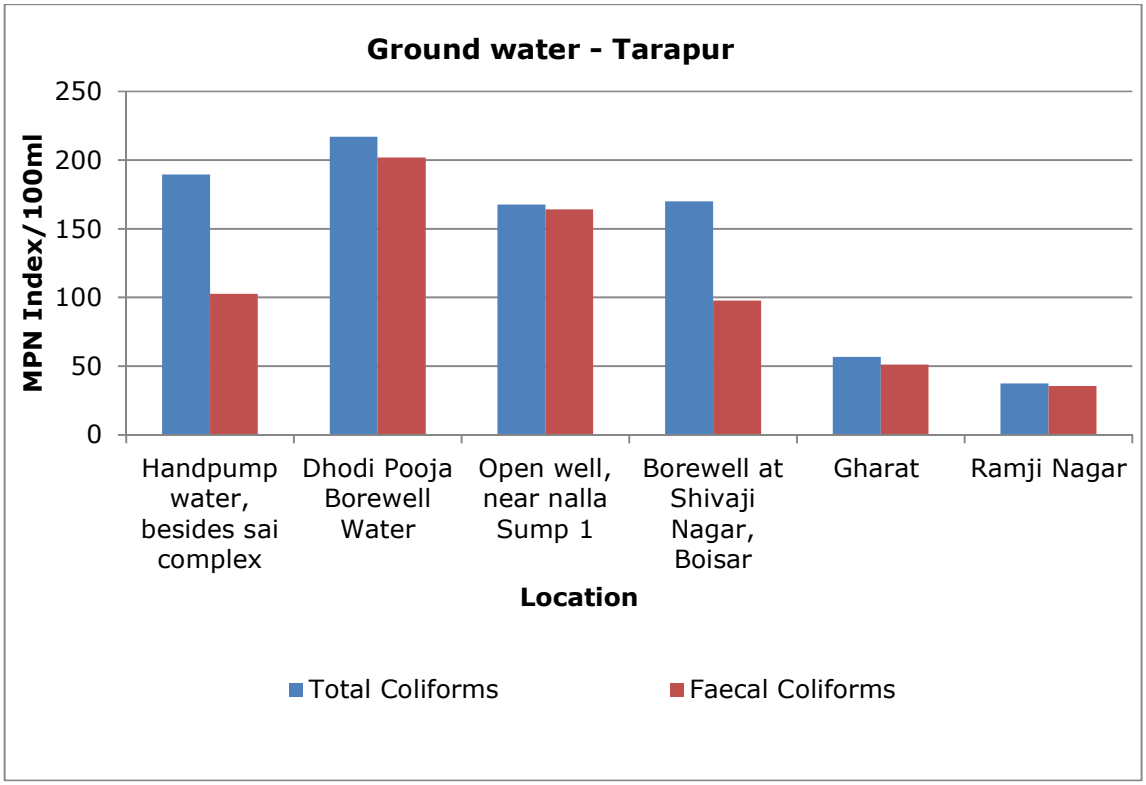
Graphs - Ground Water Quality of Tarapur

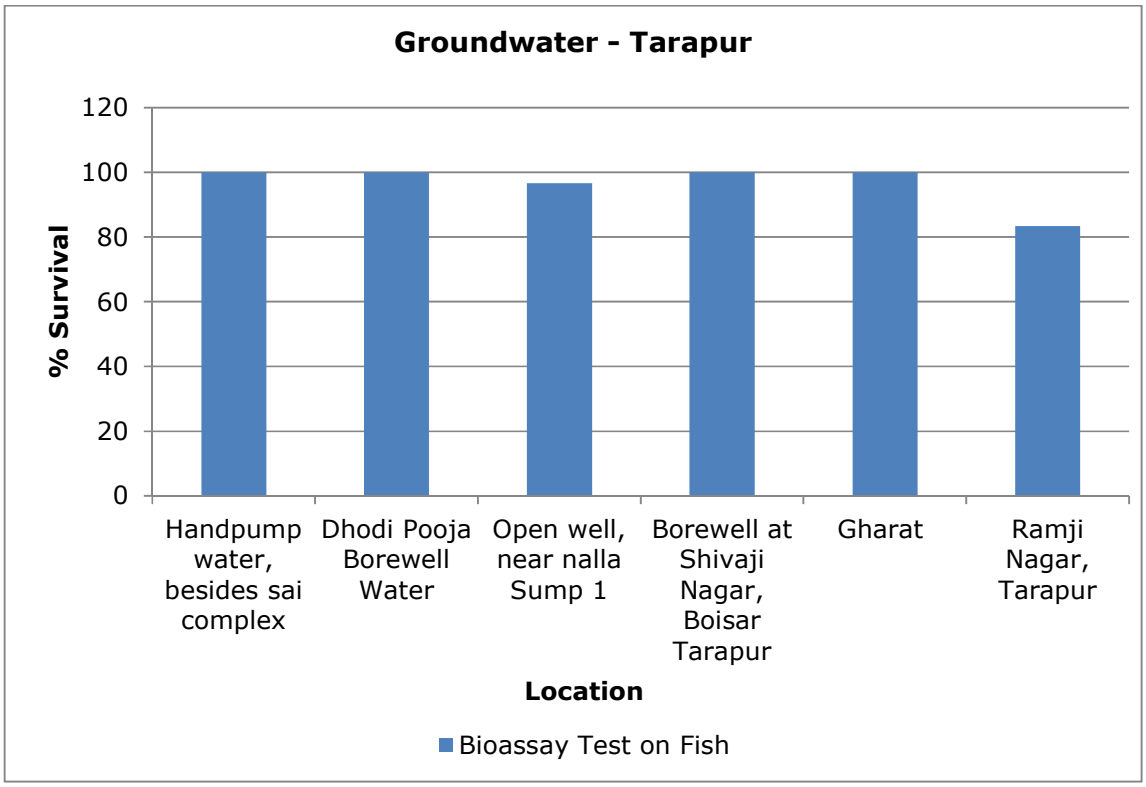





Ground water - Tarapur
9
8
7
6
5
4
3
2
1
0
Handpump water, besides sai complex
Dhodi Pooja Borewell Water
Open well, near nalla Sump 1
Borewell at Shivaji Nagar, Boisar
Gharat
Ramji Nagar
Location
Sodium Adsorption Ratio
pH


Ground water - Tarapur
Concentration (µmhos/cm)
3000
2500
2000
1500
1000
500
0
Handpump water, besides sai complex
Dhodi Pooja Borewell Water
Open well, near nalla Sump 1
Borewell at Shivaji Nagar, Boisar
Gharat
Ramji Nagar
Location
Electrical Conductivity


Ground water - Tarapur
MPN Index/100ml
250
200
150
100
50
0
Handpump water, besides sai complex
Dhodi Pooja Borewell Water
Open well, near nalla Sump 1
Borewell at Shivaji Nagar, Boisar
Gharat
Ramji Nagar
Location
Total Coliforms
Faecal Coliforms


Groundwater - Tarapur
% Survival
120
100
80
60
40
20
0
Handpump water, besides sai complex
Dhodi Pooja Borewell Water
Open well, near nalla Sump 1
Borewell at Shivaji Nagar, Boisar Tarapur
Gharat
Ramji Nagar, Tarapur
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 an early warning tool which helps in the 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	2.75	4	11	0	0	10	**21.00**
Water Index	2.5	4	10	43	0	10	**63.00**
Land Index	1.5	4	6	34.75	0	10	**50.80**
						Aggregated CEPI	**66.94**

Table 8.2 Comparison of CEPI Scores

	Air Index	Water Index	Land Index	CEPI
CEPI Score March 2023	21.00	63.00	50.75	**66.94**
CEPI score June 2021	31	61.5	60	**68.66**
CEPI Score March 2021	31	65	30.75	**68.34**
CEPI score March 2020	47.0	65.3	36.5	**71.30**
CEPI score June 2019	37.07	51.1	54.4	**54.56**
CEPI score March 2019	34.75	45.0	45.0	**53.60**
CEPI score June 2018	26.0	39.25	45.0	**50.61**
CEPI score March 2018	32.5	38.5	45.0	**51.88**
CPCB CEPI score March 2018	72.0	89.0	59.25	**93.69**

CEPI Score Calculation:

Tarapur

Ambient Air Analysis Report

Pollutant	Group	A1	A2	A (A1 X A2)
PM_{10}	B	2	Large	
NO_2	A	0.25		
$PM_{2.5}$	B	0.5		
		2.75	**4**	**11**

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)	
PM_{10}	74.42	100	0.74	0	8	0.00	L	0
NO_2	15.36	80	0.19	0	8	0.00	L	0
$PM_{2.5}$	21	60	0.35	0	8	0.00	L	0
B score = (B1+B2+B3)							**B**	**0**

C	**0**	**<5%**
D	**10**	**A-A-IA**

Air CEPI Score	**(A+B+C+D)**	**21.00**

Water Quality Analysis Report

Pollutant	Group	A1	A2	A (A1 X A2)
BOD	B	2	Large	
Zn	A	0.25		
TN	A	0.25		
		2.5	**4**	**10**

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)	
BOD	252.78	8	31.60	6	6	31.60	C	30
Zn	0.17	0.3	0.57	1	6	0.09	M	3
TN	89.37	15	5.96	6	6	5.96	C	10
B score = (B1+B2+B3)							**B**	**43**

C	**0**	**<5%**
D	**10**	**A-A-IA**

Water CEPI	**(A+B+C+D)**	**63.00**

Ground Water Quality Analysis Report

Pollutant	**Group**	**A1**	**A2**	**A (A1 X A2)**
TKN	A	1	Large	
Fe	A	0.25		
TN	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)**	
TKN	11.00	1	11.00	6	6	11.00	C	30
Fe	0.25	0.3	0.83	3	6	0.42	M	4.75
TN	13.72	45	0.30	0	6	0.00	L	0
B score = (B1+B2+B3)							**B**	**34.75**

C	**0**	**<5%**
D	**10**	**A-A-IA**

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

Water CEPI Score (im) **63.00**

Land CEPI Score (i2) **50.75**

Air CEPI Score (i3) **21.00**

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 **66.94**

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 were observed well within the limits as per NAAQS.
- Concentration of PM10 was observed in the range of 61.33µg/m^3 to 89.33µg/m^3 and PM2.5 in the range of 18.33 to 24.00µg/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 $PM_{2.5}$ has exceeded at 10 locations out of 12, which contributed to higher air index (72.00). 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 (21.00).

Surface Water Quality

- To understand the quality of treated effluent, samples were collected from six industries
- Higher concentration of BOD, COD and Total Kjeldahl Nitrogen (TKN) was observed in the surface water samples collected which may be due to domestic wastewater, sewage, other localized activities.
- All the industries in the Tarapur 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 2018, concentration values of TKN 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.
- All the parameters of ground water analysis were found within the permissible limits.
- In the CEPI score calculated for Land Environment by CPCB in March 2018, concentration of TKN and Total hardness was found to exceed in most of the water sample.

CEPI Score

- The CEPI Score post monsoon season is 66.94.
- During calculation of CEPI score, Water Index is calculated highest with a score of 63, followed by the Land index as 50.75 and the Air Index 21.00. The parameters of air and ground water in

Tarapur region are observed well within the limits. Hence, aggregated CEPI score is calculated as 66.94, which is lower than the CPCB CEPI score February 2018 which was 93.69.

- In CEPI score of CPCB 2018, all the indices i.e. Air index, water index and land index were higher as compared to the present (March, 2023) indices.
- In comparison with the CEPI Score of March 2021, a decrease in all the three indices is observed.
- As per the CPCB CEPI calculation revised in 2016, Health statistics represented by Receptor C in CEPI Calculation, also play an important role.
- For analysing the health data collected from hospitals, 38% decrease in water borne disease cases is observed in the year 2022 as compared to the year 2021. Hence score for receptor C is considered as 0 for water & land Environment. However, in the CEPI score calculated by CPCB (2018), the receptor C (the health data) score was 10 for water and land environment.
- Collective efforts of the regional office of MPCB, NMMC, administration and environmental organizations are resulting in a significant reduction in pollution levels.
- 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 the dilution of environmental samples resulting in lower pollution load, hence also affecting the total score.
- In conclusion, an approximately a 28.5% decrease in CEPI score is observed from 93.69 (critically polluted) in 2018 to 66.94 in 2023.

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

- Installation of CEMS installed for Air and Water in Large and Medium scale RED category industries: Two-way SCADA installed by industries
- Waste is collected and segregated at MWML, Taloja.
- Establishment of three Continuous Ambient Air Quality Monitoring (CAAQM) with meteorological data in the Tarapur industrial area is also proposed by the regional office.
- Establishment of eight monitoring stations under the National Water Quality Monitoring Program (NWMP).
- Steps are taken for industrial area/other units to recycle 100% treated effluent to achieve zero liquid discharge (ZLD) -120
- Use of clean fuel (PNG) is encouraged to reduce dust emissions by industries.
- Total 978 trees are planted in last one year (2021-2022).
- Other initiatives taken to control and reduce pollution in air, surface water and groundwater in last one year (2021-2022):
    a) Arrested of MIDC nalla and taken into CETP.
    b) CETP inlet parameter is within prescribed standards.
    c) Installation of Two-way SCADA, positive discharge system, NRV nalla, SCADA is centrally controlled.
    d) Vigilance & monitoring of area.

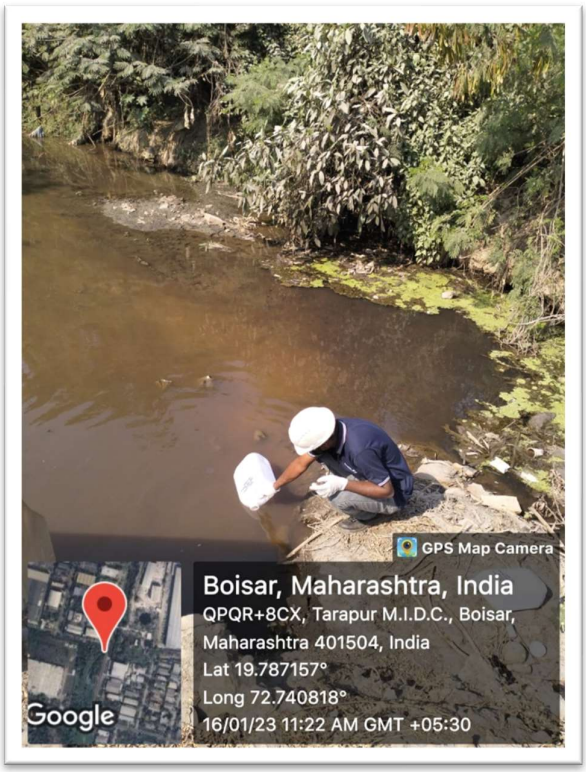
Continuous Ambient Air Quality Monitoring Station (CAAQMS)

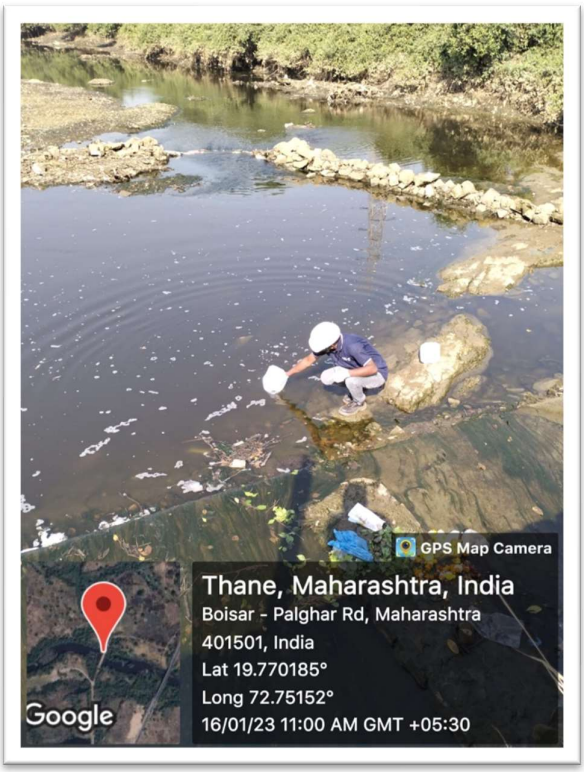
Ambient Air Quality Monitoring (AAQM) Van

12. Photographs

Ambient Air Sampling at Sumitomo Chemical India Pvt Ltd.

Ambient Air Sampling at Lupin Ltd.





Surface water sampling at over flow sump – 1 nallah	Surface water sampling at Nallah to Saravalli
	
Groundwater sampling at Gharat wadi	**Groundwater sampling at Shivaji nagar**

HEALTH STATISTICS

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

Name of the Polluted Industrial Area (PIA)	TARAPUR
Name of the major health center/ organization	GOVERNMENT HOSPITAL
Name and designation of the Contact person	Mrs. Savita S. Bagul
Address	R. H. Boisar.

S No.	Diseases	No. of Patients Reported	
		2022 (Jan-Dec)	2021 (Jan-Dec)
AIRBORNE DISEASES			
1.	Asthma	12	19
2.	Acute Respiratory Infection	107	253
3.	Bronchitis	0	0
4.	Cancer	0	02
WATERBORNE DISEASES			
1.	Gastroenteritis	28	05
2.	Diarrhea	67	128
3.	Renal diseases	0	0
4.	Cancer	0	02

Date: 21/1/2023

Signature

S Bagul

R. H. Boisar.

Medical Superintendent
Class-I
RURAL HOSPITAL BOISAR

HEALTH STATISTICS

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

Name of the Polluted Industrial Area (PIA)	TARAPUR
Name of the major health center/ organization	THUNGA HOSPITAL
Name and designation of the Contact person	SANTHOSHA SHETTY (ADMIN Officer) 8380005944
Address	AM-32, Tarapur M.I.D.C., Boisar, Maharashtra 401506

S No.	Diseases	No. of Patients Reported	
		2022 (Jan-Dec)	2021 (Jan-Dec)
AIRBORNE DISEASES			
1.	Asthma	328	454
2.	Acute Respiratory Infection	2	22
3.	Bronchitis	17	6
4.	Cancer	2	3
WATERBORNE DISEASES			
1.	Gastroenteritis	142	108
2.	Diarrhea	10	12
3.	Renal diseases	45	41
4.	Cancer	–	–

Date: 20/01/2023

Signature

THUNGA HOSPITAL PVT. LTD. TMRCT * BOISAR 401 506