

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI
(Through Video Conferencing)**

**Original Application No.92/2018 (WZ)
[Earlier O.A. No.1A/2018(WZ)]**

Vanshakti & Ors.

... Applicants

v/s

MPCB & Ors.

... Respondents

Submission of Report in compliance of Order dated 01/07/2020 passed by this Hon'ble NGT.

- (1) In compliance of Order dated 01/07/2020 passed by this Hon'ble Tribunal, the Respondent Board had issued Work Order dated 31/12/2020 to The Energy and Resources Institute (TERI) for Assessment of Ambient Air Quality in the nearby vicinity of brick kilns in Thane and Palghar Districts, Maharashtra.
- (2) As per the said Work Order, the Theoretical Report of July, 2021 submitted by TERI regarding Assessment of Ambient Air Quality in the nearby vicinity of brick kilns in Thane and Palghar Districts, Maharashtra was filed before this Hon'ble Tribunal in the month of July, 2021 and prayed before this Hon'ble Tribunal to grant 6 months time for submission of the Report.
- (3) Now, the TERI has submitted the Baseline Report of December, 2021 about the Assessment of Ambient Air Quality in the nearby

vicinity of brick kilns in Thane and Palghar Districts, Maharashtra.

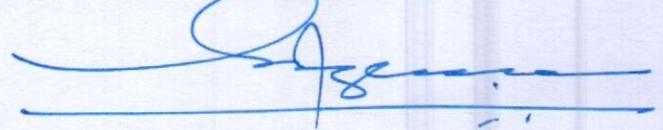
The conclusion of the Report is as follows :-

- (i) The concentration levels for PM₁₀ at the sampling locations were observed to be higher by 1.28- 3.75 times as compared to the prescribed standard limit (100 µg/m³) at all locations of industrial / residential / ecological sensitive areas.
- (ii) At the sampling locations for PM_{2.5}, two locations namely Bhiwandi-Wada (L-1) and Kawad Village, Koliwali (L-3) exceeded the standard limits (60 µg/m³) by 1.2 times respectively.
- (iii) All locations recorded SO₂ and NO₂ in the prescribed limits (80 µg/m³) at the sampling locations.
- (iv) It was concluded that higher PM¹⁰ concentration at all locations during the study period could be due to the on-site preparatory operations of brick kilns such as assembling the raw material, loading and unloading of soil, fuel material, activities like digging or preparation of soil on field, transportation.
- (v) During the monitoring phase, none of the brick kilns were actually burning the fuel and baking the bricks, which would start in the month of January, 2022.
- (vi) Therefore, as per the protocol, TERI shall be carrying out monitoring again when all the kilns are fully operational to assess the actual contribution of this sector to the overall air quality of the region.

A copy of the Baseline Report of December, 2021 about the Assessment of Ambient Air Quality in the nearby vicinity of brick kilns in Thane and Palghar Districts, Maharashtra is enclosed herewith and marked as an **Annexure-‘I’**.

- (4) In view of the above, the Respondent Board will submit the Final Report of Assessment of Ambient Air Quality in the nearby vicinity of brick kilns in Thane and Palghar Districts, when all the brick kilns are fully operational, so as to assess the actual contribution of this sector to the overall air quality of the region.

For and on behalf of Maharashtra
Pollution Control Board



(Dr.V.M. Motghare)
Joint Director(APC)

Place : Mumbai
Date : 7/3/2022

**Assessment of ambient air quality in the nearby
vicinity of brick kilns in Thane and Palghar
district, Maharashtra**

Submitted to

Maharashtra Pollution Control Board (MPCB)

Prepared by

The Energy and Resources Institute (TERI)

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Background

India is one of the 12 mega biodiversity countries in the world, harboring nearly 7-8% of the recorded species of the world¹. The country has a network of 981 Protected Areas (PAs) including 104 National Parks (NPs), 566 Wildlife Sanctuaries (WLSs), 97 Conservation Reserves and 214 Community Reserves covering a total of 1,71,921 km² of the geographical area of the country². To create some kind of "shock absorbers" around the protected areas by regulating and managing the activities in such areas; the Ministry of Environment Forests and Climate Change (MoEFCC) under the provisions of the Environment Protection Act of 1986 adopted the concept of Eco Sensitive zones (ESZs)^{3,4}. Also, the National Wildlife Action Plan 2002-2016 had identified eco sensitive zones as "vital ecological corridor links" and stressed that they must be protected to prevent isolation of fragments of biodiversity. However, owing to the anthropogenic pressures exerted due to urbanization, infrastructure development, agricultural activities, poaching and so on; these ESZs around such protected areas are under immense threat.

The state of Maharashtra, with a protected area network of about 3.03% of its total geographic area is having a presence of about 6 NPs, 48 WLS and 6 conservation reserves⁵. The eco sensitive zones created around these protected areas are experiencing increased human interference through encroachment. This interference is severely impacting the ESZs. One such PA is Tungareshwar WLS (lies in the vicinity of Thane and Palghar districts) which is having an ESZ declared by the Maharashtra Government (vide Resolution No. WLP 10-02ICR-47/F-1)⁶ on 24th October 2003. This WLS is spread over 85sq km and as per the notification, the ESZ around the boundary of Tungareshwar WLS varies from 100 meters to 4.0 kilometers. There are three different types of Forests namely Dry Deciduous, Moist Deciduous and Semi Evergreen in Tungareshwar which supports rich biodiversity which includes 600 species of plants, over 250 species of birds, 150 species of butterflies, and 36 species of herpetofauna⁷. It is also a popular destination for trekkers with the famous Shiv temple located around 3 km from the gate of the sanctuary.

- **Tungareshwar WLS is a critical wildlife corridor** between Sanjay Gandhi NP (also known as Borivali NP) and Tansa WLS and acts as a **buffer zone for the Mumbai Metropolitan Region (MMR)**
- **There are increased anthropogenic pressures** like uncontrolled tourism, deforestation, illegal construction, encroachment for agriculture, and poaching. These pressures further impact the ecological balance of Tungareshwar⁸.
- **Unorganized traditional (clamp) type brick kilns operational in the nearby regions** (Vasai and Bhiwandi) of Tungareshwar WLS.

¹ <https://www.cbd.int/countries/profile/?country=in>

² https://wii.gov.in/nwdc_aboutus#:~:text=India%20has%20a%20network%20of,country%20which%20is%20approximately%205.03%25

³ <https://journalsofindia.com/eco-sensitive-zones-esz/>

⁴ <http://moef.gov.in/wp-content/uploads/2017/06/1%20Guidelines%20for%20Eco-Sensitive%20Zones%20around%20Protected%20Areas.pdf>

⁵ <https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-maharashtra.pdf>

⁶ <http://moef.gov.in/wp-content/uploads/2018/12/tungareshwar.pdf>

⁷ <http://moef.gov.in/wp-content/uploads/2018/12/tungareshwar.pdf>

⁸ <https://www.natureinfofocus.in/travel/guide/tungareshwar-wls>

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

{The bricks produced from these kilns use coal as a fuel for brick production. Coal burning emits air pollutants like Particulate Matter - PM₁₀ & PM_{2.5}, Sulphur dioxide (SO₂), Nitrogen dioxide (NO₂), Nitrogen oxide (NO), Carbon monoxide (CO), Carbon dioxide (CO₂), Metals, Total Organic Compounds (TOC) (including methane, ethane, Volatile Organic Compounds [VOCs], and some Hazardous Air Pollutants [HAPs], and fluorides), into the environment⁹. The operations of such kilns in such a fragile eco region would seriously degrade the environment}.

Taking the above scenario into consideration and its associated impact on ambient air quality Vanashakti, a Mumbai based nonprofit, non-governmental environmental organization has filed an application that had sought action – both closure and penal -- against brick kiln manufacturers operating without licenses and environment clearance in the MMR¹⁰. In response, the Hon'ble NGT against the application No.1A/2018 (WZ) of the NGO has directed MPCB and the District Collector, Palghar to inspect the area where the illegal brick kilns are said to be operating and if upon inspection, it is found that the brick kilns are indeed operating without the necessary consent to operate and other clearances under the Rules, appropriate action to be taken against them in accordance with the law.

The report submitted by Maharashtra Pollution Control Board (MPCB) to NGT stated that the areas of concern are villages in Palghar and Thane district which are close to Tungreshwar WLS and other natural entities. NGT further directed CPCB and MPCB to conduct an assessment study of ambient air quality monitoring and suggest opinions on how brick kilns can be allowed in the region without damage to the air quality, number of brick kilns to be allowed and criteria for fixing such numbers.

Further to this, MPCB has issued the work order No.BO/JD (APC)/Brick Kilns/TB-2-B-201231-FT5-0105 to TERI on 31st December 2020 for carrying out an "Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra."

As per the scope of work, TERI has defined the following project objectives

⁹ G. Kornelius, *Atmospheric emissions from clamp kilns in the south african clay brick industry*, 2015

¹⁰ <https://www.hindustantimes.com/india-news/ngt-directs-pollution-control-bodies-to-study-impact-of-brick-kilns-on-mmr-air-quality/story-UA7FzYFzISHgoAVOuQDmVL.html>

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

Project Objectives and Work Update:

Objectives	Action taken by TERI
1) To conduct site survey of selected operational brick kilns in consultation with MPCB for Thane and Palghar district to understand: <ul style="list-style-type: none"> ✓ Geographical Location (Rural/Urban/Peri-Urban) ✓ Capacity of brick kiln ✓ Scale of Operation ✓ Duration of Operation ✓ Technology adopted ✓ Raw Material ✓ Fuel type and Consumption ✓ Consent and NOC from other departments 	<ul style="list-style-type: none"> ✓ TERI had several interactions with MPCB officials to get information about the active brick kilns in the Thane and Palghar District. ✓ 1st Site survey (for obtaining basic information) of 20 locations (14 in Palghar and 6 in Thane district) dated 12th July, 2021 - Survey report submitted on 16th July, 2021 ✓ 2nd site visit (to finalize brick kiln locations) dated 1st – 2nd November, 2021 – Survey report submitted on 9th November, 2021
2) To carry out ambient air quality monitoring in the vicinity of brick kilns in Thane and Palghar districts	AAQM conducted at selected 10 locations from 8 th to 12 th December 2021
3) To carry out stack emission monitoring of select brick kilns	There are only clamp type of brick kilns listed in the specified districts hence stack monitoring will not be possible.
4) To compare the results with existing ambient air quality/emissions standard prescribed by Central Pollution Control Board (CPCB)	Refer Figure No. 3 (Concentration levels of PM ₁₀ , PM _{2.5} , SO ₂ and NO ₂ across the 10 brick kilns in Thane and Palghar District) and Annexure 1 of this report
5) Scope of fly ash utilization in brick manufacturing	Review has been submitted dated 17 th April 2021
6) To submit a report on the monitoring carried out and infer upon the monitored status with the prescribed standard limits for the various parameter, wherever applicable	The assessment will be carried out in 2 steps: <ol style="list-style-type: none"> 1. Baseline- To monitor the level of pollutants when the kilns are not operational. (Nov- Dec 2021) 2. AQM assessment when the kilns get fully operational (Feb- March 2022)
7) To submit suggestions on how brick kilns can be allowed and criteria for fixing such numbers in the region without damaging the air quality	TERI had clearly stated in its acceptance of the work order that a separate set of study is required to fulfill this objective

Baseline (To provide concentration values of pollutants when the Brick kilns are not functional) Ambient Air-Quality (AAQ) Monitoring at Thane and Palghar districts

The main objective of AAQ monitoring was to generate the baseline data of ambient concentrations of SO₂, NO₂, PM₁₀ and PM_{2.5} around the brick kilns located in the vicinity of the Tungareshwar sanctuary. The brick kilns were not in operation during the ambient air monitoring.

Methodology:

To estimate the concentration levels of Particulate matter, SO₂ and NO₂ generated due to the brick kilns in the vicinity of Tungareshwar WLS air quality monitoring was carried out at ten monitoring locations specified by MPCB. The power supply at all these locations was uninterrupted at the time of monitoring.

Site selection

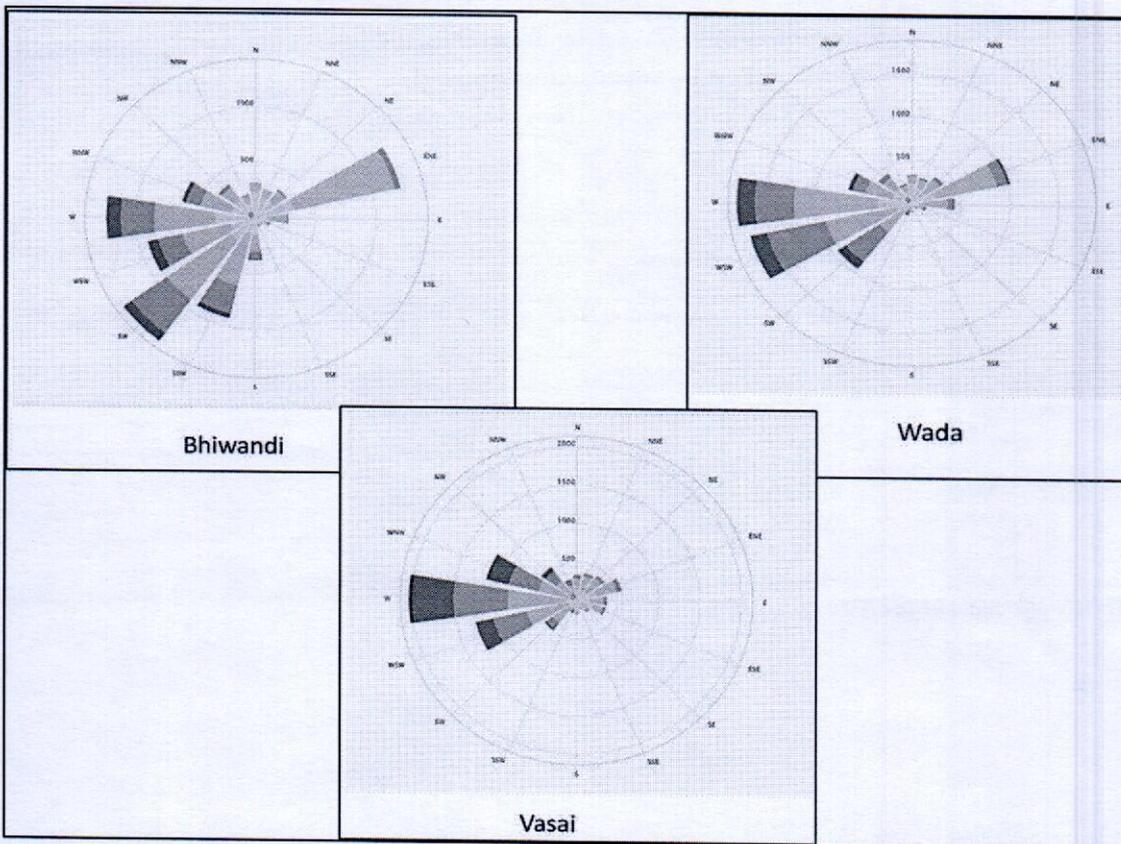


Figure No. 1: Windrose diagram for Bhiwandi, Wada and Vasai region

Source : https://www.meteoblue.com/en/weather/archive/windrose/bhiwandi_india_1275901

As represented in Figure No.1, the wind direction in the specified zone is towards East from West and South-West direction. Therefore a specific location in the upwind direction with respect to the Brick Kiln clusters was chosen to provide a baseline/ control reading at each region which include Bhiwandi (B1), Wada (W1) and Vasai (V1) henceforth referred to as the Control Locations (CLB1, CLW1 and CLV1 respectively). It was also ensured that there were no

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

brick kilns in the nearby areas or upward of this Control Location.

The entire ambient air quality monitoring exercise was carried out during the month of December (between 8th and 12th) of 2021 and the air quality monitoring was carried out continuously for 24-hours.

Thane district	Palghar district	
Bhiwandi (Total 4 locations)	Wada (Total 2 locations)	Vasai (Total 4 locations)
<ul style="list-style-type: none"> • 1 location in Upwind Direction (CL) • 3 locations in Downwind direction 	<ul style="list-style-type: none"> • 1 location in Upwind Direction (CL) • 1 location in Downwind direction 	<ul style="list-style-type: none"> • 1 location in Upwind direction (CL) • 3 locations in Downwind direction

The monitoring schedule of monitoring is given in Table No.1. The details of the monitoring locations are given in Table No.2 and spatial representation is given in Figure No.2.

Table No. 1 Monitoring Schedule of Ambient air quality monitoring at Thane and Palghar District

Sr. No.	District	Region	Location	Date of monitoring (December, 2021)				
				8	9	10	11	12
1	Thane	Bhiwandi	Bhiwandi-Wada Road, Koliwali, Bhiwandi					
2			Kawad Village, Koliwali (3 Nos. Brick kilns)					
3			Kawad Village, Koliwali					
4			Ambika City (Upwind)					
5	Palghar	Wada	Dakiwali village					
6			Sai Mandir, Keltan (Upwind)					
7		Vasai	Shimla Dhudh Dairy					
8			Stelmech Industry					
9			Aqua water filter factory					
10			Sarpanch Home (Upwind)					

24 hour sampling carried out for 3 days/location

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

Sampling Sites

The details of monitoring locations and status of brick kilns are tabulated in Table No.1

Table No. 2: Details of monitoring locations and status

Sr. No.	District	Region	Location code	Location	Status of Brick kiln	Brick Kiln		AAQ Machines		Approx. Distance between Brick kiln and monitoring machine (Km)	Approx. Distance between Monitoring machines and boundary of Tungreshwar WLS (Km)
						Latitude	Longitude	Latitude	Longitude		
1.	Thane	Bhiwandi	L-1	Bhiwandi-Wada Road, Koliwali, Bhiwandi	Non operational	19.35016	73.0723	19.35012	73.07294	0.04	2.83
2.			L-2	Kawad Village, Koliwali (3 Nos. Brick kilns)*		19.35643	73.0665	19.356419	73.066579	0.01	2.22
						19.35593	73.0663				
						19.35594	73.0670				
3.		L-3	Kawad Village, Koliwali	19.35533	73.0695	19.35530	73.06956	0.02	2.50		
4.		CLB1 (L-4)	Ambika City (Upwind)	Control reading		19.33318	73.06551	NA	2.30		
5.	Palghar	Wada	L-5	Dakiwali village	19.50401	73.0475	19.50430	73.04738	0.05	4.63	
6.			CLW1 (L-6)	Sai Mandir, Keltan (Upwind)	Control reading		19.49751	73.03496	NA	3.59	
7.		Vasai	L-7	Shimla Dhudh Dairy	19.47041	72.9237	19.47724	72.90345	2.3	1.69	
8.			L-8	Stelmeh Industry	19.47038	72.9237	19.46886	72.92644	0.35	0.91	
9.			L-9	Aqua water filter factory	19.47034	72.9238	19.46265	72.94190	2.2	0.91	
10.			CLV1 (L-10)	Sarpanch Home (Upwind)	Control reading		19.45704	72.94481	NA	0.67	

*Control reading highlighted in blue. Note: *Single monitoring machine was used for 3 locations (@ Kawad Village, Koliwali) considering their close proximity.

Representative District wise photos of Brick kilns and monitoring machines are attached as Annexure 1

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

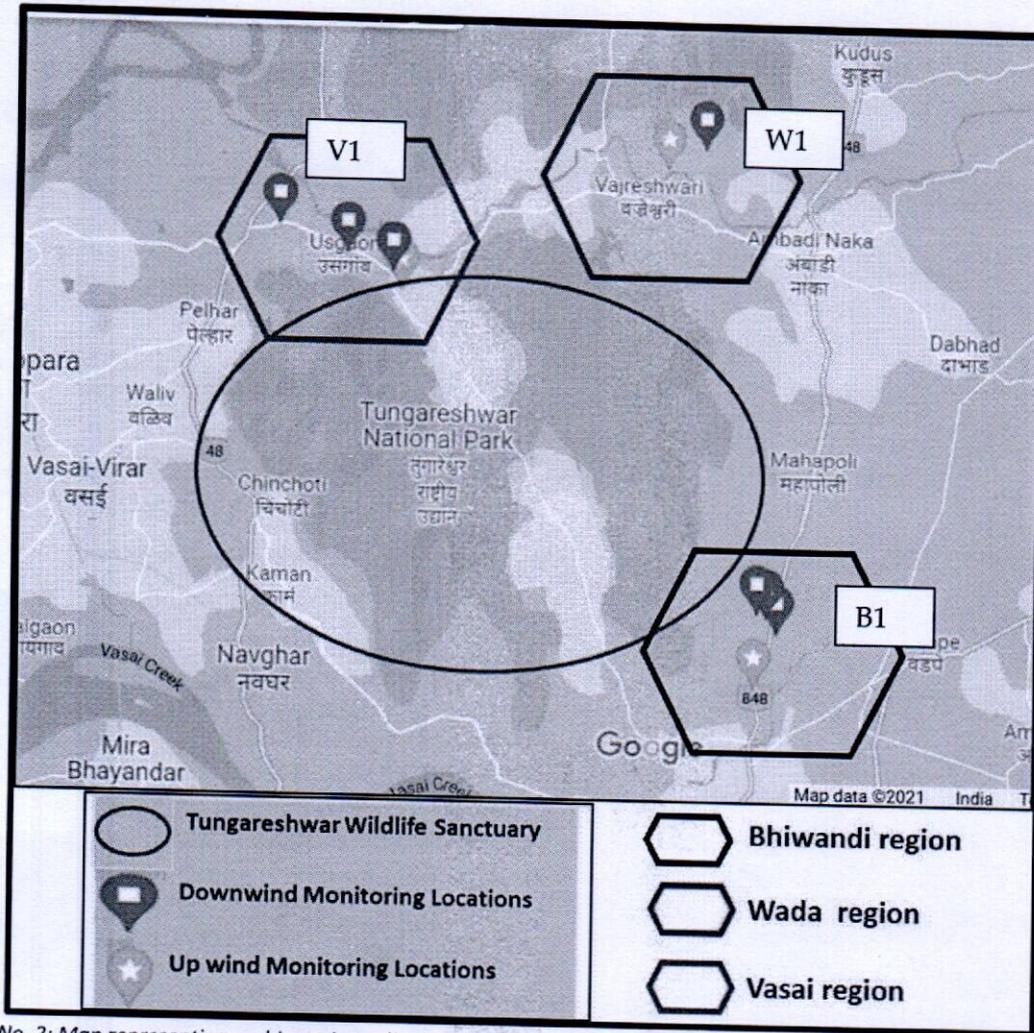


Figure No. 2: Map representing ambient air quality monitoring locations around Tungareashwar Wildlife sanctuary

The methods followed are strictly in accordance with the guidelines laid down by the Central Pollution Control Board (CPCB) and Bureau of Indian Standards (BIS). The summary of the sampling and monitoring techniques is given below in Table: 3

Table No. 3 Summary of sampling and monitoring techniques

Pollutant	Sampling and measurement Techniques	Method
PM ₁₀ /PM	PM ₁₀ /PM _{2.5} Sampler	Gravimetric
SO ₂ , NO ₂	Absorption and analysis by wet chemical methods(modified West & Gaeke method for SO ₂ & Jacob & Hochheiser modified Na- Arsenite method for NO ₂	SO ₂ – IS 5182 (Part 2): 2017 NO ₂ – IS 5182 (Part 6): 2017

Observation and Results of Baseline Ambient Air-Quality (AAQ) Monitoring at Thane and Palghar districts

The results of the ambient air quality monitoring carried out at various locations are summarized in Table 4. The results are compared with National Ambient Air Quality Standard prescribed by the Central Pollution Control Board (CPCB).

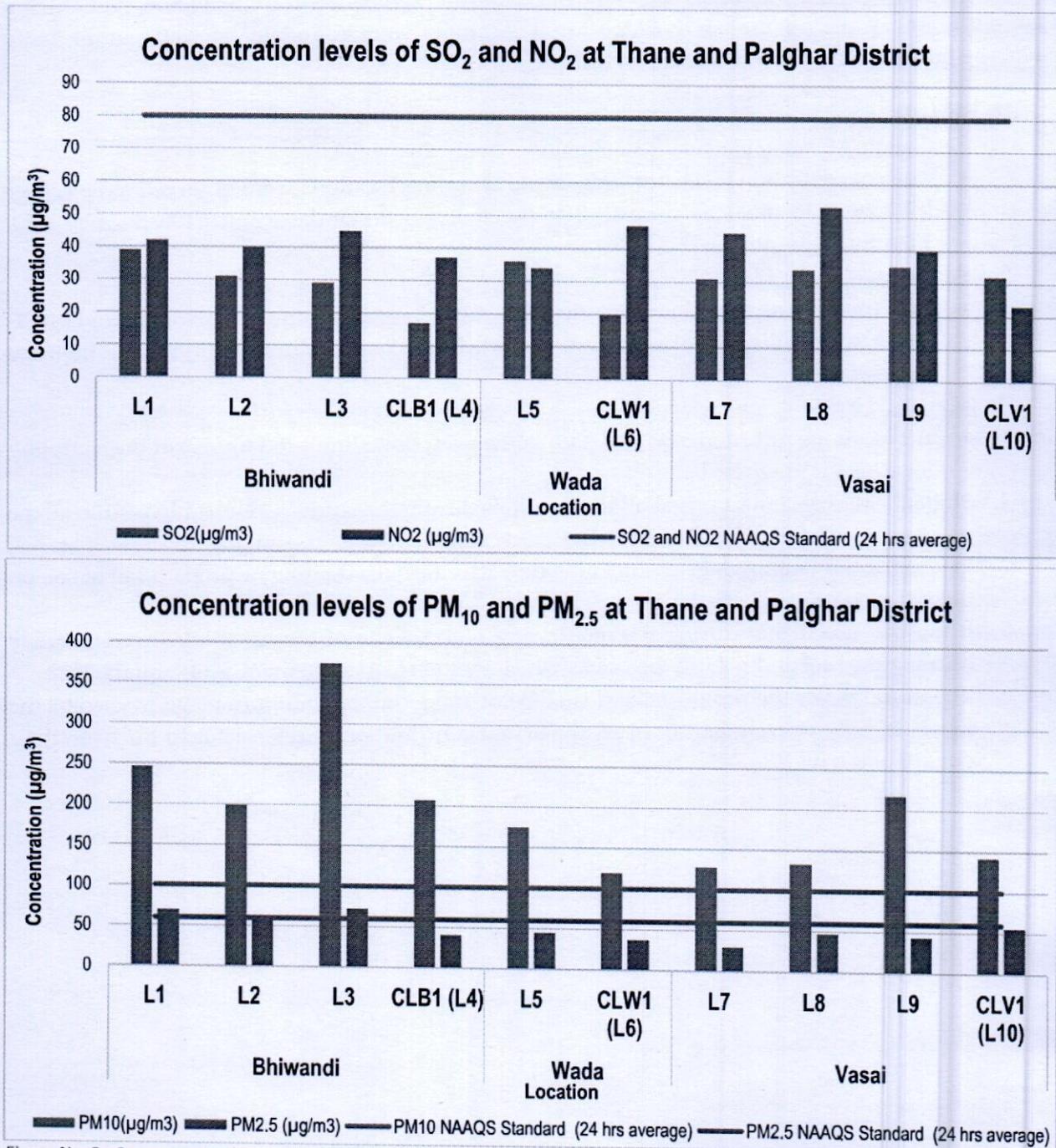


Figure No. 3 : Concentration levels of SO₂, NO₂, PM₁₀, PM_{2.5} across the 10 brick kilns in Thane and Palghar District

The details of the concentration levels across 10 brick kilns at Thane and Palghar District as Annexure 2

During monitoring, the levels of particulate matter PM₁₀ at all the locations violated the 24-hr standard of 100µg/m³ for industrial/residential/ecological sensitive areas, while PM_{2.5} were found to be within the 24-hrs standard of 60µg/m³ for most of the locations except location 1 (Bhiwandi-Wada) and location 3 (Kawad Village, Koliwali) respectively. The average PM₁₀ levels across various locations ranged between 120-374µg/m³ and the corresponding PM_{2.5} levels at different locations varied between 30-72 µg/m³. The concentrations of SO₂, NO₂ during the entire study period for all the monitored locations were found to be well within 24hrs average limits of 80µg/m³ prescribed by CPCB.

Conclusion

1. Particulate Matter (10)
 - The concentration levels for PM₁₀ at the sampling locations were observed to be higher by 1.28 -3.75 times as compared to the prescribed standard limit (100 µg/m³) at all monitoring locations
2. Particulate Matter (2.5)
 - In terms of sampling locations for PM_{2.5}, two locations namely Bhiwandi-wada (L-1) and Kawad Village, Koliwali (L-3) exceeded the standard limit (60µg/m³) by 1.2 times respectively.
3. SO₂ and NO₂
 - All locations recorded SO₂ and NO₂ in the prescribed limits (80 µg/m³) at the sampling locations
4. Higher PM₁₀ concentrations at all the locations during the study period could be due to the on-site preparatory operations of the Brick Kilns such as assembling the raw material, loading and unloading of soil, fuel material, activities like digging or preparation of soil on field, transportation. .
5. It may be noted that during the monitoring phase, none of the brick kilns were actually burning the fuel and baking the bricks which would start in the months of January 2022
6. Therefore, as per the protocol, TERI shall be carrying out the monitoring again when all the kilns are fully operational to assess the actual contribution of this sector to the overall air quality of the region.

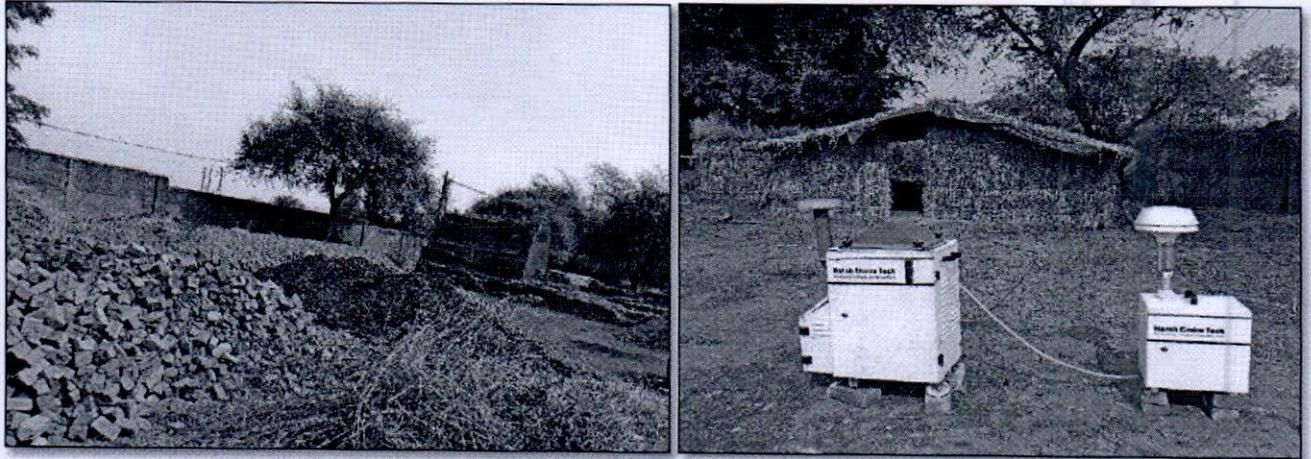
Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

Annexure 1- District wise representative photos of Brick kilns and monitoring machines

1. Thane District

Monitoring Locations at Bhiwandi

Location 1 (L1): Bhiwandi-Wada Road, Koliwali, Bhiwandi



Picture No. 1: Brick kiln (above) and Monitoring Equipment set up in the vicinity of L1 (below)

2. Palghar District

a) Monitoring Locations at Wada

Location 5: (L5) Dakiwali Village, Wada

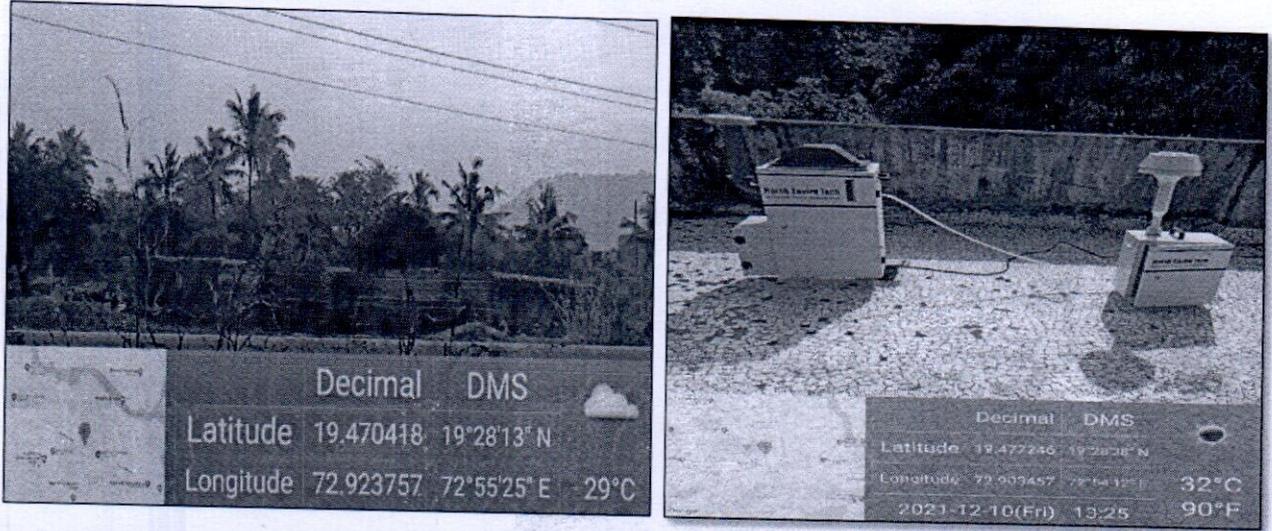


Picture No. 2: Brick kiln (above) and Monitoring Equipment set up in the vicinity of L5 (below)

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

b) Monitoring locations at Vasai

Location 7 (L7): Shimla Dhudh Dairy, Vasai



Picture No. 3: Brick kiln (above) and Monitoring Equipment set up in the vicinity of L7 (below)

Assessment of ambient air quality in the nearby vicinity of brick kilns in Thane and Palghar district, Maharashtra

Annexure 2- Details of the concentration levels across 10 brick kilns at Thane and Palghar District

Table No. 4: Results of ambient air quality monitoring

Region	Location code	Location	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)
Standard - 24-hr average NAAQS			60	100	80	80
Bhiwandi	L1	Bhiwandi-Wada Road,	47-91(69)	240-252(246)	35-43(39)	40-43(42)
	L2	Kawad Village, Koliwali near Kiln -3 Nos.	28-88(58)	196-202(199)	25-37(31)	26-55(40)
	L3	Kawad Village ,Koliwali	57-86(72)	320-428(374)	21-37(29)	44-45(45)
	CLB1 (L4)	Ambika City (Upwind)	35-48(41)	140-275(207)	15-18(17)	33-41(37)
Wada	L5	Dakiwali village	32-58(45)	132-218(175)	32-40(36)	33-34(34)
	CLW1 (L6)	Sai Mandir, Keltan (Upwind)	30-45(37)	104-135(120)	18-22(20)	45-48(47)
Vasai	L7	Shimla Dhudh Dairy	23-37(30)	115-141(128)	28-34(31)	42-48(45)
	L8	Stelmech Industry	31-62(47)	130-135(133)	34-34(34)	51-55(53)
	L9	Aqua water filter factory	38-51(44)	212-224(218)	31-39(35)	37-44(40)
	CLV1 (L10)	Sarpanch House	49-63(56)	132-151(142)	31-34(32)	18-28(23)

*values are in the form Min-Max (Mean)
Control reading highlighted in blue.