

Six-Months Compliance Status Report of Talcher Fertilizers Limited, Talcher, Odisha

October 2019 – March 2020
Report



CSIR-National Environmental Engineering Research Institute
Nehru Marg, Nagpur

1.0 About the Industry

In 1971, The Fertilizer Corporation of India Ltd. (FCIL), set up Talcher Unit over an area of 902 acre in the district of Angul, Odisha which is located about 126 km away from Bhubaneswar to produce urea using coal as feed stock. Licensor for the Coal gasification was M/s Krupp Koppers, Germany and for Ammonia and Urea units Ammonia synthesis, M/s Tecnimont, Italy.

Commercial Production of Ammonia and Urea commenced on 01.11.1980 with Ammonia and Urea production capacity of 900 and 1500 Tons per day respectively. However due to frequent power restriction, obsolete and mismatch of technology and precarious steam balance the plant could not be sustained. The Board for Industrial and Financial Reconstruction (BIFR) declared the FCIL sick in 1992 and in 2002 Government of India initiated actions to close the company.

Due to shortage of domestic Urea and availability of large land banks, infrastructure and tied-up rail, water & electricity in the units of FCIL, GoI in the year 2007 decided to revive all units of FCIL. Government of India approved Policy for new Investments in the Urea Sector in September 2008 and constituted Empowered Committee of Secretaries (ECOS) in October 2008 with the mandate to evaluate all options of revival of closed units of FCIL/HFCL and to make suitable recommendations for consideration of the Government. In August, 2011, the Cabinet Committee on Economic Affairs (CCEA) had approved the Draft Rehabilitation Scheme (DRS) for revival of all the Units of FCIL and HFCL. DRS envisaged revival of Talcher Unit by the consortium of M/s.Rashtriya Chemical & Fertilizers Limited (RCF), M/s Coal India Limited (CIL) and M/s GAIL (India) Ltd. (GAIL).

2.0 About the Report

TFL received environmental clearance from MoEF&CC (F. No. J-11011/231/2013-1A-II(I) dated 9th February, 2018) for Setting up Ammonia & Urea Fertilizer Unit at Village Vikrampur, Tehsil Talcher, District Angul (Odisha); under the provisions of EIA Notification, 2006 and the amendments made therein, subject to the compliance of terms and conditions (**Annexure**

1):According to the suggestion given by MoEF&CC, six-month environmental status report should be furnished to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and SPCB. In this regard, the environmental monitoring was carried out by CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur for the period of October 2019 to March 2020. Monitoring in March 2020 couldn't be completed due to the COVID 19 pandemic and associated lockdown. The report is formulated based on the data provided by CSIR-NEERI.

3.0 EC Compliance Form

Compliance status of EC terms and conditions

Sr. No.	EC Terms and Conditions	Compliance Status
(i)	In view of the base line air quality data for PM ₁₀ already exceeding the prescribed standards, one more season data to be collected to confirm the consistency of readings/values, and for suggesting mitigating measures accordingly.	<ul style="list-style-type: none"> Monitoring of PM₁₀ has been completed for the period October 2019 to March 2020. Copy of the same is enclosed in this report.
(ii)	The project proponent shall, take stringent mitigating measures to minimize the incremental concentration of air pollutants (mainly PM ₁₀ & PM _{2.5}) to the extent possible due to the proposed industrial operations.	<ul style="list-style-type: none"> As the monitored results are well within the specified limits no additional measures are proposed to be installed.
(iii)	The project proponent shall develop local air quality management plan in consultation with SPCB and implemented to achieve desired standards.	<ul style="list-style-type: none"> Compliance Assured
(iv)	The incremental ground level concentrations (GLCs) for PM ₁₀ , PM _{2.5} , SO ₂ & NO ₂ due to the increased vehicular and other allied / developmental activities, shall be analysed and reported for actual impact of the project, besides remedial measures.	<ul style="list-style-type: none"> Compliance Assured To check the incremental increase in air pollutants during construction phase, two monitoring stations were selected in the project site. The data is included in this report. As indicated in EIA the major transport of raw material will be by conveyor and hence no impact on GLC due to transport is expected.
(v)	Consent to Establish/Operate for the project shall be obtained from the State	<ul style="list-style-type: none"> Consent to Establish is received.

	Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.	
(vi)	As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste/treated water shall be discharged outside the premises.	<ul style="list-style-type: none"> Feasibility study for ZLD will be undertaken and appropriate treatment/recycling method will be selected to achieve ZLD.
(vii)	Necessary authorization required under the Hazardous and Other Wastes (Management and Trans-Boundary Movement) Rules, 2016, Solid Waste Management Rules, 2016 shall be obtained and the provisions contained in the Rules shall be strictly adhered to.	<ul style="list-style-type: none"> Compliance Assured. It will be obtained in consent to operate.
(viii)	National Emission Standards for Organic Chemicals Manufacturing Industry issued by the Ministry vide G.S.R, 608(E) dated 21st July, 2010 and amended from time to time shall be followed.	<ul style="list-style-type: none"> Compliance Assured
(ix)	To control source and the fugitive emissions, suitable pollution control devices shall be installed to meet the prescribed norms and/or the NMQS. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/SPCB guidelines.	<ul style="list-style-type: none"> Plants will be designed with state of Art technologies with inbuilt pollution control systems so that the prescribe norms and fugitive emissions will be under control.
(x)	Total fresh water requirement shall not exceed 49200 cum/day to be met from surface water from Brahmini River. Prior permission in this regard shall be obtained from the concerned regulatory authority.	<ul style="list-style-type: none"> Fresh Water source will be received from the stipulated source. And all necessary permissions will be ensured prior to installation of the project.
(xi)	Process effluent/any wastewater shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.	<ul style="list-style-type: none"> Compliance Assured.
(xii)	Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc, Flame arresters shall be provided on tank farm, and solvent transfer through pumps.	<ul style="list-style-type: none"> Compliance Assured.
(xiii)	ETP sludge, process inorganic & evaporation salt, if any, shall be disposed off to the TSDF.	<ul style="list-style-type: none"> Compliance Assured

(xiv)	The Company shall strictly comply with the rules and guidelines under Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. All transportation of Hazardous Chemicals shall be as per the Motor Vehicle Act (MVA), 1989.	<ul style="list-style-type: none"> • Compliance Assured.
(xv)	The company shall undertake waste minimization measures as below: -	<ul style="list-style-type: none"> • Compliance Assured.
(a)	Metering and control of quantities of active ingredients to minimize waste.	
(b)	Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.	
(c)	Use of automated filling to minimize spillage,	
(d)	Use of Close Feed system into batch reactors.	
(e)	Venting equipment through vapour recovery system.	
(f)	Use of high pressure hoses for equipment clearing to reduce wastewater generation.	
(xvi)	The green belt of 5-10 m width shall be developed in more than 33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.	<ul style="list-style-type: none"> • The project activities will be implemented in existing site of TFL with lot of greenery and the guide line of 33% area under greenbelt out of total project area will be achieved.
(xvii)	All the commitment made regarding issues raised during the Public Hearing/consultation meeting held on 30th August ,2017 shall be satisfactorily implemented.	<ul style="list-style-type: none"> • CSR dept. will keep aside a sum for CSR activities for project to meet public hearing requirement to the practical extent possible for an industrial unit.
(xviii)	At least 2.5% of the total project cost shall be allocated for Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.	<ul style="list-style-type: none"> • Compliance Assured.
(xix)	For the DG sets, emission limits and the stack height shall be in conformity with the extant regulations and the CPCB guidelines, Acoustic enclosure shall be	<ul style="list-style-type: none"> • Compliance Assured.

	provided to DG set for controlling the noise pollution,	
(xx)	The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Firefighting system shall be as per the norms.	<ul style="list-style-type: none"> • Compliance Assured.
(xxi)	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.	<ul style="list-style-type: none"> • HR and OHC Dept. will conduct regular health checkups and records for the same will be maintained as per the Factories Act.
(xxii)	Continuous online (24x7) monitoring system for stack emissions shall be installed for measurement of flue gas discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For online continuous monitoring of effluent, the unit shall install web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises.	<ul style="list-style-type: none"> • Compliance Assured.

Compliance of other generic conditions

Sr. No.	EC proposal	Compliance Status
(i)	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board, Central Pollution Control Board, State Government and any other statutory authority.	<ul style="list-style-type: none"> • Compliance assured.
(ii)	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	<ul style="list-style-type: none"> • Compliance Assured.
(iii)	The locations of ambient air quality monitoring stations shall be decided in consultation with the State Pollution Control Board (SPCB) and it shall be ensured that at least one station each is Installed in the upwind and downwind direction as well as	<ul style="list-style-type: none"> • Compliance assured.

	where maximum ground level concentrations are anticipated.	
(iv)	The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 shall be followed,	<ul style="list-style-type: none"> • Compliance assured.
(v)	The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).	<ul style="list-style-type: none"> • Compliance assured.
(vi)	The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.	<ul style="list-style-type: none"> • Compliance assured.
(vii)	Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.	<ul style="list-style-type: none"> • Training on safety and health aspects of handling of chemicals used and MSDS will be imparted regularly.
(viii)	The company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, and risk mitigation measures relating to the project shall be implemented.	<ul style="list-style-type: none"> • Compliance assured
(ix)	The company shall undertake all relevant measures for improving the socioeconomic conditions of the surrounding area. ESC activities shall be undertaken by involving local villages and administration.	<ul style="list-style-type: none"> • CSR activities shall be undertaken by involving local and other stake holders.
(x)	The company shall undertake eco developmental measures including community welfare measures in the project area for the overall improvement of the environment.	<ul style="list-style-type: none"> • Greenery development in the area will be undertaken. Activities shall be undertaken for Developmental measures for welfare of overall environment.
(xi)	The. company shall earmark sufficient funds towards capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment, Forest and	<ul style="list-style-type: none"> • Compliance assured

	Climate Change as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management pollution control measures shall not be diverted for any other purpose,	
(xii)	A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zilla Parishad /Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.	<ul style="list-style-type: none"> Complied.
(xiii)	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and SPCB. A copy of .Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.	<ul style="list-style-type: none"> Compliance assured. We are submitting first six monthly compliance report for the TFL joint venture project.
(xiv)	The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail,	This will be complied after commencement of commercial production.
(xv)	The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry at http://moef.nic.in . This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local, newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional Office of the Ministry.	Compliance done.

(xvi)	The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.	This will be complied with. Presently, the site preparation work is under progress.
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4.0 Compliance report for EC condition 9(i): In view of the base line air quality data for PM₁₀ already exceeding the prescribed standards, one more season data to be collected to confirm the consistency of readings/values, and for suggesting mitigating measures accordingly.

The baseline status with respect to ambient air quality has been established through a scientifically designed ambient air quality monitoring network based on the following considerations:

- Meteorological conditions prevailing within study area;
- Topography of the study area;
- Representatives of background air quality; and
- Representatives of likely impact areas.

Air Quality monitoring has been conducted at eight sampling locations during October 2019 to February 2020. The location of ambient air sampling stations has been presented below in **Table 1**.

Table 1: Details of sampling locations

Sl. No	Location Name	With respect to Project Site	
		Dir.	Distance
01.	Tech. Building of FCI	-	-
02.	Housing Board Colony	ENE	1.2 km
03.	Karnpur village	W	4.5 Km
04.	TFL Guest House	-	-
05.	Balanda village	NW	2.5 Km
06.	Kukudanga village	SW	2.5 km

Salient features of the observations made with respect to PM₁₀ during the study period are summarized below in **Table 2** as under:

Table 2: Summary of PM₁₀ concentrations (µg/m³) (October 2019-February 2020)

Sampling Location	Min.	24-hr Average	Max.	NAAQS for PM ₁₀ µg/m ³
Technical Building of FCI	35	80	126	100
Housing Board Colony	28	80	138	
Karnpur village	25	74	119	
TFL Guest House	33	77	119	
Balanda village	62	123	178	
Kukudanga village	25	64	99	

The average concentrations of PM₁₀ at all the six sampling locations were observed in the range of 25 to 178 µg/m³. It has been observed that the minimum value of 25 µg/m³ have been observed at Kukudanga village, whereas the maximum value of 178 µg/m³ was observed at Balanda Village.

4.0 Compliance report for EC condition 9(iv):The incremental ground level concentrations (GLCs) for PM₁₀, PM_{2.5}, SO₂& NO₂ due to the increased vehicular and other allied / developmental activities, shall be analysed and reported for actual impact of the project, besides remedial measures.

Reconnaissance was undertaken to establish the existing status of air environment in the study region. Ambient Air Quality Monitoring (AAQM) locations were selected based on guidelines of network siting criteria based on meteorological data (October 2019 and February 2020). The ambient air quality monitoring was carried out in the study area of 10 km radial distance around the proposed site, details of these locations are presented in **Table 3**. Administrative

building, Bikrampur housing board colony and guest houses are near to the proposed project site. The average values of PM₁₀, PM_{2.5}, SO₂ and NO₂ are given in **Table 4 and 5**.

**Table 3 : Details of Air Quality Monitoring Locations
(Monsoon Season –October 2019 to February 2020)**

Sr. No.	Sample Code	Sampling Locations	Geographical Position
1.	TFL/A1	Administrative Building TFL	20°54'42.8" N 85°09'38.4" E
2.	TFL/A2	Housing Board Colony, Bikrampur	20°54'19.3" N 85°10'20.2" E
3.	TFL/A3	Village Karnapur	20°54'26.4" N 85°07'06.1" E
4.	TFL/A4	TFL-Guest House	20°54'14.8" N 85°09'56.9" E
5.	TFL/A5	Village Balanda	20°55'31.0" N 85°09'26.8" E
6.	TFL/A6	Village Kukudanga	20°53'23.3" N 85°08'50.8" E

Table 4 Air Quality Status (PM₁₀) within the Study Area

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀				
		October 2019	November 2019	December 2019	January 2020	February 2020
1	Administrative Building TFL	45	42	74	81	157
2	Housing Board Colony, Bikrampur	68	51	87	79	117
3	Village Karnapur	45	46	84	72	123
4	TFL-Guest House	35	33	68	76	172
5	Village Balanda	101	112	109	113	181
6	Village Kukudanga	30	31	77	69	112
	Permissible limits	100				

Table 4 Air Quality Status (PM_{2.5}) within the Study Area

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	PM _{2.5}				
		October 2019	November 2019	December 2019	January 2020	February 2020
1	Administrative Building TFL	24	27	36	39	94
2	Housing Board Colony, Bikrampur	67	52	39	32	101
3	Village Karnapur	35	29	31	36	90
4	TFL-Guest House	24	31	38	33	80
5	Village Balanda	78	69	87	69	92
6	Village Kukudanga	16	17	38	32	55
	Permissible limits	60				

Table 5 Air Quality Status (SO₂) within the Study Area Units: µg/m³Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂				
		October 2019	November 2019	December 2019	January 2020	February 2020
1	Administrative Building TFL	16	21	34	39	81
2	Housing Board Colony, Bikrampur	31	37	39	30	101
3	Village Karnapur	12	14	23	26	42
4	TFL-Guest House	18	19	43	45	91
5	Village Balanda	26	21	54	49	69
6	Village Kukudanga	16	17	42	45	50
Permissible limits		80				

Table 5 Air Quality Status (NO₂) within the Study Area Units: µg/m³Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂				
		October 2019	November 2019	December 2019	January 2020	February 2020
1	Administrative Building TFL	76	69	56	66	119
2	Housing Board Colony, Bikrampur	59	44	52	59	158
3	Village Karnapur	83	42	40	43	104
4	TFL-Guest House	54	48	57	63	134
5	Village Balanda	70	62	88	82	118
6	Village Kukudanga	37	27	43	47	110
Permissible limits		80				

Table 5 Air Quality Status (NH₃) within the Study Area Units: µg/m³Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	NH ₃				
		October 2019	November 2019	December 2019	January 2020	February 2020
1	Administrative Building TFL	35	29	33	41	59
2	Housing Board Colony, Bikrampur	37	43	35	31	41
3	Village Karnapur	38	38	38	44	46
4	TFL-Guest House	32	39	38	39	48
5	Village Balanda	44	42	56	52	72
6	Village Kukudanga	38	32	38	39	42
Permissible limits		400				

Baseline data provided in the EIA report clearly states that PM₁₀ and PM_{2.5} concentrations in the buffer area of proposed project site is quite high. The concentrations of PM₁₀ and PM_{2.5} were quite less during October and December but show increasing trends during the January to February period. Sites close to

coal mining areas like Balanda and Karnapur villages have shown great increase in particulate concentrations also exceeding the permissible values in the month of February.

Slight variations in SO₂, NO₂ and NH₃ were observed during the study period. However, all the values are within the permissible limits.

The detailed air monitoring report is enclosed as **Annexure 2**.

Annexure 1

Environmental Clearance Letter

F. No. J-11011/231/2013-IA-II(I)
 Government of India
 Ministry of Environment, Forest and Climate Change
 (IA- II Section)

Indira Paryavaran Bhawan
 Jorbagh Road, New Delhi -3

Dated: 9th February, 2018

To

M/s Talcher Fertilizers Ltd
 Village Vikrampur, Tehsil Talcher
 District Angul (Odisha)

Sub: Setting up Ammonia & Urea Fertilizer Unit at Village Vikrampur, Tehsil Talcher, District Angul (Odisha) by M/s Talcher Fertilizers Ltd - Environmental Clearance -reg.

Sir,

This has reference to your proposal No. IA/OR/IND2/58560/2013 dated 11th October, 2017, submitting the EIA/EMP report with public consultation details on the above subject matter.

2. The Ministry of Environment, Forest and Climate Change has examined the proposal for environmental clearance to the project for setting up ammonia & urea fertilizer unit based on coal gasification for production of 1.27 MMTPA of neem coated urea (end product) by M/s Talcher Fertilizers Ltd at Village Vikrampur, Tehsil Talcher, District Angul (Odisha).

3. The total land area of the project is 570 acre, out of which green belt will be developed in 180 acre. The cost of the project is Rs.10741.05 Crores. The project will provide employment to 1500 people during construction phase.

4. The proposed product/unit and capacity are as under:

S.No	Product/Unit	Capacity
1	Ammonia	2200 MTPD
2	Urea (Neem coated)	3850 MTPD
3	Coal Gasification Plant	Synthesis Gas: 242978 Nm ³ /hr

5. Total water requirement for the project is 49,200 m³/day. The permission for drawal of surface water from Brahmini River has been obtained from the State Government of Odisha vide letter No. 1513/SF/59 dated 3rd November, 2009.

The power requirement of 72 MW will be met from the Captive Power Plant. The raw Material required for the project are Coal, Pet Coke and lime stone. During initial stages of operation of the plant, coal shall be supplied through Bhubaneswari Coal Mine of M/s Mahanadi Coalfields Ltd. Later, the project proponent shall develop the dedicated coal mine for the procurement of coal in the desired quantity.

6. The project/activity is covered under category A of item 5(a) 'Chemical fertilizers' of the Schedule to the Environment Impact Assessment Notification, 2006, and requires appraisal at central level by the sectoral Expert Appraisal Committee in the Ministry.

7. The terms of reference (ToR) for the project was initially granted on 26th November, 2013, and then extended up to 25th November, 2017. The ToR was transferred in the name of M/s Talcher Fertilizers Ltd from M/s Rashtriya Chemicals & Fertilizers Ltd, vide Ministry's letter dated 27th September, 2017. Public hearing was conducted by the State Pollution Control Board on 30th August, 2017.



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8. The proposal for environmental clearance was considered by the EAC (Industry-2) in its meeting held on 12-13 October, 2017. The project proponent and the accredited consultant M/s Projects & Development India Ltd presented the EIA/EMP report. The committee found the EIA/EMP report satisfactory and recommended the proposal for environmental clearance with certain conditions.

9. Based on the proposal submitted by the project proponent and recommendations of the EAC (Industry-2), the Ministry of Environment, Forest and Climate Change hereby accords environmental clearance to the project 'Setting up Ammonia & Urea Fertilizer Unit for production of 1.27 MMTPA of Neem Coated Urea (end product)' by M/s Talcher Fertilizers Ltd at Village Vikrampur, Tehsil Talcher, District Angul (Odisha), under the provisions of EIA Notification, 2006 and the amendments made therein, subject to the compliance of terms and conditions, as under:-

- (i) In view of the base line air quality data for PM₁₀ already exceeding the prescribed standards, one more season data to be collected to confirm the consistency of readings/values, and for suggesting mitigating measures accordingly.
- (ii) The project proponent shall take stringent mitigating measures to minimize the incremental concentration of air pollutants (mainly PM₁₀ & PM_{2.5}) to the extent possible due to the proposed industrial operations.
- (iii) The project proponent shall develop local air quality management plan in consultation with SPCB and implemented to achieve desired standards.
- (iv) The incremental ground level concentrations (GLCs) for PM₁₀, PM_{2.5}, SO₂ & NO₂ due to the increased vehicular and other allied/developmental activities, shall be analysed and reported for actual impact of the project, besides remedial measures.
- (v) Consent to Establish/Operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.
- (vi) As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste/treated water shall be discharged outside the premises.
- (vii) Necessary authorization required under the Hazardous and Other Wastes (Management and Trans-Boundary Movement) Rules, 2016, Solid Waste Management Rules, 2016 shall be obtained and the provisions contained in the Rules shall be strictly adhered to.
- (viii) National Emission Standards for Organic Chemicals Manufacturing Industry Issued by the Ministry vide G.S.R. 608(E) dated 21st July, 2010 and amended from time to time shall be followed.
- (ix) To control source and the fugitive emissions, suitable pollution control devices shall be installed to meet the prescribed norms and/or the NAAQS. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/SPCB guidelines.
- (x) Total fresh water requirement shall not exceed 49200 cum/day to be met from surface water from Brahmini River. Prior permission in this regard shall be obtained from the concerned regulatory authority.
- (xi) Process effluent/any wastewater shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.
- (xii) Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc. Flame arresters shall be provided on tank farm, and solvent transfer through pumps.
- (xiii) ETP sludge, process Inorganic & evaporation salt, if any, shall be disposed off to the TSDF.



- (xiv) The Company shall strictly comply with the rules and guidelines under Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. All transportation of Hazardous Chemicals shall be as per the Motor Vehicle Act (MVA), 1989.
 - (xv) The company shall undertake waste minimization measures as below:-
 - (a) Metering and control of quantities of active ingredients to minimize waste.
 - (b) Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.
 - (c) Use of automated filling to minimize spillage.
 - (d) Use of Close Feed system into batch reactors.
 - (e) Venting equipment through vapour recovery system.
 - (f) Use of high pressure hoses for equipment clearing to reduce wastewater generation.
 - (xvi) The green belt of 5-10 m width shall be developed in more than 33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department.
 - (xvii) All the commitment made regarding issues raised during the Public Hearing/consultation meeting held on 30th August, 2017 shall be satisfactorily implemented
 - (xviii) At least 2.5% of the total project cost shall be allocated for Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional Office.
 - (xix) For the DG sets, emission limits and the stack height shall be in conformity with the extant regulations and the CPCB guidelines. Acoustic enclosure shall be provided to DG set for controlling the noise pollution.
 - (xx) The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire fighting system shall be as per the norms.
 - (xxi) Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.
 - (xxii) Continuous online (24x7) monitoring system for stack emissions shall be installed for measurement of flue gas discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For online continuous monitoring of effluent, the unit shall install web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises.
- 9.1.** The grant of environmental clearance is subject to compliance of other general conditions, as under:-
- (i) The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board, Central Pollution Control Board, State Government and any other statutory authority.
 - (ii) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.
 - (iii) The locations of ambient air quality monitoring stations shall be decided in consultation with the State Pollution Control Board (SPCB) and it shall be ensured that at least one station each is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.




- (iv) The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 shall be followed.
- (v) The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).
- (vi) The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.
- (vii) Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.
- (viii) The company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, and risk mitigation measures relating to the project shall be implemented.
- (ix) The company shall undertake all relevant measures for improving the socio-economic conditions of the surrounding area. ESC activities shall be undertaken by involving local villages and administration.
- (x) The company shall undertake eco-developmental measures including community welfare measures in the project area for the overall improvement of the environment.
- (xi) The company shall earmark sufficient funds towards capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/ pollution control measures shall not be diverted for any other purpose.
- (xii) A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.
- (xiii) The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and SPCB. A copy of Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.
- (xiv) The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail.
- (xv) The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry at <http://moef.nic.in>. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular




language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional Office of the Ministry.

- (xvi) The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.
10. The Ministry may revoke or suspend the clearance, at subsequent stages, if implementation of any of the above conditions is not satisfactory.
11. The Ministry reserves the right to stipulate additional conditions, if found necessary. The company in a time bound manner will implement these conditions.
12. The above conditions will be enforced, inter alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Water Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and rules.


9/2/2018
(S. K. Srivastava)
Scientist E

Copy to:-

1. The Additional PCCF (C), MoEF&CC Regional Office (EZ), A/3, Chandersekharpur, Bhubaneswar - 23 (Odisha)
2. The Secretary, Department of Forest and Environment, Government of Odisha, Bhubaneswar (Odisha)
3. The Member Secretary, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
4. The Member Secretary, Odisha State Pollution Control Board, Paribesh Bhawan, A/118, Nilakantha Nagar, Unit - VIII, Bhubaneswar -12 (Odisha)
5. Guard File/Monitoring File/Website/Record File


9/2/2018
(S. K. Srivastava)
Scientist E

Annexure 2

Air Quality Monitoring Report (October 2019 to February 2020)

Ambient Air Quality study

The knowledge of quality of ambient air plays an important role in assessing the environmental scenario of the locality. The ambient air quality status in the vicinity of the project site forms an indispensable part of the Environment Impact Assessment studies. The quality of ambient air depends upon the concentrations of criteria pollutants, the emission sources and meteorological condition. Data collected has been analysed and presented herewith.

The studies on air environment include identification of criteria air pollutants and assessing their existing levels in ambient air within the study zone. The existing status of air environment with respect to the identified air pollutants is assessed through air quality surveillance programme with scientifically designed ambient air quality monitoring network.

The ambient air quality monitoring was carried out through reconnaissance followed by air quality surveillance programme and micrometeorological study.

Reconnaissance

Reconnaissance was undertaken to establish the existing status of air environment in the study region. Ambient Air Quality Monitoring (AAQM) locations were selected based on guidelines of network siting criteria based on meteorological data. The ambient air quality monitoring was carried out in the study area of 10 km radial distance around the proposed site, details of these locations are presented in **Figure 1 and Table 1**.

Ambient Air Quality Monitoring Network and Analytical Methods

The ambient air quality status in the study zone is assessed through a network of ambient air quality monitoring locations. The studies on air environment include identification of criteria air pollutants for assessing the impacts of existing port operations. The existing status of air environment is assessed through a systematic air quality surveillance program, which is planned based on the following criteria:

- ◆ Topography/terrain of the study area
- ◆ Regional synoptic scale climatological normals

- ◆ Densely populated areas within the region
- ◆ Location of surrounding industries
- ◆ Representation of valid cross-sectional distribution in downwind direction of the study area.

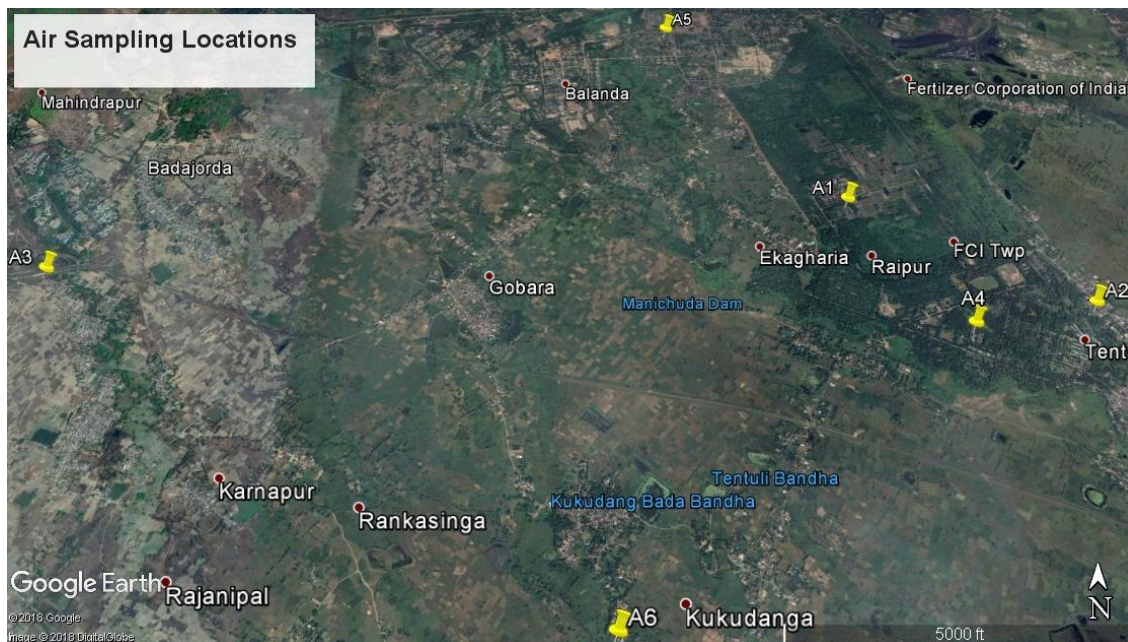


Figure 1 Ambient Air Quality Monitoring Locations around the Project Site

Table 1 Details of Air Quality Monitoring Locations

Sr. No.	Sample Code	Sampling Locations	Geographical Position
1.	TFL/A1	Administrative Building TFL	20°54'42.8" N 85°09'38.4" E
2.	TFL/A2	Housing Board Colony, Bikrampur	20°54'19.3" N 85°10'20.2" E
3.	TFL/A3	Village Karnapur	20°54'26.4" N 85°07'06.1" E
4.	TFL/A4	TFL-Guest House	20°54'14.8" N 85°09'56.9" E
5.	TFL/A5	Village Balanda	20°55'29.5" N 85°09'05.1" E
6.	TFL/A6	Village Kukudanga	20°53'23.3" N 85°08'50.8" E

As per NAAQS (2009) the pollutants viz., particulate matters (PM₁₀ and PM_{2.5}), sulphur dioxide (SO₂), nitrogen dioxide (NO₂), ammonia (NH₃), Methane Hydrocarbons (MH), Non-methane Hydrocarbons (NMHC) and Volatile Organic Carbon (VOCs) were stipulated parameters for air quality monitoring. The particulate parameters along with SO₂, NO₂ and NH₃ were monitored on 24 hourly basis and representative samples were collected for the rest. Standard analytical procedures were used for analysis and quantification of air quality parameters and the details are given in **Table 2**. The photographs showing sampling stations/locations are given in the **Plate 1**.

Table 2 Analytical Methods used for Quantification of Air Quality Parameters in the Ambient Air

Sr. No.	Air Quality Parameter	Unit	Analytical Method used for Testing/Analysis	Analytical Measurement Range	Standard value as per NAAQS, 2009 and Monitoring duration
1.	Particulate Matter size < 10 microns or PM ₁₀	µg/m ³	Gravimetric IS-5182: Part-23, 2006	5-5000	100 (24 h)
2.	Particulate Matter size < 2.5 microns or PM _{2.5}	µg/m ³	Gravimetric U.S.EPA EQM-0308-170	5-500	60 (24 h)
3.	Sulphur Dioxide (SO ₂)	µg/m ³	EPA Improved West and Gaeke Method IS-5182: Part-2, 2001	5-1000	80 (24 h)
4.	Nitrogen Dioxide (NO ₂)	µg/m ³	Modified Jacobs-Hachheiser Method IS-5182: Part-6, 2006	7-750	80 (24 h)
5.	Ammonia (NH ₃)	µg/m ³	Indophenol Blue method Method 401: Methods of Air Sampling and analysis, James P. Lodge	5-1000	400 (24 h)
6.	Benzene (C ₆ H ₆)	µg/m ³	GC based continuous analyzer IS-5182: Part-11, 2006	0.01-10	5.0 (Annual)
7.	VOCs	µg/m ³	U.S. EPA Method TO17: 1999	0.01-10	0.01-500 (Annual)
8.	Hydrocarbons	µg/m ³	HC Analyzer for Spot Concentration	0.01 – 10	-

Six AAQM locations were selected based on guidelines of network siting criteria. The six identified sampling locations for AAQM are depicted in **Figure 1** and details of which is given in **Table 1**.

In all sampling locations Fine Particulate Samplers (FPS) designed by Envirotech Pvt. Ltd. were installed for continuous sampling of PM₁₀, PM_{2.5} and gaseous pollutants. All the samples collected at the site were brought to the laboratory for further assessment for some concrete results.

Air Quality Status

Particulate matter is ubiquitous component of the atmosphere and has become a persistent and pervasive environmental problem that imposes significant health risk. The sources, characteristics and potential health effects of the larger or coarse particle (>2.5 µm in diameter) and smaller or fine particles (<2.5 µm in diameter) are very different. The fine airborne particles have a high probability of deposition deeper into the respiratory tract and likely to trigger or exacerbate respiratory diseases. These particles also have higher burdens of toxins, which when absorbed in the body can result in health consequences other than respiratory health effects. Therefore, the US environmental Protection Agency promulgated a new PM_{2.5} National Air Quality Standards to effective control the aerosol problem¹. Sources vary for gaseous pollutants viz. major source of SO₂ and NO₂ include burning of fossil fuels like coal and other petroleum products. For NH₃, sources include industrial processes, vehicular emissions. The anthropogenic sources of VOCs consist of vehicular emissions, petroleum products, chemicals, manufacturing industries, painting operations, varnishes, coating operations, consumer products, petroleum handling, auto refinishing, cold clean degreasing, printing inks, dry-cleaning etc.

Particulate Matter:

October 2019

- ◆ The average concentrations of PM₁₀ varied from 30 to 101µg/m³. The lowest concentration of PM₁₀ was found at Kukudanga while the highest concentration was found at Balanda sampling site (**Figure 2 and Table 3**).
- ◆ PM_{2.5} average concentrations varied from 16 to 78µg/m³. The lowest concentration of PM_{2.5} was found at Kukudanga while the highest

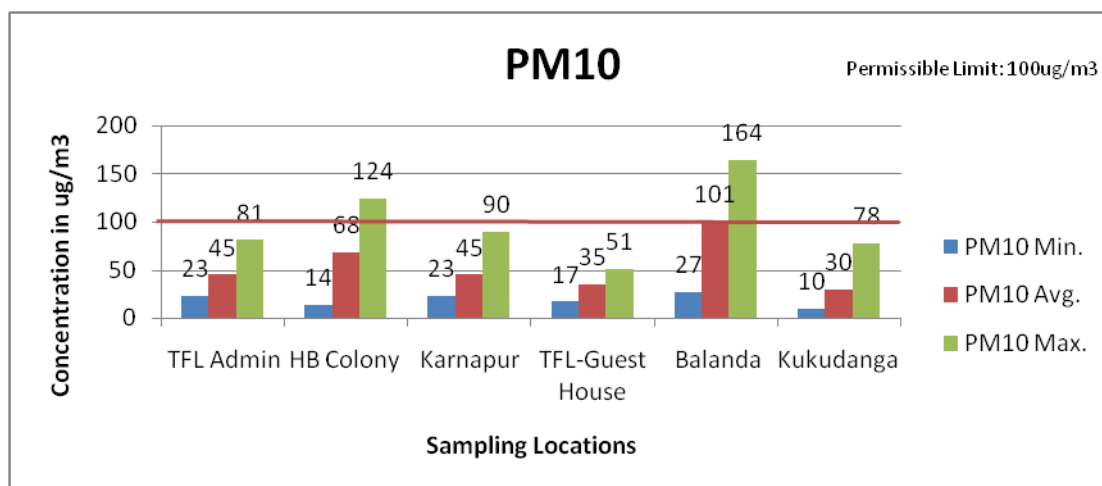
concentration was found at Balanda sampling site (**Figure 3 and Table 3**).

**Table 3 Air Quality Status within the Study Area
(Post-Monsoon Season- October, 2019)**

Units: $\mu\text{g}/\text{m}^3$

Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀			PM _{2.5}		
		Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	23	45	81	8	24	43
2	Housing Board Colony, Bikrampur	14	68	124	28	67	125
3	Village Karnapur	23	45	90	24	35	42
4	TFL-Guest House	17	35	51	11	24	52
5	Village Balanda	27	101	164	21	78	118
6	Village Kukudanga	10	30	78	8	16	40
	Permissible limits	100			60		



**Figure 2 Concentration of PM₁₀ at Sampling sites
(Post-Monsoon Season - October, 2019)**

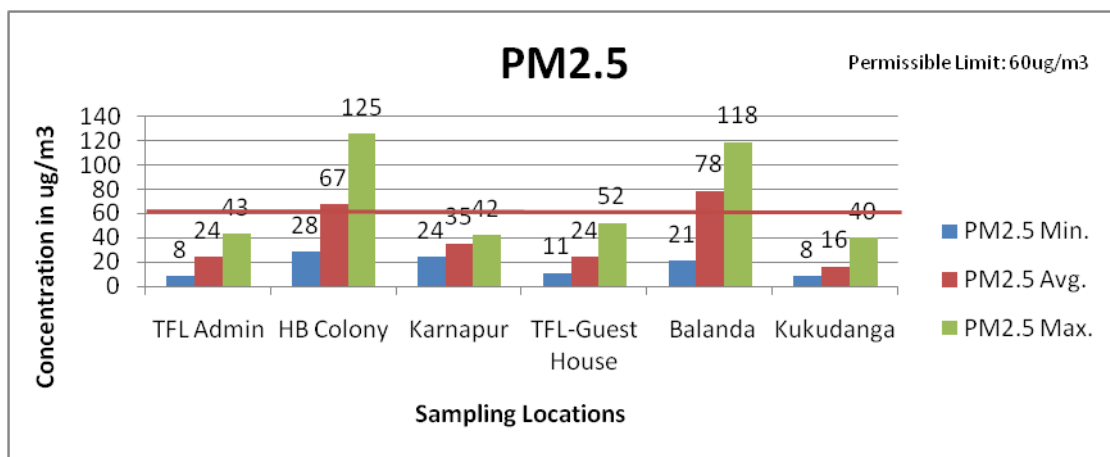


Figure 3 Concentration of PM_{2.5} at Sampling sites (Post-Monsoon Season - October, 2019)

November 2019

- ◆ The average concentrations of PM₁₀ varied from 31 to 112µg/m³. The lowest concentration of PM₁₀ was found at Kukudanga while the highest concentration was found at Balanda sampling site (**Figure 4 and Table 4**).
- ◆ Average PM_{2.5} concentrations varied from 17 to 69µg/m³. The lowest concentration of PM_{2.5} was found at Kukudanga while the highest concentration was found at Balanda sampling site (**Figure 5 and Table 4**).

Table 4 Air Quality Status within the Study Area (Post-Monsoon Season- November, 2019)

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀			PM _{2.5}		
		Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	24	42	91	6	27	51
2	Housing Board Colony, Bikrampur	19	51	102	25	52	75
3	Village Karnapur	21	46	81	21	29	39
4	TFL-Guest House	14	33	49	17	31	59
5	Village Balanda	25	112	147	21	69	108
6	Village Kukudanga	17	31	63	9	17	38
	Permissible limits	100			60		

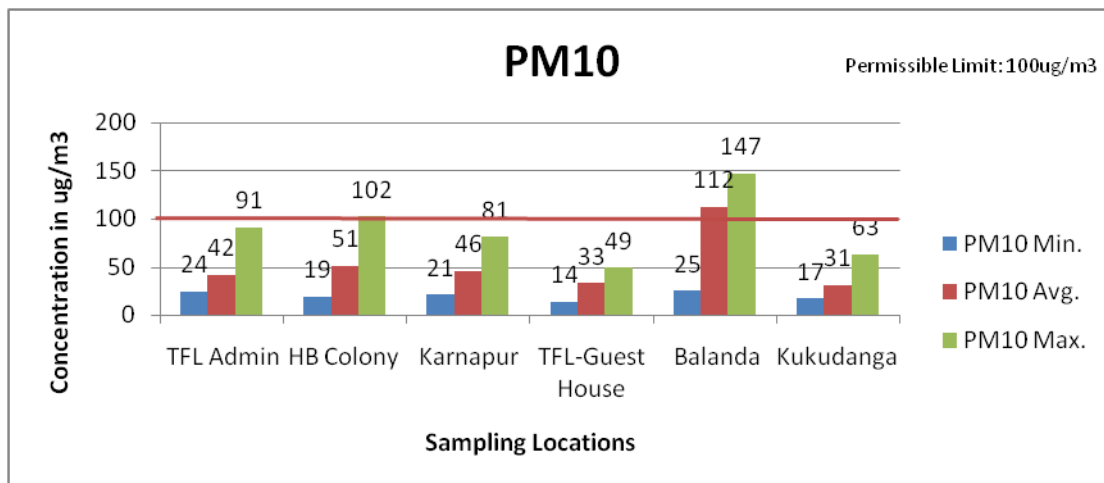


Figure 4 Concentration of PM₁₀ at Sampling sites (Post-Monsoon Season - November, 2019)

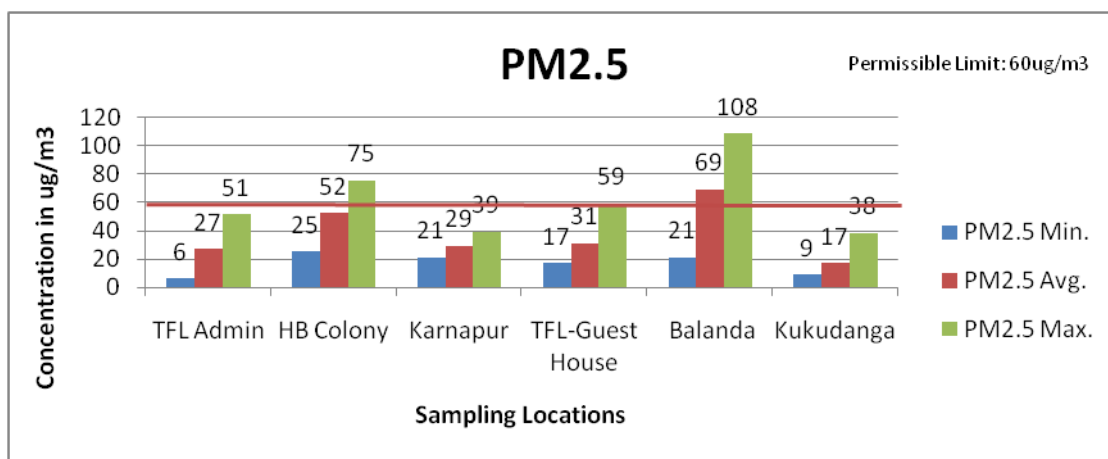


Figure 5 Concentration of PM_{2.5} at Sampling sites (Post-Monsoon Season - November, 2019)

December 2019

- ◆ The average concentrations of PM₁₀ varied from 68 to 109µg/m³. The lowest concentration of PM₁₀ was found at TFL Guest House while the highest concentration was found at Balanda sampling site (**Figure 6 and Table 5**).
- ◆ Average PM_{2.5} concentrations varied from 31 to 87µg/m³. The lowest concentration of PM_{2.5} was found at Karnapur while the highest concentration was found at Balanda sampling site (**Figure 7 and Table 5**).

Table 5 Air Quality Status within the Study Area (Winter Season- December, 2019)

Units: $\mu\text{g}/\text{m}^3$

Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀			PM _{2.5}		
		Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	44	74	90	23	36	58
2	Housing Board Colony, Bikrampur	38	87	136	28	39	50
3	Village Karnapur	27	84	125	21	31	44
4	TFL-Guest House	34	68	119	22	38	97
5	Village Balanda	80	109	158	75	87	97
6	Village Kukudanga	21	77	102	24	38	47
Permissible limits		100			60		

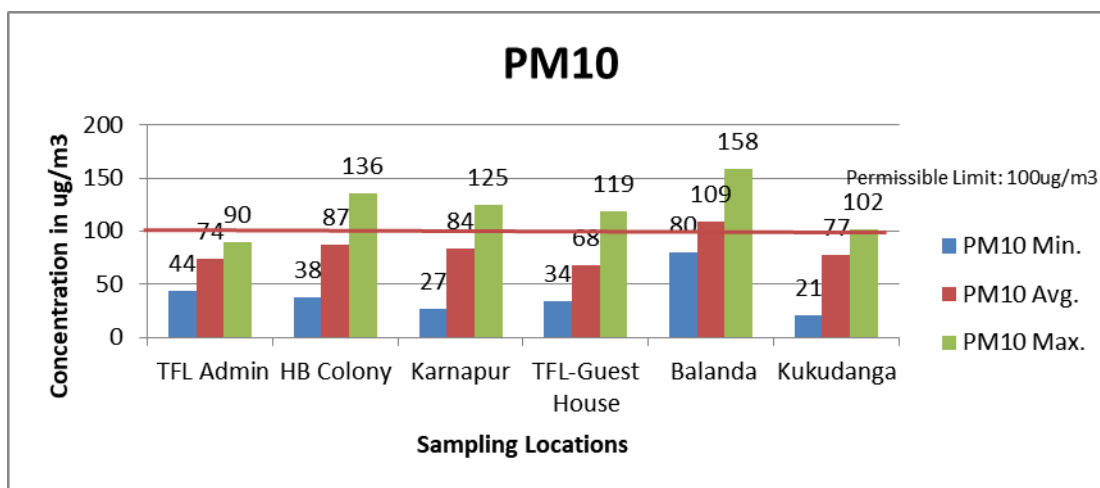


Figure 6 Concentration of PM10 at Sampling sites (Winter Season - December, 2019)

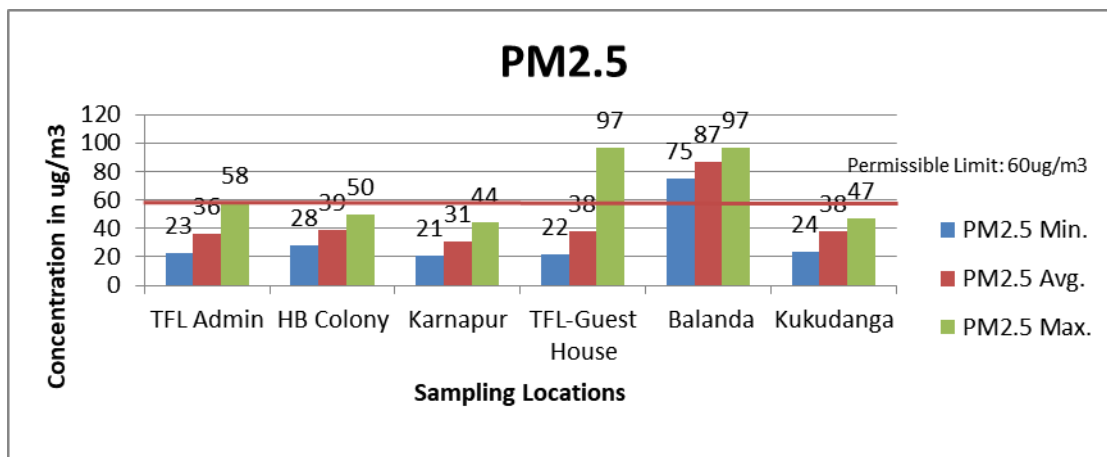


Figure 7 Concentration of PM2.5 at Sampling sites (Winter Season - December, 2019)

January 2020

- ◆ The average concentrations of PM₁₀ varied from 69 to 113µg/m³. The lowest concentration of PM₁₀ was found at Kukudanga while the highest concentration was found at Balanda sampling site (**Figure 8 and Table 6**).
- ◆ Average PM_{2.5} concentrations varied from 32 to 69µg/m³. The lowest concentration of PM_{2.5} was found at HB Colony, Kukudanga while the highest concentration was found at Balanda sampling site (**Figure 9 and Table 6**).

Table 6 Air Quality Status within the Study Area (January 2020)

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀			PM _{2.5}		
		Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	39	81	98	26	39	68
2	Housing Board Colony, Bikrampur	31	79	110	19	32	58
3	Village Karnapur	26	72	105	28	36	52
4	TFL-Guest House	36	76	93	22	33	88
5	Village Balanda	85	113	128	66	69	87
6	Village Kukudanga	19	69	93	24	32	40
Permissible limits		100			60		

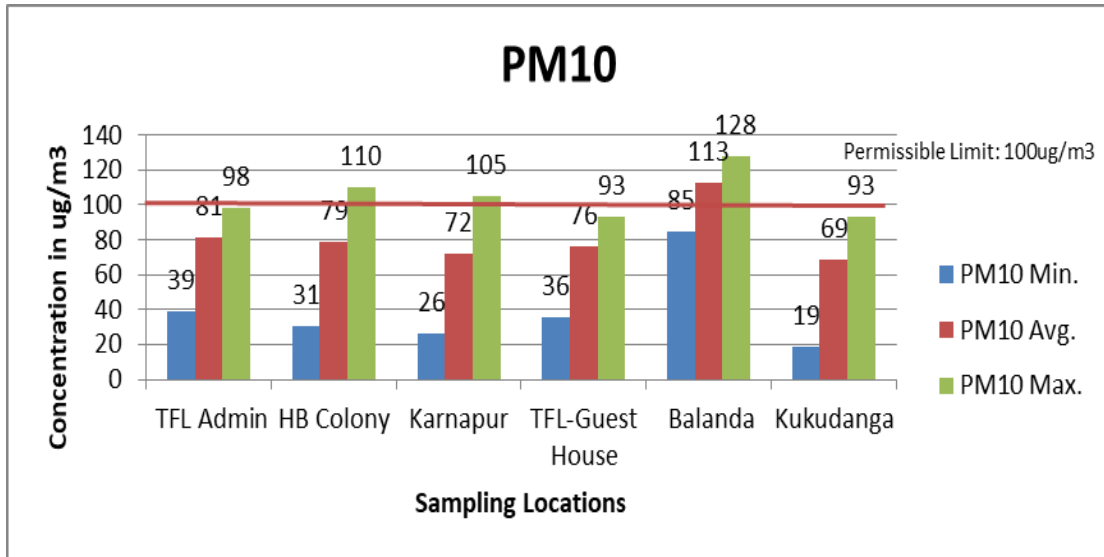


Figure 8 Concentration of PM₁₀ at Sampling sites (January 2020)

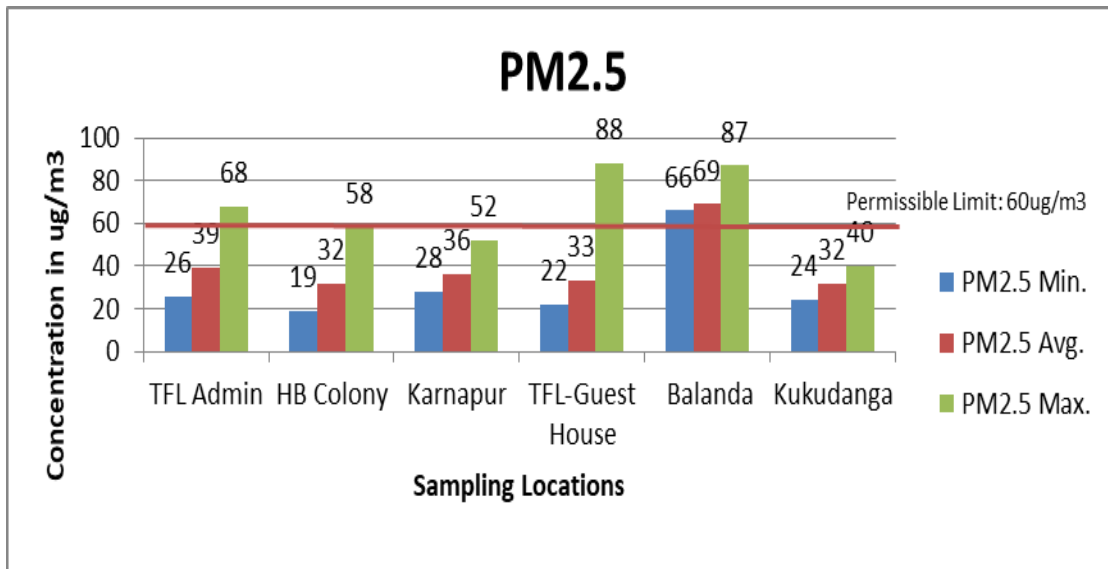


Figure 9 Concentration of PM_{2.5} at Sampling sites (January 2020)

February 2020

- ◆ The average concentrations of PM₁₀ varied from 112 to 181µg/m³. The lowest concentration of PM₁₀ was found at Kukudanga while the

highest concentration was found at Balanda sampling site (**Figure 10 and Table 7**).

- ◆ Average PM_{2.5} concentrations varied from 55 to 101µg/m³. The lowest concentration of PM_{2.5} was found at Kukudanga while the highest concentration was found at HB Colony sampling site (**Figure 11 and Table 7**).

**Table 7 Air Quality Status within the Study Area
(Post-Monsoon Season- February 2020)**

Units: µg/m³ Average: 24 hrs.

Sr. No.	Sampling Location	PM ₁₀			PM _{2.5}		
		Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	44	157	271	38	94	169
2	Housing Board Colony, Bikrampur	38	117	216	28	101	182
3	Village Karnapur	27	123	195	42	90	196
4	TFL-Guest House	65	172	282	34	80	147
5	Village Balanda	91	181	292	75	92	126
6	Village Kukudanga	59	112	159	34	55	116
	Permissible limits	100			60		

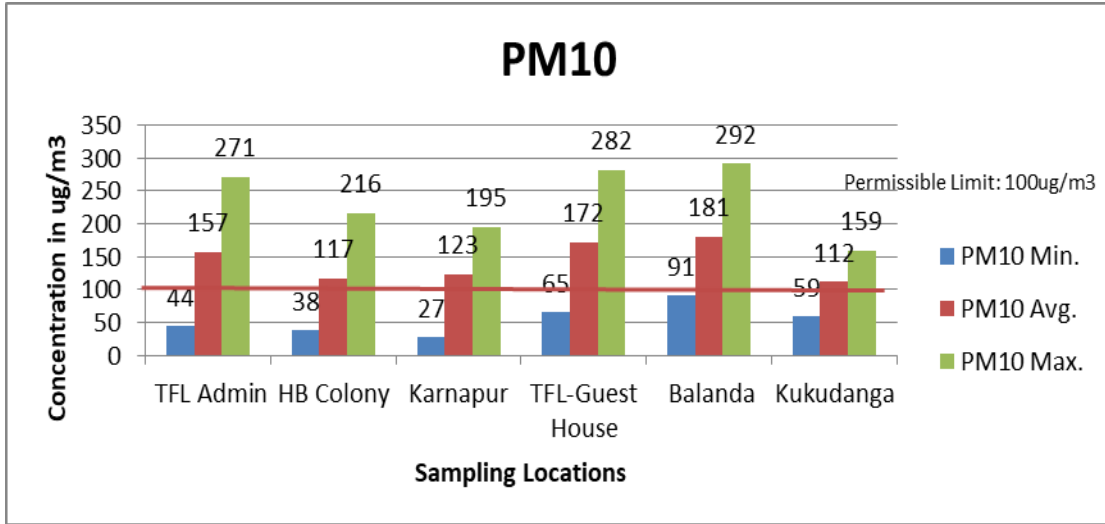


Figure 9 : Concentration of PM₁₀ at Sampling sites (Post-Monsoon Season – February 2020)

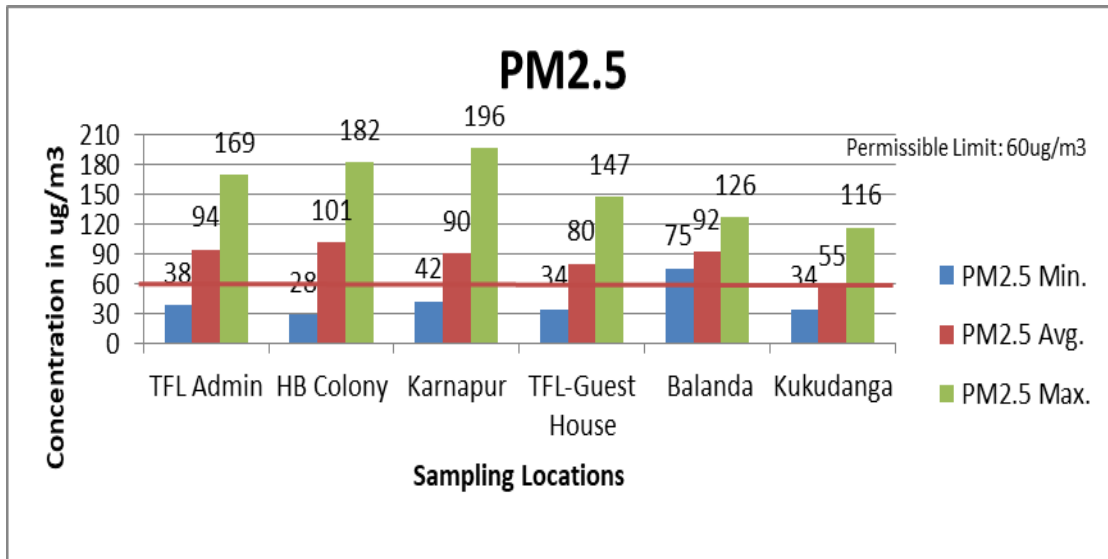


Figure 10 : Concentration of PM_{2.5} at Sampling sites (Post-Monsoon Season – February 2020)

Gaseous Pollutants:**October 2019**

- ◆ The concentration of Sulphur dioxide (SO₂) varied from 12 to 31µg/m³. The concentration of Sulphur dioxide (SO₂) was observed minimum at Karnapur and maximum at HB Colony. (**Figure 13 and Table 9**).
- ◆ The concentration of Nitrogen dioxide (NO₂) was observed in the range of 37 to 83µg/m³, the minimum concentration was found at Kukudanga while maximum concentration was accounted at Karnapur (**Figure 14 and Table 9**).
- ◆ The concentration of NH₃ varied from 32 to 44µg/m³, minimum concentration of Ammonia (NH₃) found at TFL Guest House and maximum was found at Balanda sampling site (**Figure 15 and Table 9**).
- ◆ VOCs were undetectable in any of the sites; values of MHC and NMHC are given in the table. (**Table 10**)

The sampling was carried out during the Post-Monsoon season (October, 2019). Overall, all Air Quality Parameters studied in the study area were found to be well within the permissible limits.

**Table 9 Air Quality Status within the Study Area
(Post-Monsoon Season - October, 2019)**

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂			NO ₂			NH ₃		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	5	16	28	11	76	132	12	35	56
2	Housing Board Colony, Bikrampur	18	31	45	8	59	154	17	37	52
3	Village Karnapur	7	12	17	67	83	118	18	38	62
4	TFL-Guest House	14	18	30	9	54	82	9	32	48
5	Village Balanda	9	26	51	28	70	120	25	44	59
6	Village Kukudanga	10	16	25	9	37	66	25	38	55
Permissible limits		80			80			400		

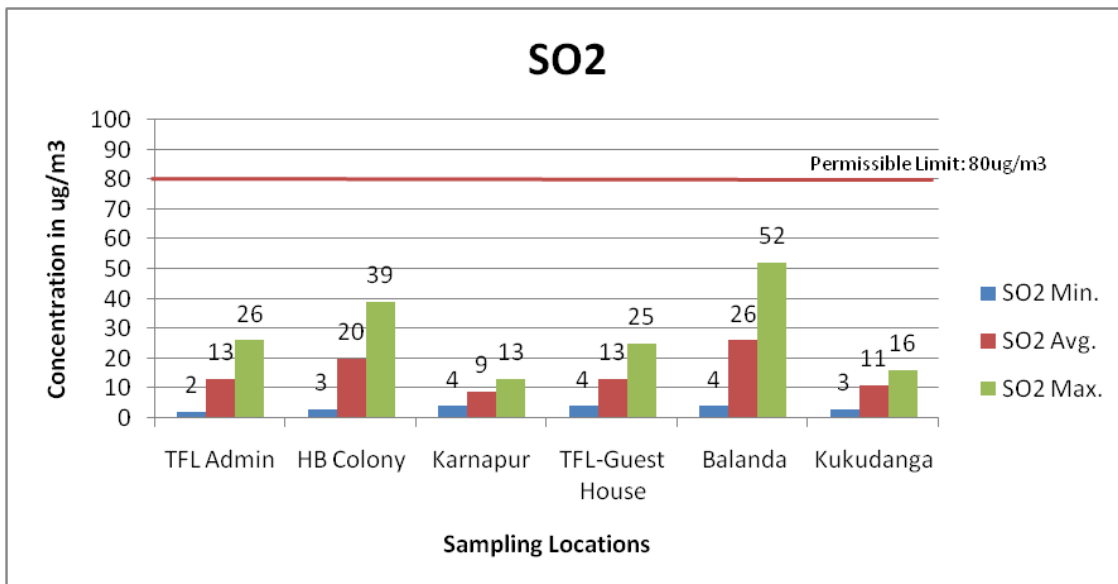


Figure 13 Concentration of SO₂ at Sampling sites (Post-Monsoon Season - October, 2019)

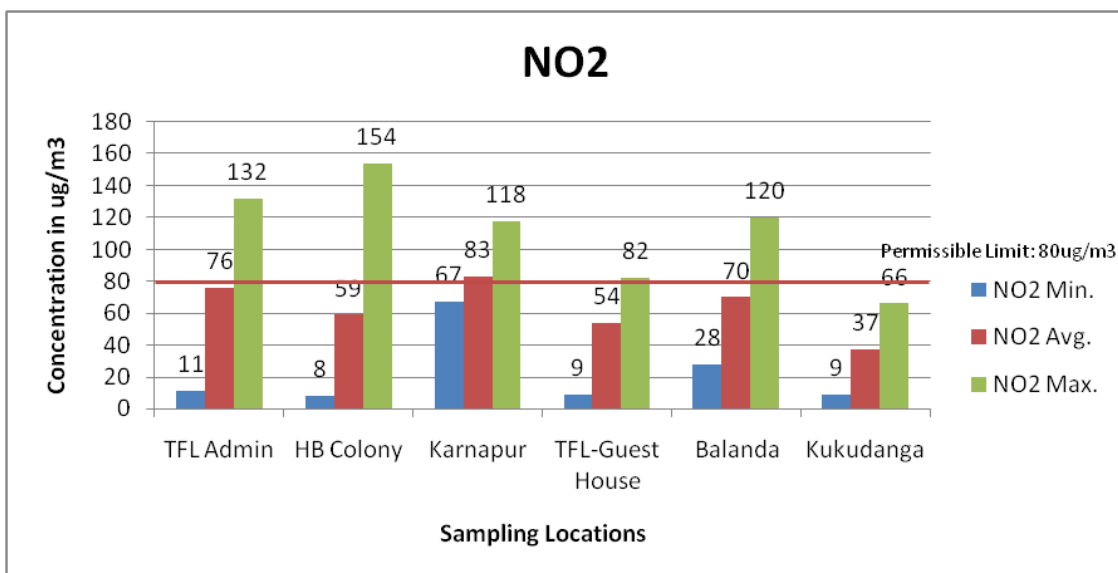


Figure 14 Concentration of NO₂ at Sampling sites (Post-Monsoon Season - October, 2019)

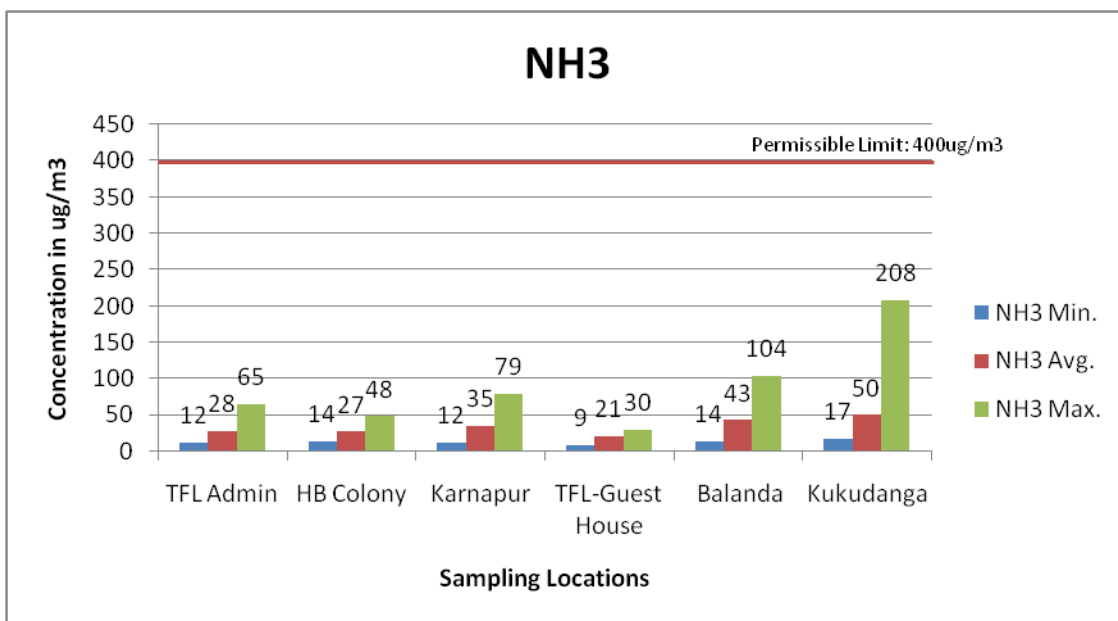


Figure 15 Concentration of NH₃ at Sampling sites (Post-Monsoon Season - October, 2019)

Table: 10 Concentrations of VOCs and HC in the Ambient Air (Post-Monsoon Season – October, 2019)

Sr. No.	Sampling Location	Benzene	Toluene	Xylene	MHC	NMHC
		(µg/m ³)	(µg/m ³)	(µg/m ³)	ppm	ppm
1.	Administrative Building TFL	<0.1	<0.1	<0.1	0.5	0.4
2.	Housing Board Colony, Bikrampur	<0.1	<0.1	<0.1	0.4	0.3
3.	Village Karnapur	<0.1	<0.1	<0.1	0.2	0.1
4.	TFL-Guest House	<0.1	<0.1	<0.1	0.2	0.3
5.	Village Balanda	<0.1	<0.1	<0.1	0.3	0.5
6.	Village Kukudanga	<0.1	<0.1	<0.1	0.3	0.2
	Permissible limits	5µg/m ³				

November 2019

- ◆ The concentration of Sulphur dioxide (SO₂) varied from 14 to 37µg/m³. The concentration of Sulphur dioxide (SO₂) was observed minimum at Karnapur and maximum at HB Colony. **(Figure 16 and Table 11)**.
- ◆ The concentration of Nitrogen dioxide (NO₂) was observed in the range of 27 to 69µg/m³, the minimum concentration was found at Kukudanga while maximum concentration was accounted at Administrative building. **(Figure 17 and Table 11)**.
- ◆ The concentration of NH₃ varied from 32 to 43µg/m³, minimum concentration of Ammonia (NH₃) found at Kukudanga and maximum was found at HB Colony sampling site **(Figure 18 and Table 11)**.
- ◆ VOCs were undetectable in any of the sites; values of MHC and NMHC are given in the table. **(Table 12)**

The sampling was carried out during the Post-Monsoon season (November, 2019). Overall, all Air Quality Parameters studied in the study area were found to be well within the permissible limits.

**Table 11 Air Quality Status within the Study Area
(Post-Monsoon Season - November, 2019)**

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂			NO ₂			NH ₃		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	7	21	35	13	69	125	10	29	54
2	Housing Board Colony, Bikrapur	21	37	55	7	44	74	11	43	67
3	Village Karnapur	6	14	21	24	42	62	12	38	59
4	TFL-Guest House	12	19	32	7	48	78	11	39	51
5	Village Balanda	11	21	47	21	62	80	21	42	67
6	Village Kukudanga	9	17	24	7	27	46	22	32	51
Permissible limits		80			80			400		

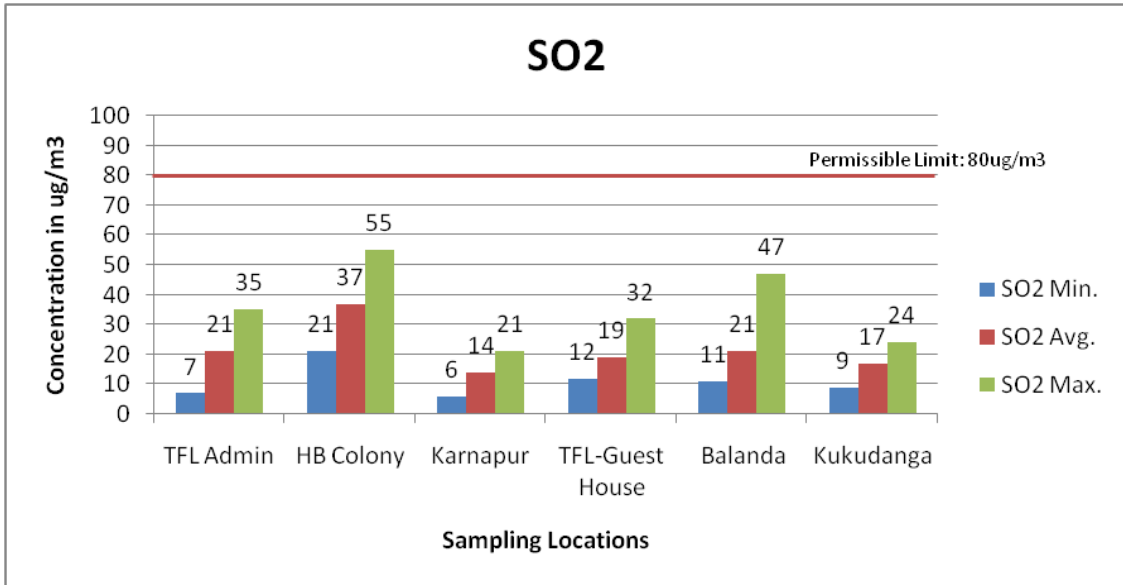


Figure 16 Concentration of SO₂ at Sampling sites (Post-Monsoon Season - November, 2019)

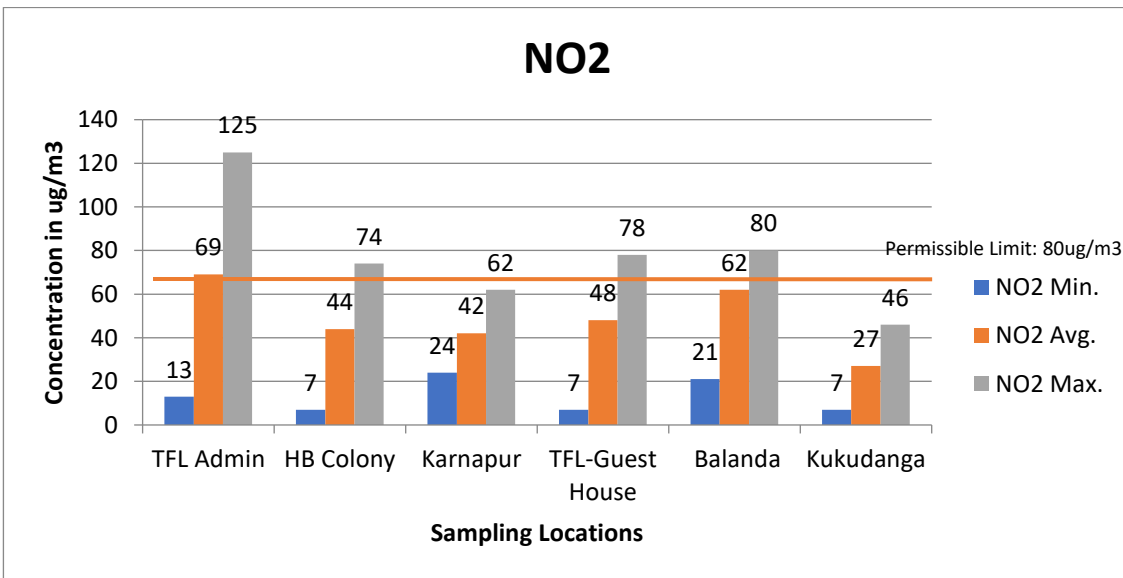


Figure 17 Concentration of NO₂ at Sampling sites (Post-Monsoon Season - November, 2019)

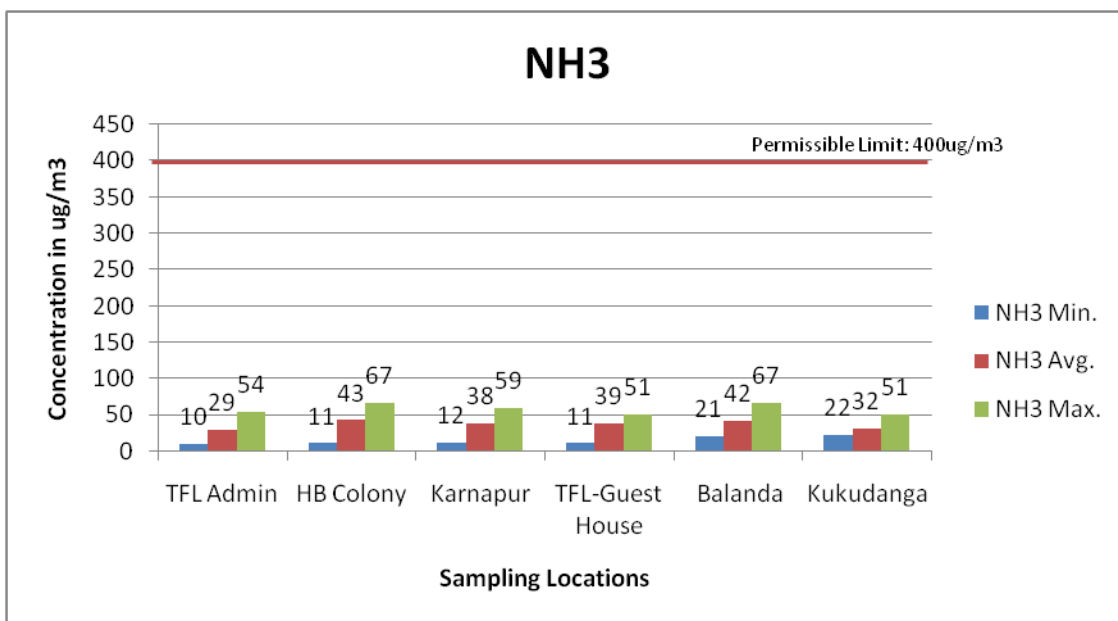


Figure 18 Concentration of NH₃ at Sampling sites (Post-Monsoon Season - November, 2019)

Table: 12 Concentrations of VOCs and HC in the Ambient Air (Post-Monsoon Season - November, 2019)

Sr. No.	Sampling Location	Benzene	Toluene	Xylene	MHC	NMHC
		(µg/m ³)	(µg/m ³)	(µg/m ³)	ppm	ppm
1.	Administrative Building TFL	<0.1	<0.1	<0.1	0.5	0.4
2.	Housing Board Colony, Bikrapur	<0.1	<0.1	<0.1	0.4	0.3
3.	Village Karnapur	<0.1	<0.1	<0.1	0.2	0.1
4.	TFL-Guest House	<0.1	<0.1	<0.1	0.2	0.3
5.	Village Balanda	<0.1	<0.1	<0.1	0.3	0.5
6.	Village Kukudanga	<0.1	<0.1	<0.1	0.3	0.2
	Permissible limits	5µg/m ³				

December 2019

- ◆ The concentration of Sulphur dioxide (SO₂) varied from 23 to 54 µg/m³. The concentration of Sulphur dioxide (SO₂) was observed minimum at Karnapur and maximum at Balanda. **(Figure 19 and Table 13).**
- ◆ The concentration of Nitrogen dioxide (NO₂) was observed in the range of 40 to 88 µg/m³, the minimum concentration was found at Karnapur while maximum concentration was accounted at Balanda. **(Figure 20 and Table 13).**
- ◆ The concentration of NH₃ varied from 33 to 56 µg/m³, minimum concentration of Ammonia (NH₃) found at TFL Admin building and maximum was found at Balanda sampling site **(Figure 21 and Table 13).**
- ◆ VOCs were undetectable in any of the sites; values of MHC and NMHC are given in the table. **(Table 14)**

The sampling was carried out during the Winter season (December, 2019). Overall, all Air Quality Parameters studied in the study area were found to be well within the permissible limits.

Table 13 Air Quality Status within the Study Area (Winter Season - December, 2019)

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂			NO ₂			NH ₃		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	22	34	52	47	56	64	25	33	56
2	Housing Board Colony, Bikrapur	15	39	83	41	52	64	21	35	48
3	Village Karnapur	9	23	35	18	40	80	28	38	61
4	TFL-Guest House	19	43	66	35	57	70	27	38	49
5	Village Balanda	30	54	76	66	88	124	27	56	71

6	Village Kukudanga	33	42	56	25	43	62	27	38	50
Permissible limits		80			80			400		

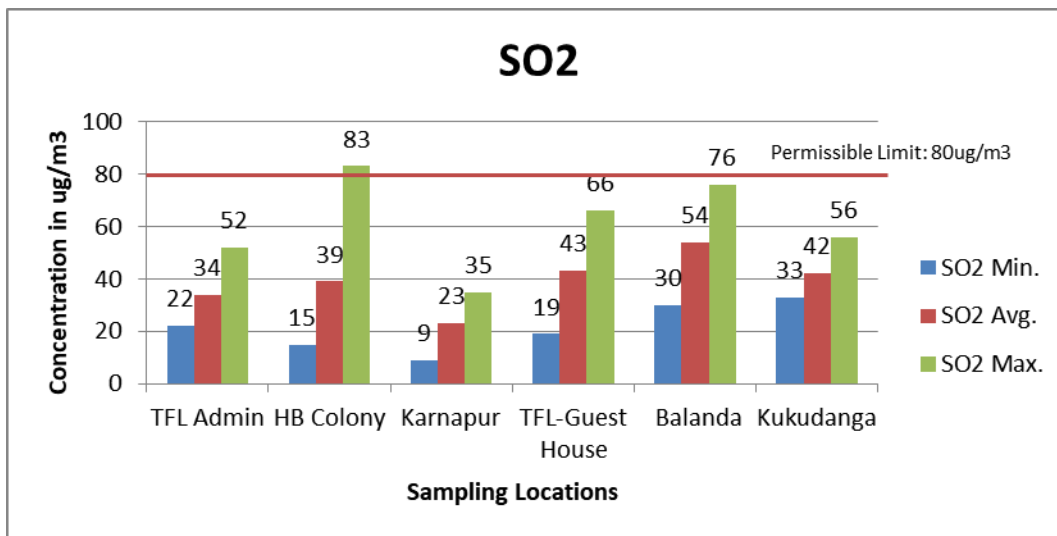


Figure 19 Concentration of SO₂ at Sampling sites (Winter Season - December, 2019)

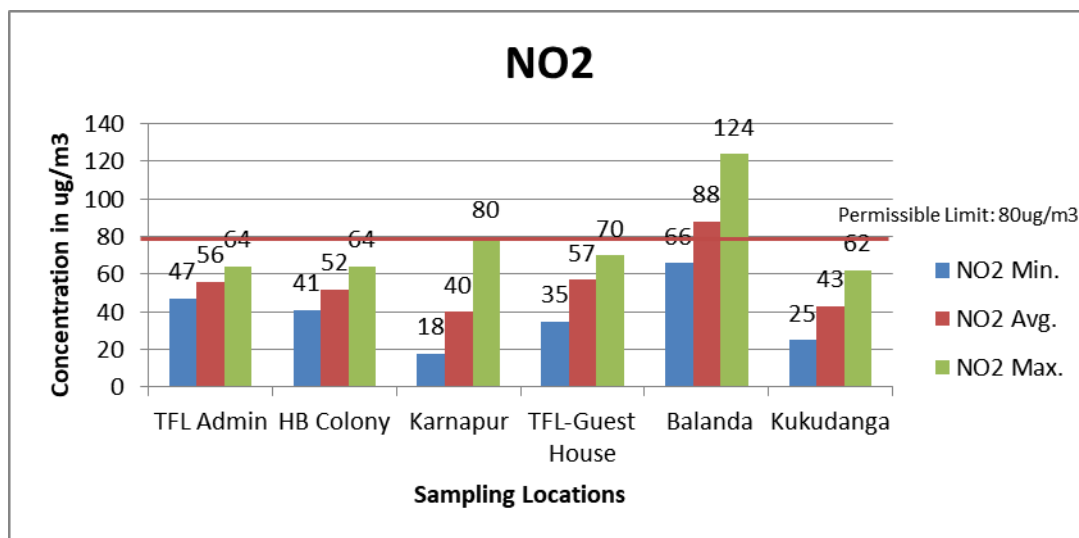


Figure 20 Concentration of NO₂ at Sampling sites (Winter Season - December, 2019)

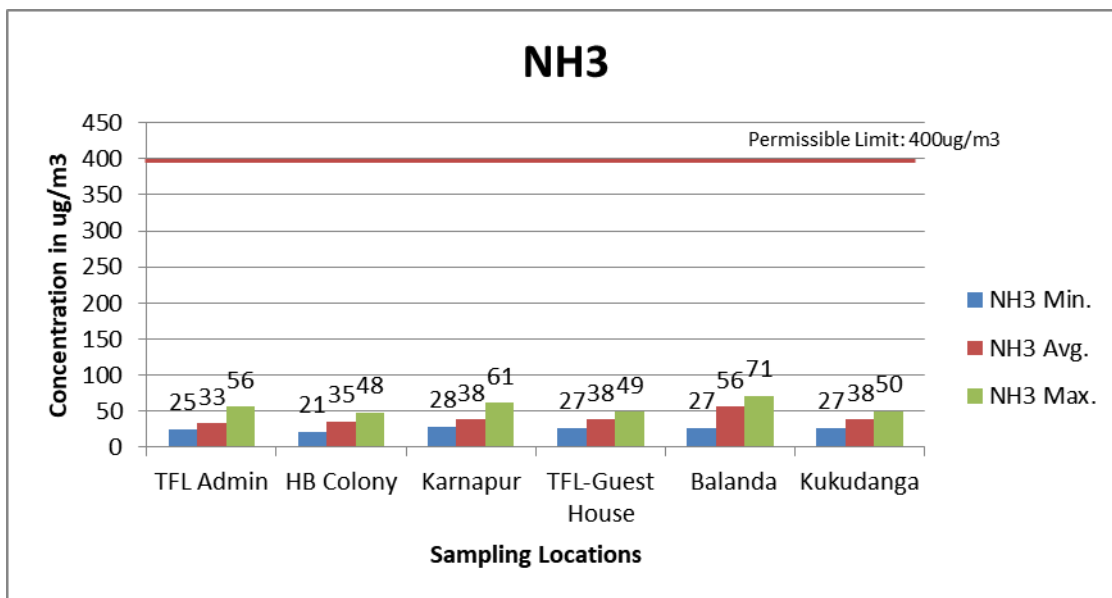


Figure 21 Concentration of NH₃ at Sampling sites (Winter Season - December, 2019)

Table: 14 Concentrations of VOCs and HC in the Ambient Air (Winter Season - December, 2019)

Sr. No.	Sampling Location	Benzene	Toluene	Xylene	MHC	NMHC
		(µg/m ³)	(µg/m ³)	(µg/m ³)	ppm	ppm
1.	Administrative Building TFL	<0.1	<0.1	<0.1	0.4	0.5
2.	Housing Board Colony, Bikrampur	<0.1	<0.1	<0.1	0.2	0.3
3.	Village Karnapur	<0.1	<0.1	<0.1	0.3	0.2
4.	TFL-Guest House	<0.1	<0.1	<0.1	0.2	0.4
5.	Village Balanda	<0.1	<0.1	<0.1	0.2	0.4
6.	Village Kukudanga	<0.1	<0.1	<0.1	0.5	0.3
	Permissible limits	5 µg/m ³				

January 2020

- ◆ The concentration of Sulphur dioxide (SO₂) varied from 30 to 49µg/m³. The concentration of Sulphur dioxide (SO₂) was observed minimum at HB Colony and maximum at Balanda. **(Figure 22 and Table 15).**
- ◆ The concentration of Nitrogen dioxide (NO₂) was observed in the range of 43 to 82µg/m³, the minimum concentration was found at Karnapur while maximum concentration was accounted at Balanda. **(Figure 23 and Table 15).**
- ◆ The concentration of NH₃ varied from 31 to 52µg/m³, minimum concentration of Ammonia (NH₃) found at HB Colony and maximum was found at Balanda sampling site **(Figure 24 and Table 15).**
- ◆ VOCs were undetectable in any of the sites; values of MHC and NMHC are given in the table **(Table 16)**

The sampling was carried out during the Post-Monsoon season (January 2020). Overall, all Air Quality Parameters studied in the study area were found to be well within the permissible limits.

**Table 15 Air Quality Status within the Study Area
(January 2020)**

Units: µg/m³

Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂			NO ₂			NH ₃		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	19	39	61	49	66	81	21	41	69
2	Housing Board Colony, Bikrampur	13	30	52	42	59	66	22	31	41
3	Village Karnapur	10	26	39	21	43	83	29	44	66
4	TFL-Guest House	21	45	71	41	63	71	24	39	51
5	Village Balanda	29	49	71	69	82	103	29	52	66
6	Village Kukudanga	33	45	61	27	47	59	22	39	51
Permissible limits		80			80			400		

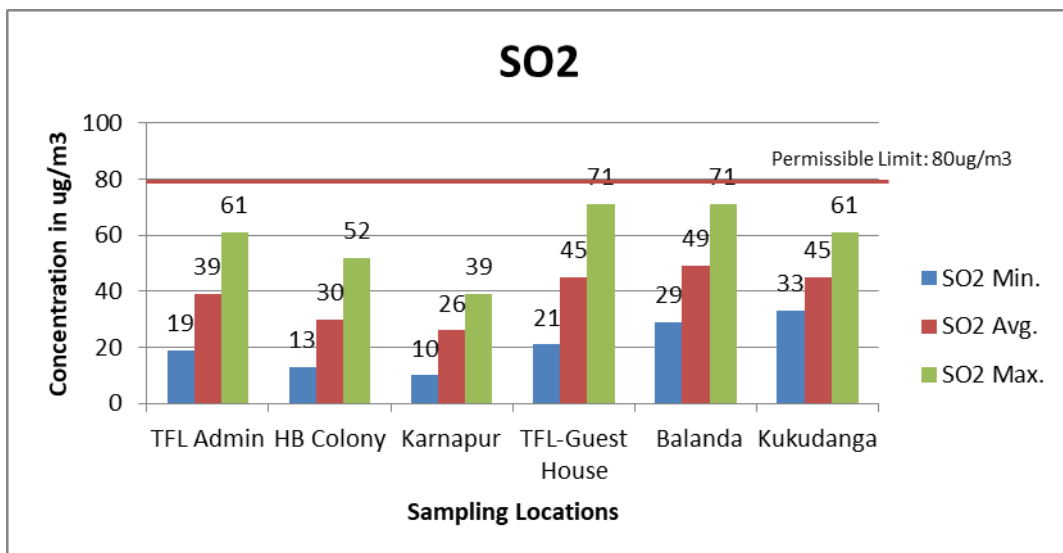


Figure 22 Concentration of SO₂ at Sampling sites (January 2020)

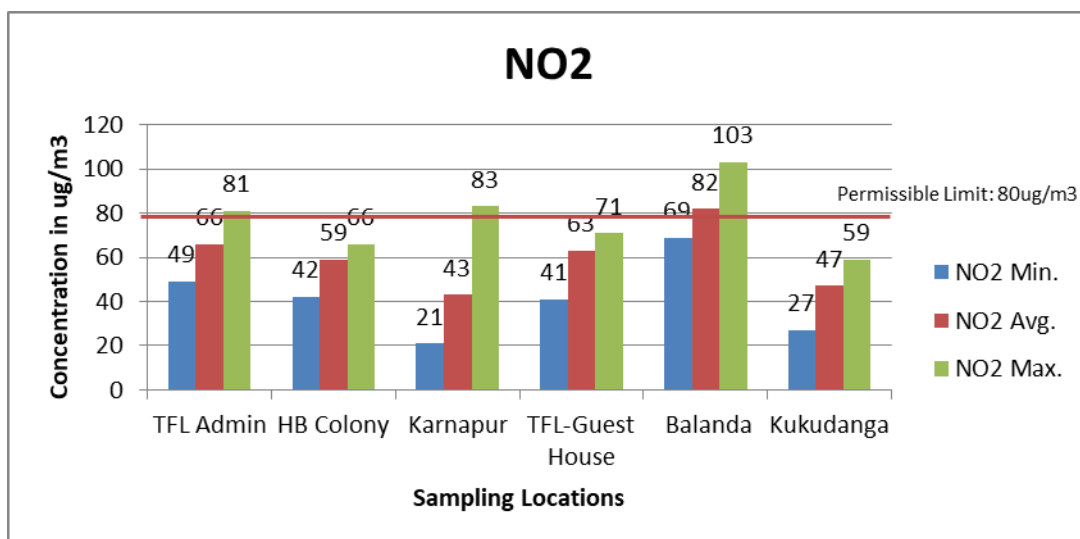
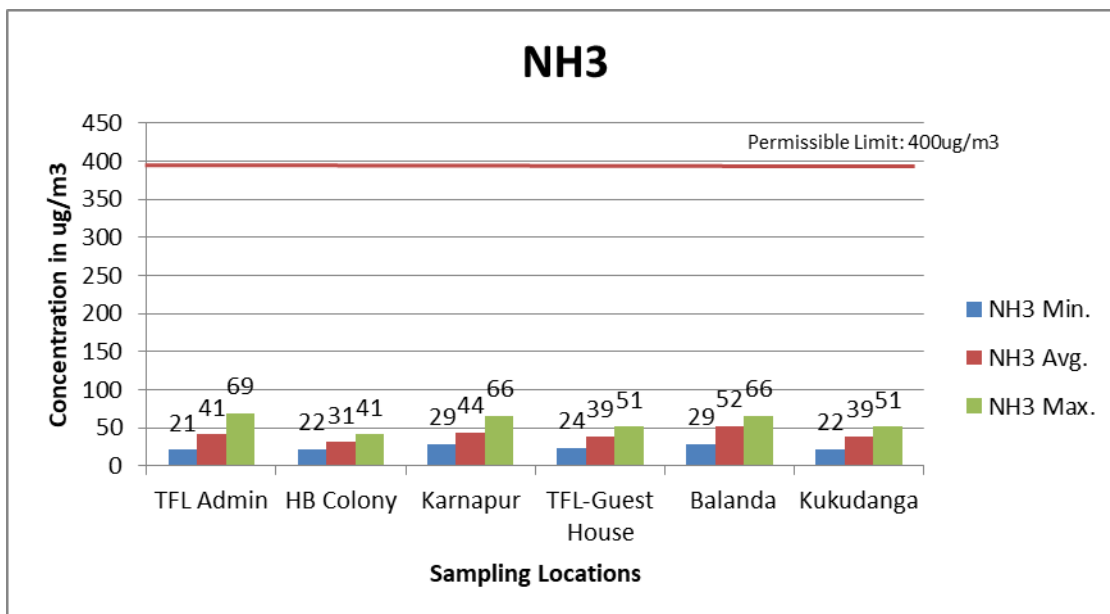


Figure 23 Concentration of NO₂ at Sampling sites (January 2020)



**Figure 24 Concentration of NH₃ at Sampling sites
(January 2020)**

**Table: 16 Concentrations of VOCs and HC in the Ambient Air
(January 2020)**

Sr. No.	Sampling Location	Benzene	Toluene	Xylene	MHC	NMHC
		(µg/m ³)	(µg/m ³)	(µg/m ³)	ppm	ppm
1.	Administrative Building TFL	<0.1	<0.1	<0.1	0.5	0.5
2.	Housing Board Colony, Bikrapur	<0.1	<0.1	<0.1	0.3	0.34
3.	Village Karnapur	<0.1	<0.1	<0.1	0.3	0.3
4.	TFL-Guest House	<0.1	<0.1	<0.1	0.4	0.3
5.	Village Balanda	<0.1	<0.1	<0.1	0.2	0.4
6.	Village Kukudanga	<0.1	<0.1	<0.1	0.5	0.2
	Permissible limits	5µg/m ³				

February 2020

- ◆ The concentration of Sulphur dioxide (SO₂) varied from 42 to 101µg/m³. The concentration of Sulphur dioxide (SO₂) was observed minimum at Karnapur maximum at HB Colony (**Figure 25 and Table 17**).
- ◆ The concentration of Nitrogen dioxide (NO₂) was observed in the range of 104 to 158µg/m³, the minimum concentration was found at Karnapur while maximum concentration was accounted at HB Colony (**Figure 26 and Table 17**).
- ◆ The concentration of NH₃ varied from 41 to 72µg/m³, minimum concentration of Ammonia (NH₃) found at HB Colony and maximum was found at Balanda sampling site (**Figure 27 and Table 17**).
- ◆ VOCs were not detectable in any of the sites; values of MHC and NMHC are given in the table (**Table 18**)

The sampling was carried out during the Post-Monsoon season (February, 2020). Overall, all Air Quality Parameters studied in the study area were found to be well within the permissible limits.

**Table 17 : Air Quality Status within the Study Area
(Post-Monsoon Season – February 2020)**

Units: µg/m³ Average: 24 hrs.

Sr. No.	Sampling Location	SO ₂			NO ₂			NH ₃		
		Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
1	Administrative Building TFL	35	81	118	55	119	174	35	59	152
2	Housing Board Colony, Bikrampur	74	101	129	76	158	202	29	41	93
3	Village Karnapur	33	42	65	80	104	120	33	46	69
4	TFL-Guest House	42	91	140	69	134	187	23	48	72
5	Village Balanda	34	69	115	79	118	174	36	72	98
6	Village Kukudanga	33	50	75	90	110	125	26	42	63
Permissible limits		80			80			400		

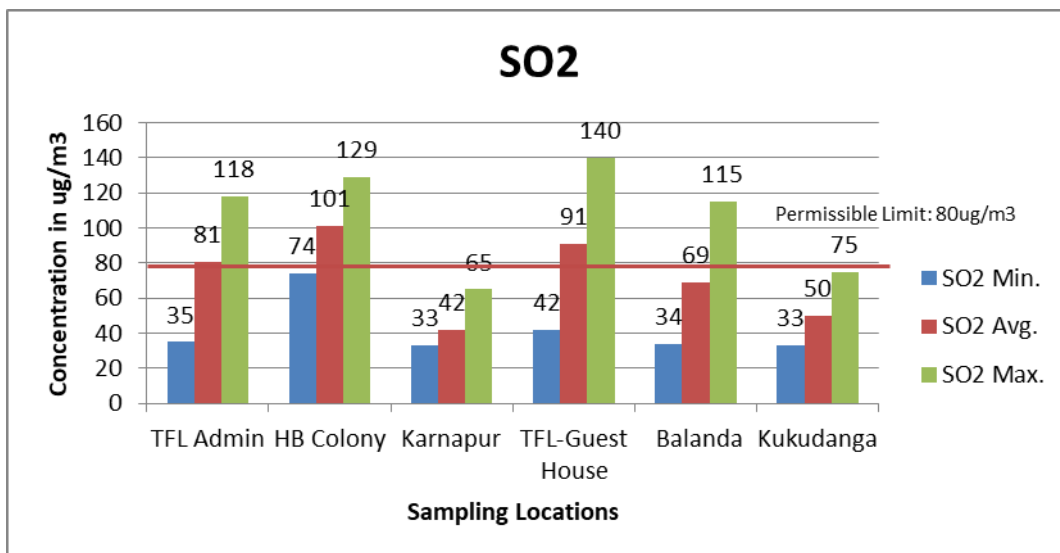


Figure 25 : Concentration of SO₂ at Sampling sites (Post-Monsoon Season – February 2020)

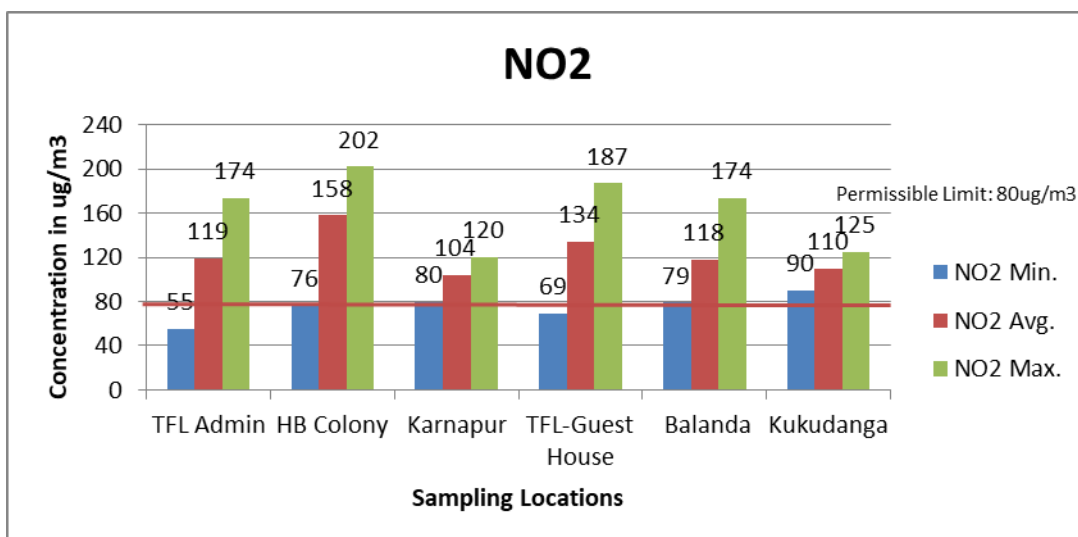
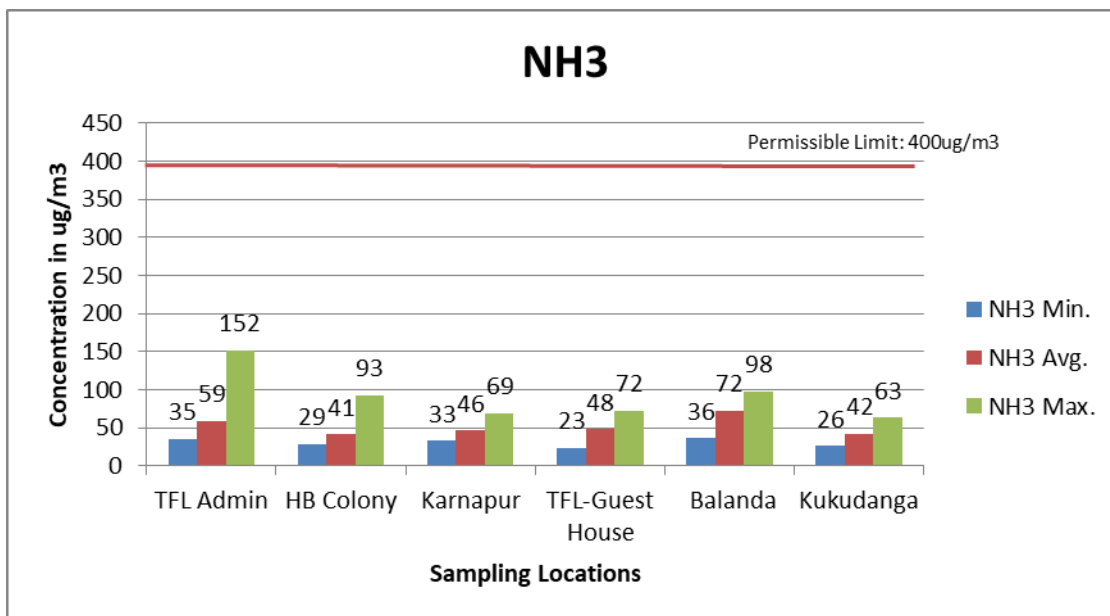


Figure 26 : Concentration of NO₂ at Sampling sites (Post-Monsoon Season – February 2020)



**Figure 27 : Concentration of NH₃ at Sampling sites
(Post-Monsoon Season – February 2020)**

**Table 18 : Concentrations of VOCs and HC in the Ambient Air
(Post-Monsoon Season – February 2020)**

Units: µg/m³

Average: 24 hrs.

S. No.	Sampling Location	Benzene	Toluene	Xylene	MHC	NMHC
		(µg/m ³)	(µg/m ³)	(µg/m ³)	ppm	ppm
1.	Administrative Building TFL	<0.1	<0.1	<0.1	0.6	0.5
2.	Housing Board Colony, Bikrapur	<0.1	<0.1	<0.1	0.4	0.5
3.	Village Karnapur	<0.1	<0.1	<0.1	0.3	0.4
4.	TFL-Guest House	<0.1	<0.1	<0.1	0.4	0.5
5.	Village Balanda	<0.1	<0.1	<0.1	0.2	0.5
6.	Village Kukudanga	<0.1	<0.1	<0.1	0.5	0.3
	Permissible limits	5µg/m ³				

Plate 1 Air Monitoring at Sampling Locations



A1: Technical Building TFL

A2: Housing Board Colony, Bikrampur



A3: Village Karnapur

A4: TFL-Guest House



A5: Village Balanda

A6: Village Kukudanga