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Indoor Air Quality and Stack Emissions Monitoring in Urban Centres of Gilgit-Baltistan

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1. INTRODUCTION

The present study "Air and Noise Pollution Monitoring in Urban Centres of GB" is an integral part of a GBEPA project titled "Strengthening of Laboratory and Baseline Studies for Environmental Parameters in GB". Government of Gilgit-Baltistan allocated funds for this project through local ADP.

Gilgit-Baltistan Environmental Protection Agency (GB-EPA), investigated selected parameters on Indoor Air Quality and Stack Emissions from wood and other burning material used in stoves at household level. For this purpose samples were collected from selected households in seven districts of Gilgit-Baltistan. SGS Pakistan has provided the technical assistance to GBEPA to conduct this study.

The rationale is to investigate the level of Indoor air pollution levels at existing settings. It is quantitative data collected during the study and it will be used to devise an indoor mitigation strategy for reduction of in house air pollution due to fossil fuel pollutants. The report documents the finding of the indoor air quality survey conducted at technically selected locations of Gilgit-Baltistan region.

1.1 PROJECT RATIONAL

In Gilgit-Baltistan, Bukhari is a wood burning traditional space heater system widely used for heating and cooking purposes. The existing construction pattern and Bukhari installations are not long enough to vent smoke outside the house, resulting in annual deaths from carbon monoxide poisoning and ARI (acute respiratory infections) infections in aged and new born throughout the region.

1.2 OBJECTIVE

The objective of the study is to:

Determine Indoor Air Quality in seven urban centres of Gilgit-Baltistan.

Determine Stack Emissions at different regions of Gilgit-Baltistan.

Identify potential sources of pollution in line with Pak-EPA National Environmental Quality Standards (NEQS).

1.3 SCOPE

The objective of the study is to:

Indoor Air Quality monitoring at identified locations on Pak-EPA NEQS Standard parameters (NO_2, SO_2 , CO, CO_2 and PM_{10})

Comparison of monitored Results with Pak-EPA NEQS.

The environmental monitoring was conducted at the indicated locations in Gilgit-Baltistan on the defined parameters. The report constitutes followings;

1.4 STUDY AREA

Gilgit-Baltistan is a mountainous region with unique high altitude ecosystem covered by high mountains and glaciers, pastures, forest and water resources. Ambient and Indoor Air Quality is deteriorating day-by-day due to influx of Vehicles, burning of Fossil Fuels during winters for heating and cooking and over exploiting of natural resources. Gilgit-Baltistan is now a self-governing territory within Pakistan which was formerly known as the Northern Areas. It is the northernmost political entity within Pakistan. It borders Pakistan's Khyber Pakhtoonkhwa province in the west, Afghanistan's Wakhan Corridor to the north, China in the northeast, Azad Jammu and Kashmir (AJK) in the south, and the Indian occupied Kashmir to the southeast. Gilgit-Baltistan region is divided into seven districts Ghanche, Skardu, Gilgit, Diamer, Ghizer, Astore and Hunza -Nagar with its administrative centre located in the town of Gilgit. Gilgit-Baltistan covers an area of 72,971 km² (28,174 mi²) with an estimated population approaching 1,000,000.

Figure 1.1: Project Location

1.4.1 INDOOR AIR QUALITY MONITORING LOCATIONS

The sites selected for the indoor air quality monitoring, PM_{10}, NO_2, SO_2 and H_2S sampling and analysis is as follows:

Table 1.1: Indoor Air Quality Monitoring Locations

Sr. No.	Location	District
1	Sonikot	Gilgit
2	Barmas Bala	
3	Majini Mohala	
4	Army Public School	
5	Khomar Damote	
6	Zulifqarabad	
7	Damas	Ghizer

8	Hime	
9	Hyderabad	Hunza-Nagar
10	Karimabad	
11	Astore Bazar	Astore
12	P.W.D. Building	
13	Sundus	Skardu
14	Aliabad	
15	Gangopi	
16	Barah	Ghanche
17	Khaplu Bazar	
18	Beesham Hotel	Chilas
19	Pine	

1.4.2 STACK EMISSION MONITORING LOCATIONS

Stack emission monitoring was conducted on the following locations:

Table 1.2: Stack Emission Quality Monitoring Locations

Sr. No.	Location	District
1	Sonikot	Gilgit
2	Barmas Bala	
3	Khomar Damote	
4	Damas	Ghizer
5	Hyderabad	Hunza-Nagar
6	P.W.D. Building	Astore
7	Sundus	Skardu
8	Aliabad	
9	Khaplu	Ghanche
10	Beesham Hotel	Chilas

2. METHODOLOGY

Following is the brief description of methodology adopted for this project.

2.1 SURVEY PLANNING

2.1.1 IDENTIFICATION OF MONITORING LOCATIONS

Locations for the sampling and monitoring on required environmental parameters were identified and finalized keeping in view the population density of urban centres.

2.1.2 MONITORING PLAN

On the basis of identified sampling locations a monitoring plan was developed in order to obtain representative data on the required environmental parameters. Indoor air samples for the assessment of Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), and Hydrogen Sulphide (H_2S) were collected from the identified sites and dispatched to SGS Environmental Laboratory for analysis while monitoring of Carbon Monoxide (CO), Carbon Dioxide (CO_2), Temperature and Humidity was conducted on site. Emissions from the stacks for the estimation of CO, CO_2, O_2, NO_2, SO_2, H_2S and smoke were monitored using Flue Gas Analyzer. Sampling for metals, particulate matter and hydrogen Halides (HX) was carried out on site and samples were dispatched to SGS Environmental Laboratory for analysis. The plan developed for field survey and sampling is presented in Table 2.1. The collected samples were preserved and labeled with their source identified before dispatching to SGS Environmental Laboratory for analysis.

Table 2.1: Survey and Monitoring Plan Indoor

Sr. No.	Activity	Duration: March, 2012							
		6	7	8	9	10	11	12	13
	Indoor Air Quality								
1	Sonikot								
2	Barmas Bala								
3	Majini Mohala								
4	Army Public School								
5	Khomar Damote								
6	Zulifqarabad								
7	Damas								
8	Hime								

9	Hyderabad								
10	Karimabad								
11	Astore Bazar								
12	P.W.D. Building								
13	Sundus								
14	Aliabad								
15	Gangopi								
16	Barah								
17	Khaplu Bazar								
18	Beesham Hotel								
19	Pine								

Table 2.2: Survey and Monitoring Plan Stack Emission

Sr. No.	Activity	Duration: March, 2012							
		6	7	8	9	10	11	12	13
	Stack Emission Monitoring								
1	Sonikot								
2	Barmas Bala								
3	Khomar Damote								
4	Damas								
5	Hyderabad								
6	P.W.D. Building								
7	Sundus								
8	Aliabad								
9	Khaplu								
10	Beesham Hotel								

2.2 SAMPLING AND ANALYTICAL METHODS

The sampling and testing methods are given in following sections of the report while the photographs of sampling are included as Annexure-1 of this report.

2.2.1 INDOOR AIR QUALITY MONITORING

Indoor air quality on the selected locations was monitored for the estimation of Carbon monoxide, Nitrogen dioxide, Sulphur dioxide, Hydrogen sulphide and Particulate matter concentrations.

I) CARBON MONOXIDE

Carbon monoxide at the project site was monitored using portable analyzer. Measurement range of the analyzer is 0- 500 ppm. Three real time readings were taken and average is reported.

II) CARBON DIOXIDE

Carbon Dioxide at sampling points was monitored using portable analyzer. Measurement range of the analyzer is 0- 5000 ppm. Three real time readings were taken and average is reported.

III) TEMPERATURE

Temperature at sampling points was monitored using portable analyzer. Measurement range of the analyzer is 0- 50 ^{o}C. Three real time readings were taken and average is reported.

IV) RELATIVE HUMIDITY

Relative Humidity at sampling points was monitored using portable analyzer. Measurement range of the analyzer is 5- 95%. Three real time readings were taken and average is reported.

V) NITROGEN DIOXIDE

A measured volume of air is bubbled through a solution sample for duration of 02 hrs. The nitrogen dioxide absorbed in the solution is analyzed by colorimetry for NO_2 concentration in ambient air.

VI) SULPHUR DIOXIDE

A measured volume of air is bubbled through a solution sample for 02 hrs duration. The solution after bubbling is analyzed by spectrophotometer and amount of SO_2 is calculated. This method is applicable to measure ambient SO_2 concentration from 0.01 to 0.04 ppm using sampling period ranging from 30 min. to 24 hrs.

2.2.2 PARTICULATE MATTER (PM_{10})

Particulate matter concentration in terms of PM_{10} was monitored in the indoor air with the help of Low Volume PM_{10} sampler. Measurement range of the equipment is 2-750 µg/m^3 with lowest detection limit of 2 µg/m^3. PM_{10} sampling was conducted for 2 hours at identified sampling locations with the help of fibreglass filters. The filters were properly

stored and placed in the vacuum desiccators and transported to SGS Pakistan (Pvt) Limited Environmental Laboratory for estimation of PM_{10}.

Table 2.3: Methodology & Sampling Duration of Indoor Air Quality Monitoring

Air Pollutant	Monitoring Sensor	Reference	Measurement Range	Resolution
Carbon Dioxide (CO_2)	Non Dispersive Infrared	Standard ASHRAE 62:2001	0 – 5000 ppm	1 ppm
Carbon Monoxide (CO)	Electro-Chemical	Standard European Directive 2000/69/CEE	0 – 500 ppm	1 ppm
Temperature	Thermistor	Standard ISO 7730	0 – 50 °C	0.1 C
Humidity	Thin Film Capacitive	Standard ISO 7730	5 to 95 %	0.1 % RH
Nitrogen Dioxide(NO_2)	Electro-Chemical	EN 50270:1999	0.2 – 100 ppm	1 ppm
Sulphur Dioxide(SO_2)	Electro-Chemical	EN 50270:1999	0.2 – 100 ppm	1 ppm
Hydrogen Sulphide (H_2S)	Electro-Chemical	EN 50270:1999	0 – 1000 ppm	1 ppm
Particulate Matter (PM_{10})	PM_{10} Sampler	40 CFR 50, App. J (US EPA)	2 – 750 µg/m^3	2 µg/m^3

2.2.3 STACK EMISSION MONITORING

Gaseous emission monitoring was conducted at recommended sampling points. CO, SO_2, O_2, NO_2, NO, CO_2 and H_2S were the parameters monitored using flue gas analyzer while Particulate Matter (PM), metals i.e. (Cd, Hg, Pb, As, Zn, Cu and Sb) and Hydrogen Halides (HF and HCl) was monitored using USEPA Methods.

3. RESULTS AND DISCUSSION

This section of the report presents the discussion on test results obtained during indoor air quality monitoring, stack emissions sampling and analysis.

3.1 INDOOR AIR QUALITY

Concentration of CO, NO_2, SO_2, H_2S and PM_{10} was measured at 19 sampling points at advised locations of Gilgit-Baltistan consecutively to get an overview of the indoor air quality. Pollutants were monitored for 2 continuous hours and its mean was calculated for each day of intervention. The results of measured concentrations at each sampling location are given in Annexure-2 of the report.

The discussion on the results of each measured pollutant concentration in indoor air is given in subsequent sections.

3.1.1 PARTICULATE MATTER (PM_{10})

The concentration of PM_{10} in the indoors was monitored for 2 hours at each advised location. The results indicate that minimum PM_{10} was 72.2 µg/m^3 on 2 hour average basis at Zulifqarabad located in Gilgit; whereas it was found highest at 937.5 µg/m^3 at Astore Bazar site. Hourly averages for the Particulate matter are given in **Annexure 2** of the report. While the results of 2 hour average at each location are plotted in **Figure 3.1**

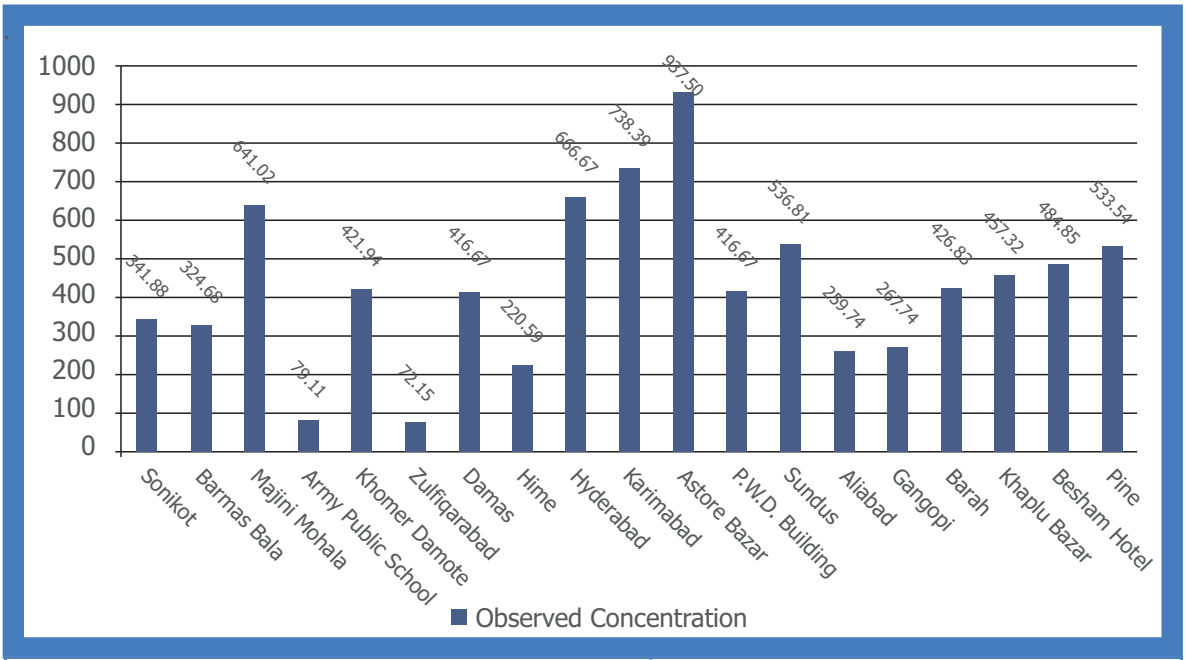

Figure 3.1: Average Concentration of PM_{10} (µg/m^3)

3.1.2 CARBON MONOXIDE (CO)

The real time concentration of CO in the indoors was monitored at each advised location. The results indicate that minimum CO was, 1.2 ppm at Damas located in Ghizer; whereas it was found highest at 26.8 ppm at Khaplu Bazar site located in Ghanche.

Averages for the CO concentration are given in **Annexure 2** of the report while the results of average at each location are plotted in **Figure 3.2**.

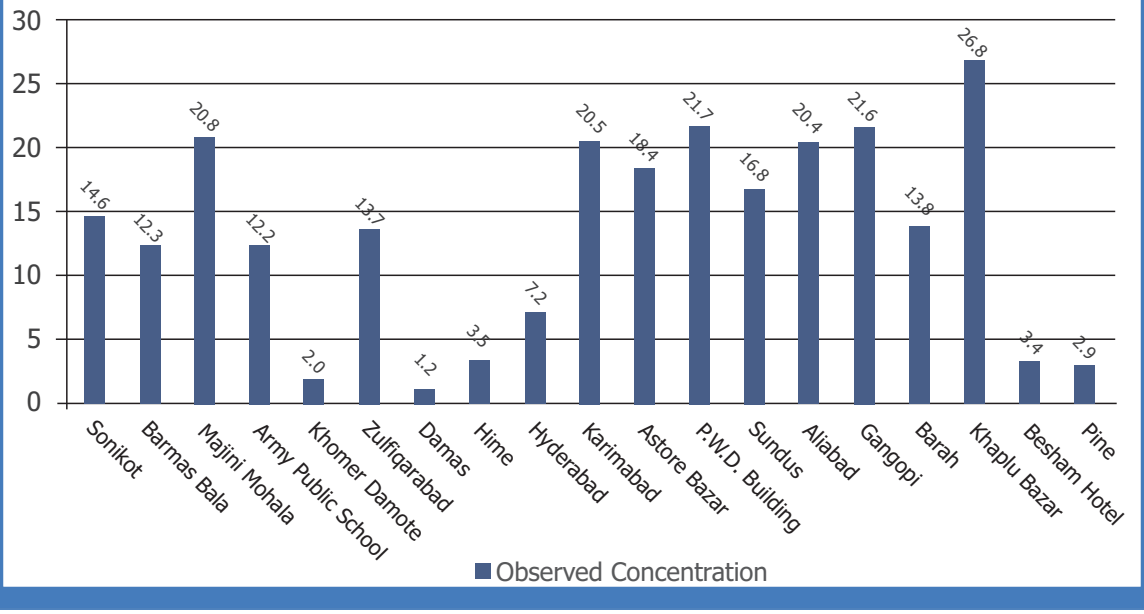

Figure 3.2: Average Concentration of CO (ppm)

3.1.3 CARBON DIOXIDE (CO_2)

The real time concentration of CO_2 in the indoors was monitored at each advised location. The results indicate that minimum CO_2 was 274.6 ppm at Damas located in Ghizer.

Averages for the CO_2 concentration are given in **Annexure 2** of the report while the results of average at each location are plotted in **Figure 3.3**.

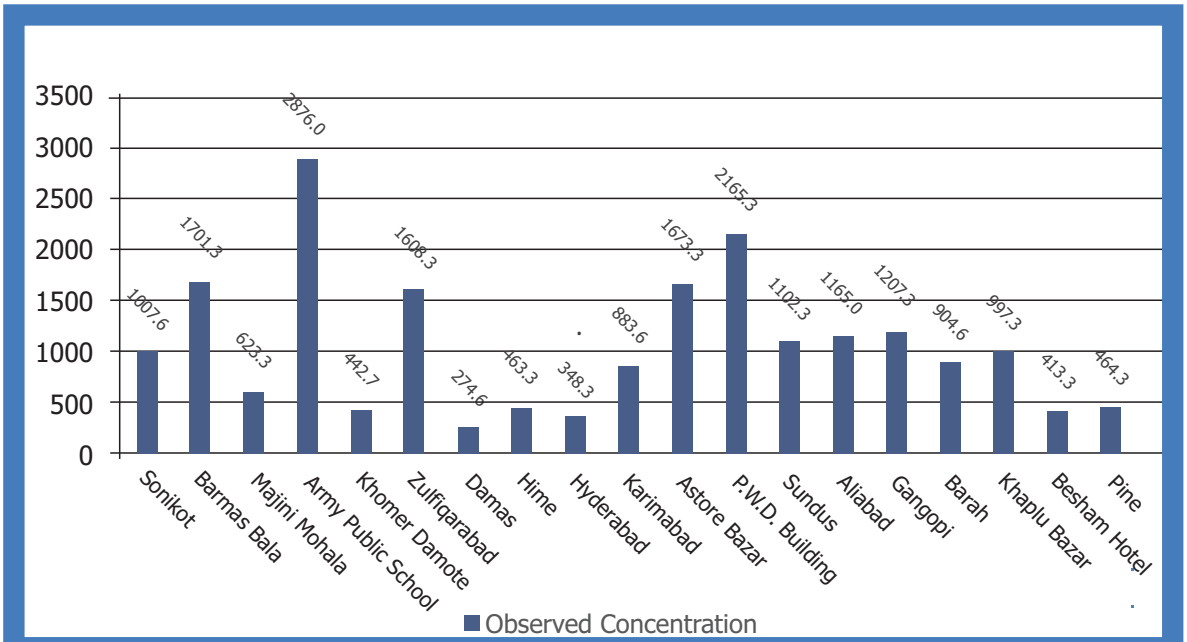

Figure 3.3: Average Concentration of Co2 (ppm)

3.1.4 TEMPERATURE

The real time temperature in the indoors was monitored at each advised location. The results indicate that minimum temperature was 12.8 ^{0}C on average basis at Damas located in Ghizer; whereas it was found highest at 29.5 ^{0}C at Hime area of Ghizer urban canter.

Averages for the temperature are given in **Annexure 2** of the report while the results of average at each location are plotted in **Figure 3.4**.

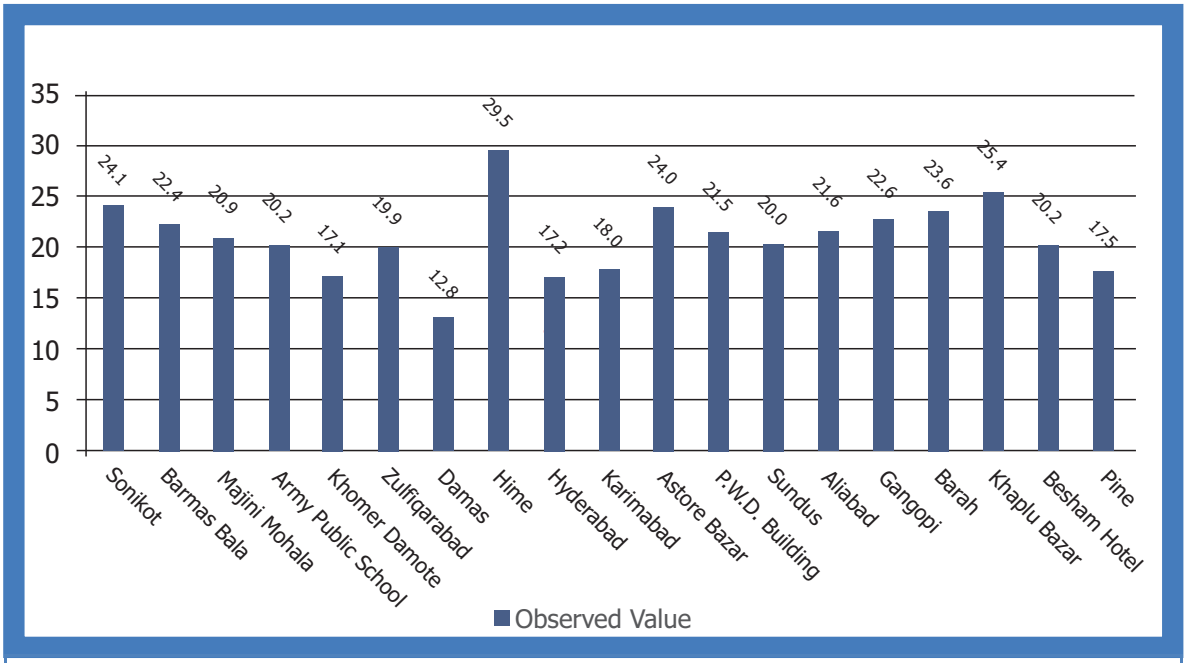

Figure 3.4: Temperature (Celsius)

3.1.5 HUMIDITY

Humidity in the indoors was monitored at each advised location. The results indicate that minimum humidity was 20.2 % average basis at Khaplu Bazar, Ghanche; whereas it was found highest at 61 % at Barmas Bala located in Gilgit.

Average values for the humidity are given in **Annexure 2** of the report while the results of average at each location are plotted in **Figure 3.5**.

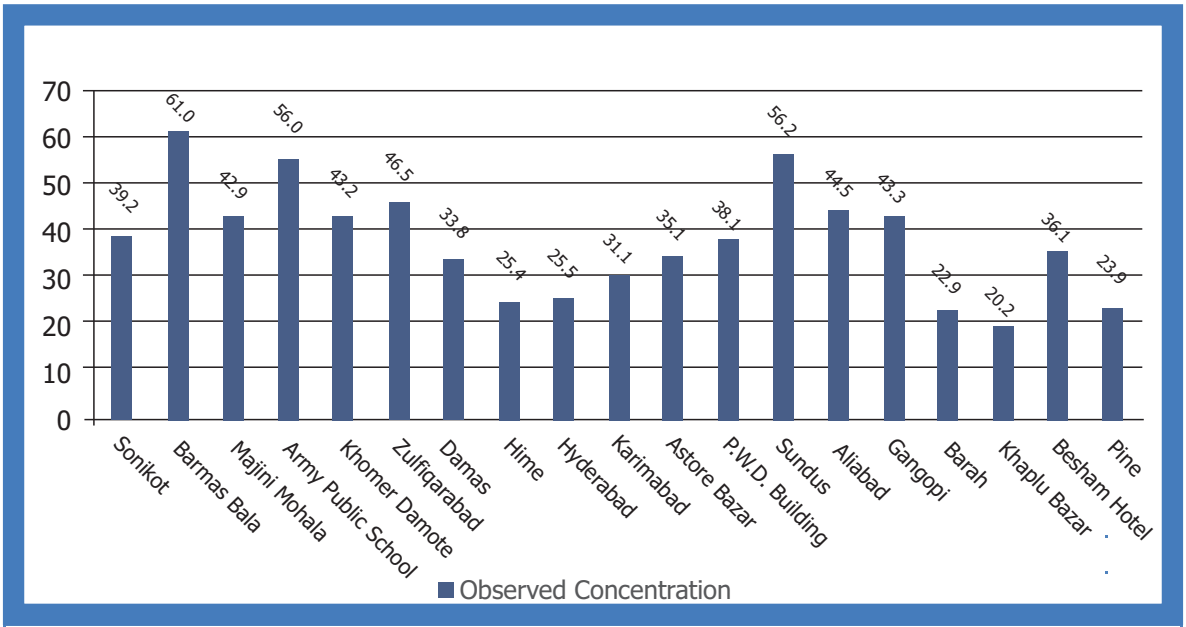

Figure 3.5: Humidity(%)

3.2 STACK EMISSION MONITORING

Gaseous emission monitoring was conducted at recommended sampling points. CO, SO_2, O_2, NO_2, NO, CO_2 and H_2S were the parameters monitored using flue gas analyzer while Particulate Matter (PM), metals i.e. (Cd, Hg, Pb, As, Zn, Cu and Sb) and Hydrogen Halides (HF and HCl) was analysed in chemical lab. All results of metal analysis were within limits. Stack emission results and thimble analysis results are attached in **Annexure 3** of the report.

3.2.1 CARBON MONOXIDE (CO)

The concentration of CO in the stack emission was monitored at each advised location. The results indicate that minimum CO was, 1,474 mg/Nm^3 at Aliabad area of Skardu; whereas it was found highest at 10,874 mg/Nm^3 at Astore Bazar. The concentration of CO is exceeding than Pak NEQS as the limit is 800 mg/Nm^3.

Averages for the CO concentration are given in **Annexure 3** of the report while the results of average at each location are plotted in **Figure 3.6**.

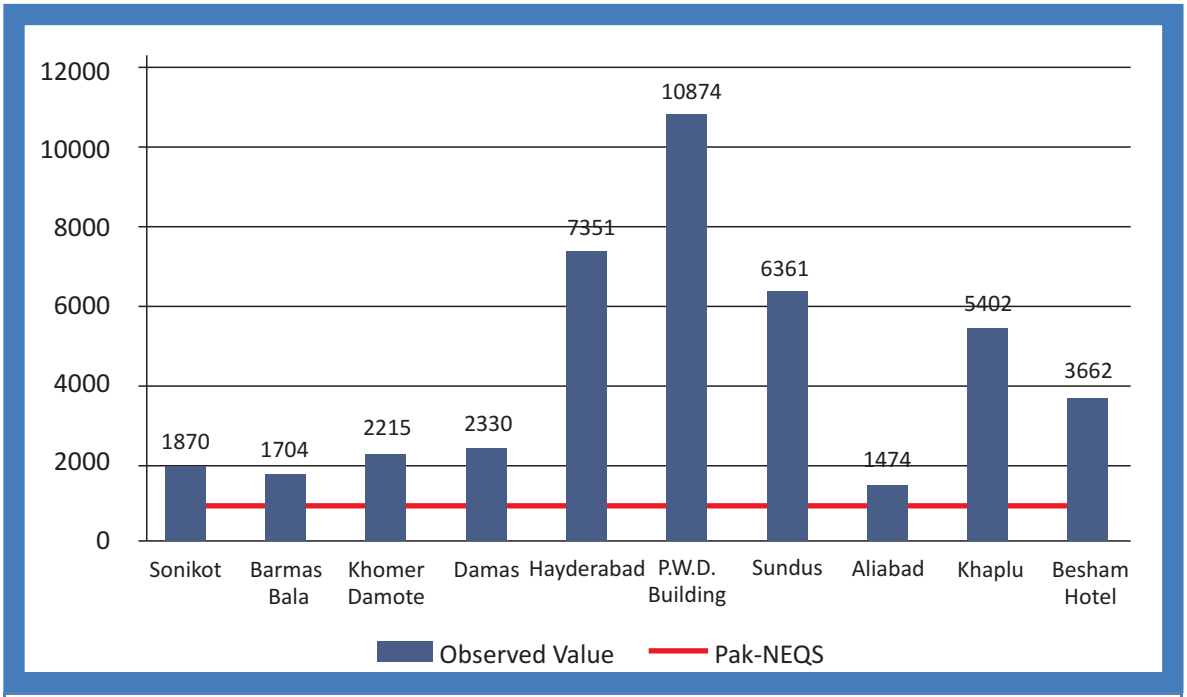

Figure 3.6: Concentration of CO (mg/Nm^3)

3.2.2 SULPHUR DIOXIDE (SO_2)

The concentration of SO_2 in the stack emission was monitored at each advised location. The results indicate that minimum SO_2 was, 1 mg/Nm^3 at Beesham Hotel located in Chilas; whereas it was found highest at 83 mg/Nm^3 at P.W.D Building, Astore. The concentration of SO_2 is less than Pak NEQS as the limit is 1700 mg/Nm^3.

Averages for the SO_2 concentration are given in **Annexure 3** of the report while the results of average at each location are plotted in **Figure 3.7**.

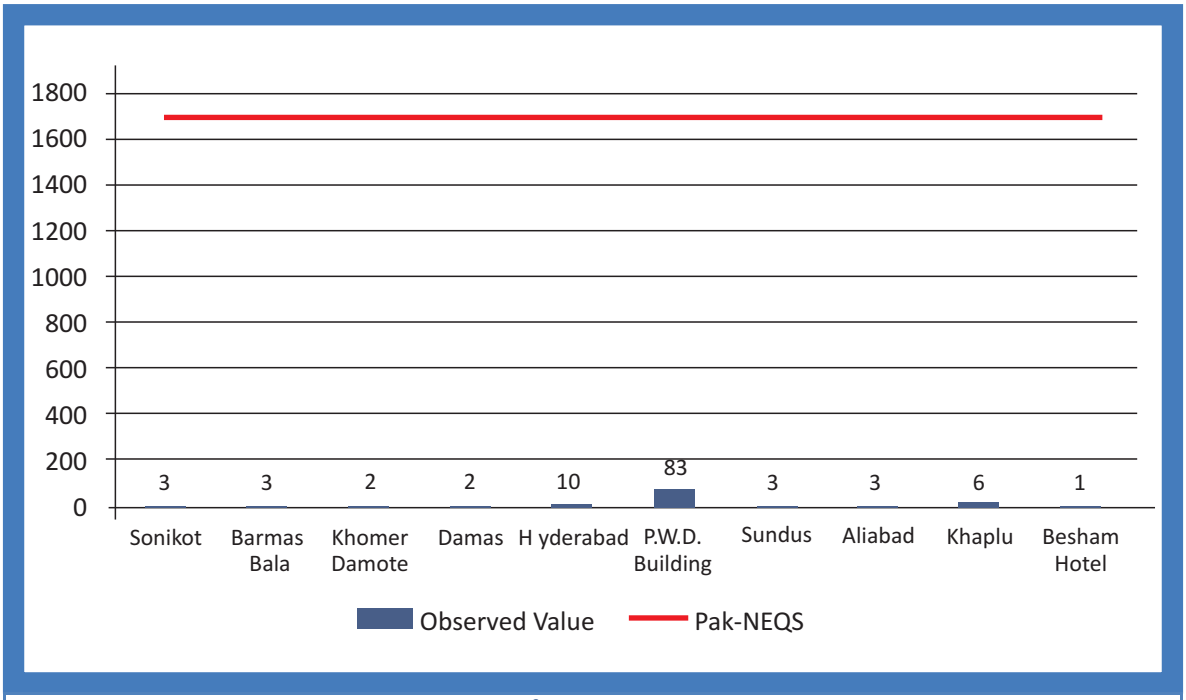

Figure 3.7: Concentration of So_2 (mg/Nm^3)

3.2.3 OXIDES OF NITROGEN (NO_X)

The concentration of NO_x in the stack emission was monitored at each advised location. The results indicate that minimum NO_x was 3 mg/Nm^3 at Sonikot located in Gilgit; whereas it was found highest at 97 mg/Nm^3 at P.W.D Building, Astore. The concentration of NO_x is less than Pak NEQS as the limit is 1200 mg/Nm^3.

Averages for the NO_x concentration are given in **Annexure 3** of the report while the results of average at each location are plotted in **Figure 3.8**.

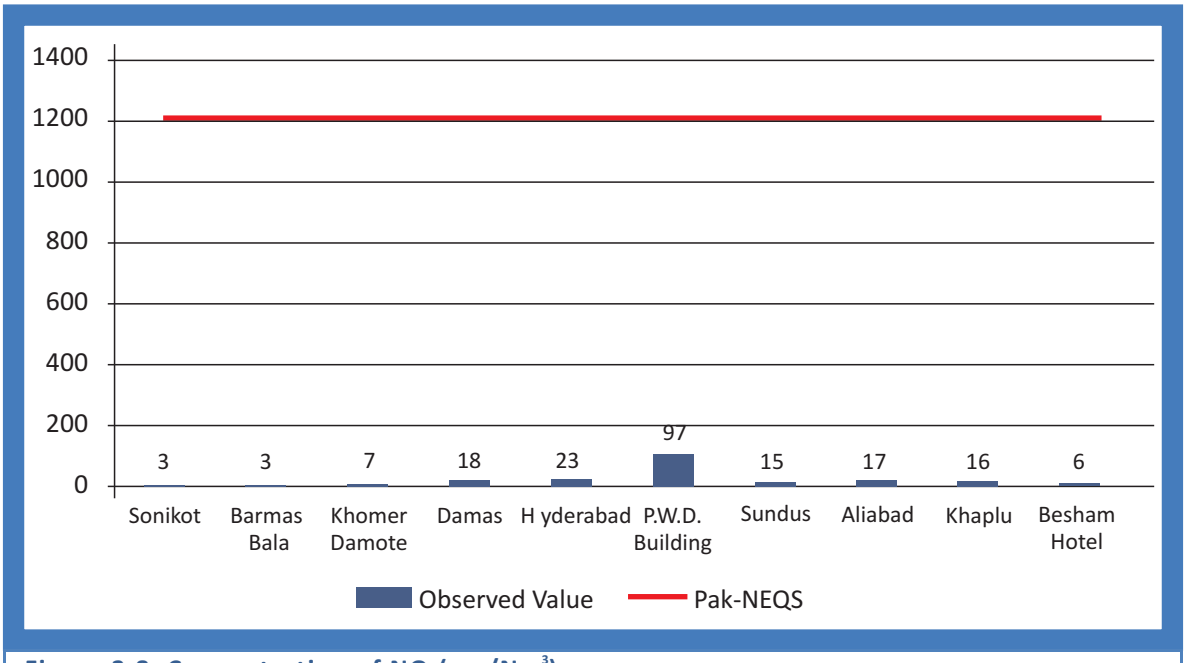

Figure 3.8: Concentration of NO_2 (mg/Nm^3)

3.2.4 SMOKE

The concentration of smoke in the stack emission was monitored at each advised location. The results indicate that minimum smoke was, 1 on Ringleman Scale at Khomar Damote located in Gilgit; whereas it was found highest at 4 on Ringleman Scale at P.W.D Building, Astore and Aliabad, Skardu. The concentration of smoke is exceeding in some areas than Pak NEQS as the limit is 2 on Ringleman Scale.

Averages for the smoke concentration are given in **Annexure 3** of the report while the results of average at each location are plotted in **Figure 3.9**.

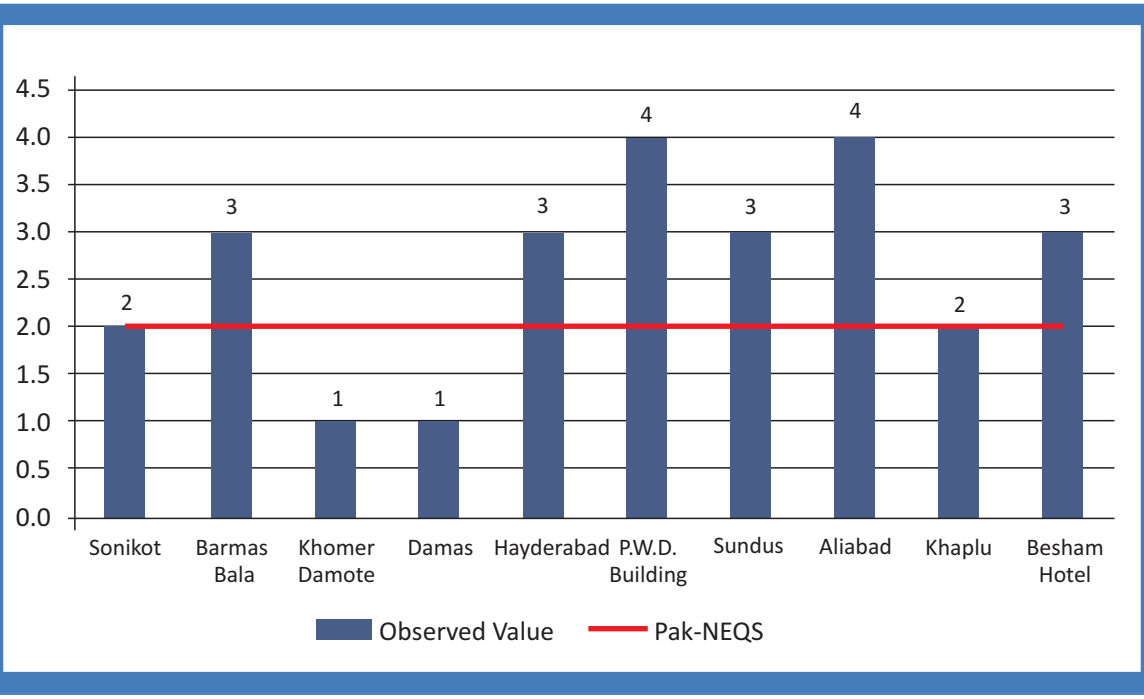

Figure 3.9: Concentration of Smoke (Ringleman Scale)

3.2.5 PARTICULATE MATTER

The concentration of Particulate Matter was monitored at each advised location. The results indicate that minimum PM was 121.58 mg/Nm^3 at Sonikot located in Gilgit; whereas it was found highest at 172.00 mg/Nm^3 at Hyderabad, Hunza-Nagar. The concentration of Particulate Matter is within limits than Pak NEQS as the limit is 500 mg/Nm^3.

Averages for the Particulate Matter concentration are given in **Annexure 3** of the report while the results of average at each location are plotted in **Figure 3.10**.

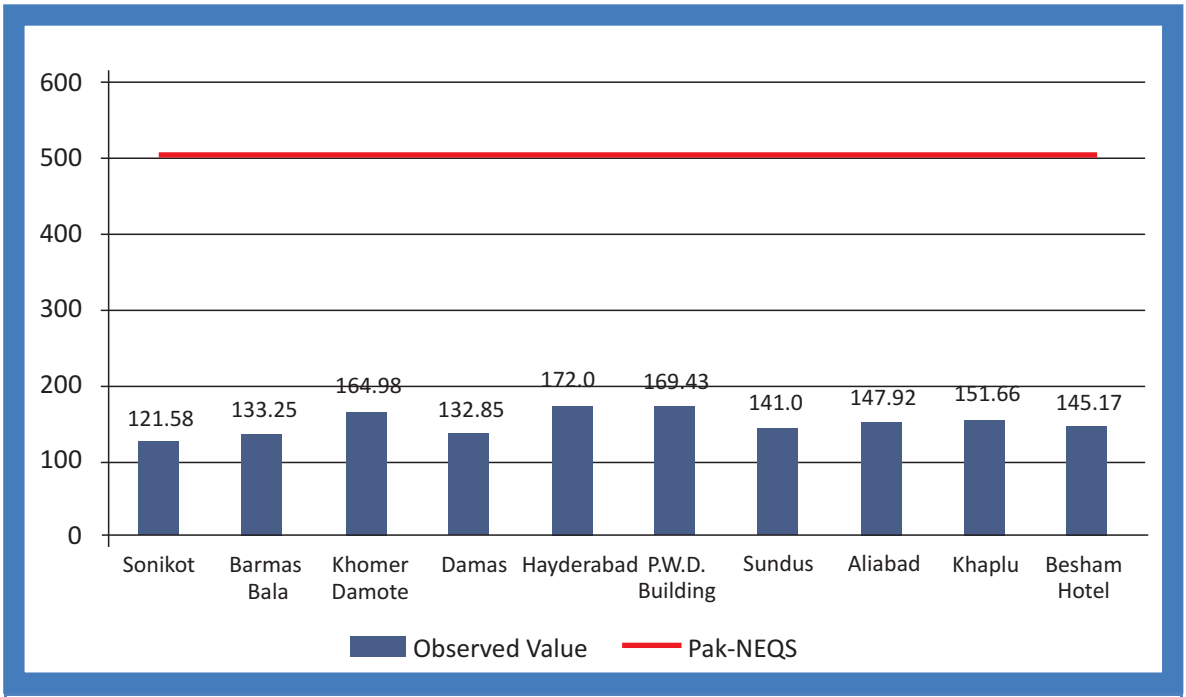

Figure 3.10: Concentration of PM (mg/Nm^3)

3.2.6 METALS

The concentration of heavy metals i.e. (Cd, Hg, Pb, As, Cu and Sb) were found below detection limits except for Zinc (Zn). The concentration of Zinc was found minimum at Hyderabad, Hunza and Khomar Damote, Gilgit at 0.025 mg/Nm^3 each; whereas it was found highest at 0.1749 mg/Nm^3 at P.W.D. Office Astore. The concentration of Zinc is within limits than Pak NEQS as the limit is 200 mg/Nm^3.

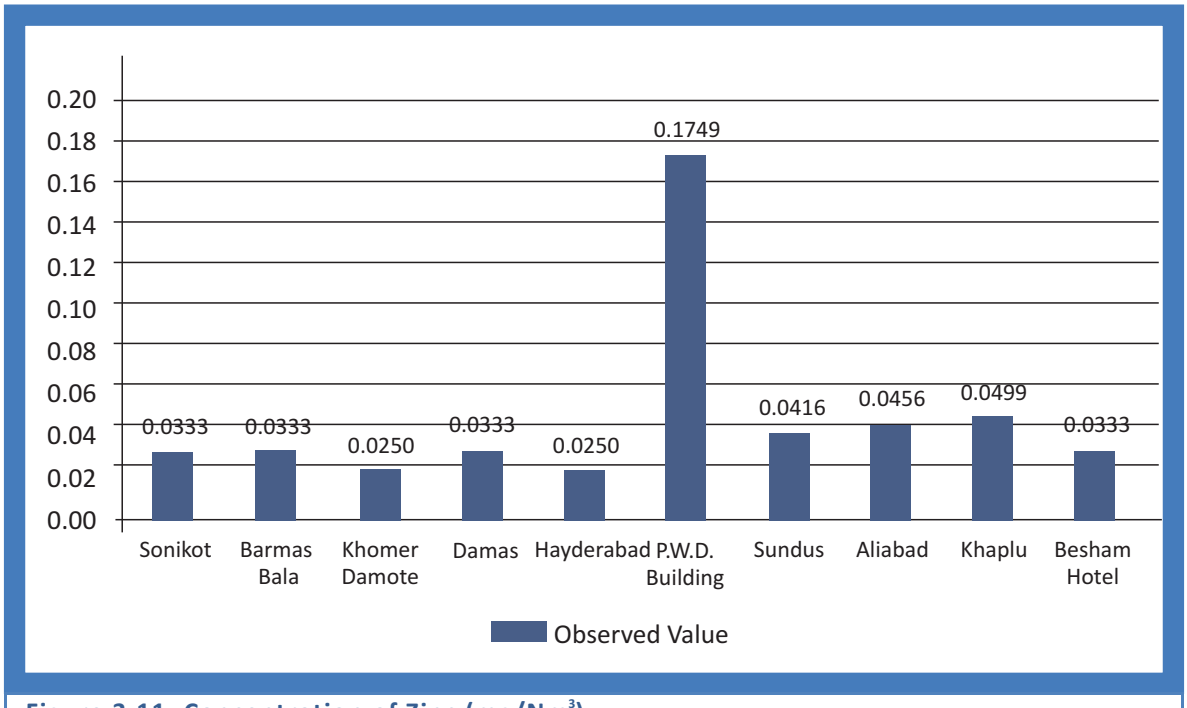

Figure 3.11: Concentration of Zinc (mg/Nm^3)

3.2.7 HYDROGEN HALIDES (HX)

The concentration of Hydrogen Halides was monitored at each advised location. The concentration of Hydrogen Halides was found minimum at 5.43 mg/Nm^3 in Damas, Ghizer; whereas it was found highest at 21.71 mg/Nm^3 Barmas Bala, Gilgit.

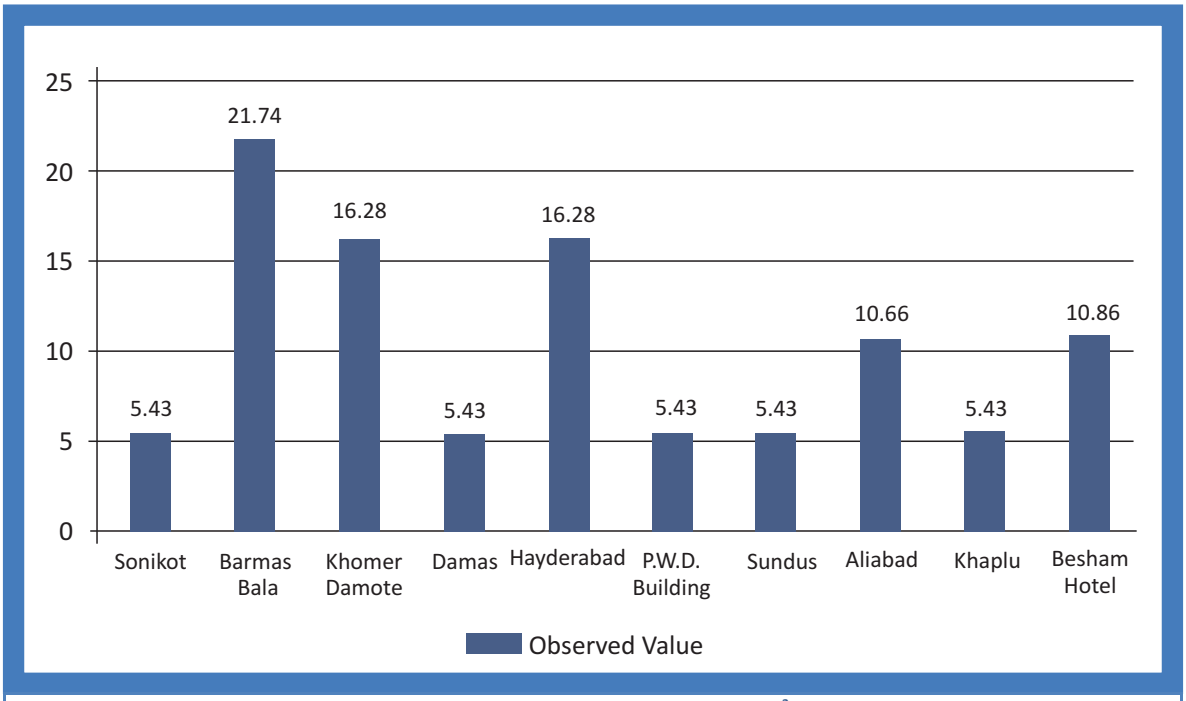

Figure 3.12: Concentration of Hydrogen Halides HX (mg/Nm^3)

ANNEXURES

ANNEXURE 1: PHOTOGRAPHS

Hydrocarbon and PM_{10} Measurement in Ambient Air at Airport Chowk

Hydrocarbon and PM_{10} in Ambient Air at Ittehad Chowk

Noise Level Monitoring at Hospital Chowk

PM_{10} and HC Sampling at Ittehad Chowk

Noise Level Monitoring at Ittehad Chowk

Noise Level Monitoring at Ittehad Chowk

PM_{10} and HC Sampling at Ittehad Chowk

Indoor Air Quality Monitoring at Skardu

	
Indoor Air Quality Monitoring at Chilas	**Indoor Air Quality Monitoring at Ghizer**

ANNEXURE 2: INDOOR AIR QUALITY MONITORING RESULTS

INDOOR AIR QUALITY RESULTS FOR PARTICULATE MATTER (PM_{10})

Sr.#	Monitoring Locations	Date (2012)	Duration	Average Concentrations
				Particulate Matter ($\mu g/m^3$)
1.	Sonikot	Mar, 06	02 Hrs	341.88
2.	Barmas Bala	Mar, 06	02 Hrs	324.68
3.	Majini Mohala	Mar, 06	02 Hrs	641.02
4.	Army Public School	Mar, 07	02 Hrs	79.11
5.	Khomar Damote	Mar, 07	02 Hrs	421.94
6.	EPA Office Zulifqarabad	Mar, 07	02 Hrs	72.15
7.	Damas	Mar, 08	02 Hrs	416.67
8.	Hime	Mar, 08	02 Hrs	220.59
9.	Hyderabad	Mar, 09	02 Hrs	666.67
10.	Karimabad	Mar, 09	02 Hrs	738.39
11.	P.W.D. Building Astore	Mar, 10	02 Hrs	937.5
12.	Astore Bazar	Mar, 10	02 Hrs	416.67
13.	Sundus	Mar, 11	02 Hrs	536.81
14.	Ali Abad	Mar, 11	02 Hrs	259.74
15.	Gangopi	Mar, 11	02 Hrs	267.74
16.	Barah	Mar, 12	02 Hrs	426.83
17.	Khaplu Bazar	Mar, 12	02 Hrs	457.32
18.	Chilas	Mar, 13	02 Hrs	484.85
19.	Pine	Mar, 13	02 Hrs	533.54

INDOOR AIR QUALITY

Date of Intervention: **06-Mar-12**
Place of Intervention: **Sonikot**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	8.60	17.10	18.10	14.6
CO_2	ppm	822.00	1,085.00	1,116.00	1007.6
Temperature	^{0}C	24.40	23.90	23.90	24.1
Relative Humidity	%	38.30	39.70	39.60	39.20

INDOOR AIR QUALITY

Date of Intervention: **06-Mar-12**
Place of Intervention: **Barmas Bala**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	7.6	8.2	20.9	12.3
CO_2	ppm	1575.0	1651.0	1878.0	1701.3
Temperature	^{0}C	22.3	22.5	22.5	22.4
Relative Humidity	%	61.0	60.2	61.8	61.0

INDOOR AIR QUALITY

Date of Intervention: **06-Mar-12**
Place of Intervention: **Majini Mohala**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	19.6	21.4	21.5	20.8
CO_2	ppm	579.0	640.0	651.0	623.3
Temperature	^{0}C	21.2	20.8	20.7	20.9
Relative Humidity	%	92.1	43.2	42.9	42.9

INDOOR AIR QUALITY

Date of Intervention: **07-Mar-12**
Place of Intervention: **Army Public School**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	11.9	12.2	12.6	12.2
CO_2	ppm	2861.0	2873.0	2894.0	2876.0
Temperature	^{0}C	20.0	20.2	20.5	20.2
Relative Humidity	%	57.0	56.1	54.9	56.0

INDOOR AIR QUALITY

Date of Intervention: **07-Mar-12**

Place of Intervention: **Khomar Damote**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	2.0	2.0	2.1	2.0
CO_2	ppm	433.0	440.0	455.0	442.7
Temperature	^{0}C	16.8	17.1	17.3	17.1
Relative Humidity	%	44.1	43.2	42.4	43.2

INDOOR AIR QUALITY

Date of Intervention: **07-Mar-12**

Place of Intervention: **EPA Office Zulifqarabad**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	13.8	13.6	13.8	13.7
CO_2	ppm	1589.0	1673.0	1563.0	1608.3
Temperature	^{0}C	20.4	19.8	19.6	19.9
Relative Humidity	%	46.1	47.0	46.5	46.5

INDOOR AIR QUALITY

Date of Intervention: **08-Mar-12**
Place of Intervention: **Damas**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	1.5	1.2	1.0	1.2
CO_2	ppm	281.0	273.0	270.0	274.6
Temperature	^{0}C	12.9	12.8	12.8	12.8
Relative Humidity	%	34.1	33.7	33.7	33.8

INDOOR AIR QUALITY

Date of Intervention: **08-Mar-12**
Place of Intervention: **Hime**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	3.9	3.2	3.5	3.5
CO_2	ppm	598.0	399.0	393.0	463.3
Temperature	^{0}C	27.9	30.2	30.3	39.5
Relative Humidity	%	31.3	22.7	22.2	25.4

INDOOR AIR QUALITY

Date of Intervention: **09-Mar-12**
Place of Intervention: **Hyderabad**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	7.3	7.2	7.2	7.2
CO_2	ppm	327.0	353.0	365.0	348.3
Temperature	^{0}C	17.2	17.2	17.2	17.2
Relative Humidity	%	25.5	25.5	25.5	25.5

INDOOR AIR QUALITY

Date of Intervention: **09-Mar-12**
Place of Intervention: **Karimabad**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	20.4	20.6	20.6	20.5
CO_2	ppm	822.0	898.0	931.0	883.6
Temperature	^{0}C	18.1	18.0	18.1	18.0
Relative Humidity	%	31.2	31.4	30.8	31.1

INDOOR AIR QUALITY

Date of Intervention: **10-Mar-12**

Place of Intervention: **PWD Building Astore**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	16.3	18.4	20.6	18.4
CO_2	ppm	1828.0	2236.0	2432.0	2165.3
Temperature	^{0}C	21.1	21.5	21.9	21.5
Relative Humidity	%	36.7	38.4	39.3	38.1

INDOOR AIR QUALITY

Date of Intervention: **10-Mar-12**

Place of Intervention: **Astore Bazar**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	23.3	20.2	21.7	21.7
CO_2	ppm	1730.0	1640.0	1650.0	1673.3
Temperature	^{0}C	24.1	24.0	24.0	24.0
Relative Humidity	%	35.0	35.2	35.1	35.1

INDOOR AIR QUALITY

Date of Intervention: 11-Mar-12

Place of Intervention: Sundus

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	17.6	16.5	16.3	16.8
CO_2	ppm	1023.0	1163.0	1121.0	1102.3
Temperature	^0C	17.1	21.5	21.5	20.0
Relative Humidity	%	76.3	46.9	45.3	56.2

INDOOR AIR QUALITY

Date of Intervention: 11-Mar-12

Place of Intervention: Aliabad

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	19.1	21.1	20.9	20.4
CO_2	ppm	1141.0	1175.0	1179.0	1165.0
Temperature	^0C	21.5	21.6	21.6	21.6
Relative Humidity	%	44.7	44.5	44.4	44.5

INDOOR AIR QUALITY

Date of Intervention: **11-Mar-12**
Place of Intervention: **Gangopi**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	21.6	21.6	21.6	21.6
CO_2	ppm	1199.0	1211.0	1212.0	1207.3
Temperature	^{0}C	22.1	22.6	23.2	22.6
Relative Humidity	%	43.8	43.3	42.7	43.3

INDOOR AIR QUALITY

Date of Intervention: **12-Mar-12**
Place of Intervention: **Barah**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	21.5	11.2	8.8	13.8
CO_2	ppm	1177.0	969.0	568.0	9.4.6
Temperature	^{0}C	23.4	26.5	20.8	23.6
Relative Humidity	%	24.3	24.4	20.1	22.9

INDOOR AIR QUALITY

Date of Intervention: **12-Mar-12**
Place of Intervention: **Khaplu**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	26.6	26.0	27.8	26.8
CO_2	ppm	1023.0	989.0	980.0	997.3
Temperature	^{0}C	23.2	26.8	26.1	25.4
Relative Humidity	%	20.1	20.7	19.8	20.0

INDOOR AIR QUALITY

Date of Intervention: **13-Mar-12**
Place of Intervention: **Pine**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	3.8	3.0	3.4	3.4
CO_2	ppm	457.0	424.0	512.0	464.3
Temperature	^{0}C	15.6	17.4	19.6	17.5
Relative Humidity	%	22.9	24.8	24.0	23.9

INDOOR AIR QUALITY

Date of Intervention: **13-Mar-12**

Place of Intervention: **Beesham Hotel, KKH**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Average Concentration
CO	ppm	3.0	2.7	3.1	2.9
CO_2	ppm	336.0	45.	454.0	413.3
Temperature	^{0}C	19.1	20.8	20.6	20.2
Relative Humidity	%	34.3	36.6	37.4	36.1

CHEMICAL ANALYSIS REPORT

TEST REPORT

Description of Sample: **Indoor Air Samples**

No. of Samples: **10**

Sr. #	Sample Collection Date	Sampling Location	NOx	SOx	H_2S
			Ldl: 10µg/m^3	Ldl: 25µg/m^3	-
1	06-03-12	Sonikot	<10	<25	ND
2	06-03-12	Barmas Bala	<10	<25	ND
3	06-03-12	Majini Mohala	<10	<25	ND
4	07-03-12	Army Public School (APS)	<10	<25	ND
5	07-03-12	Khomar Damote	<10	<25	ND
6	07-03-12	EPA office Zulifqarabad	<10	<25	ND
7	08-03-12	Damas	<10	<25	ND
8	08-03-12	Hime	<10	<25	ND
9	09-03-12	Hyderabad	<10	<25	ND
10	13-03-12	Karimabad	<10	<25	ND

CHEMICAL ANALYSIS REPORT

TEST REPORT

Description of Sample: **Indoor Air Samples**
No. of Samples: **9**
Sample Condition upon Receipt: **Satisfactory**

Sr. #	Sample Collection Date	Sampling Location	NOx	SOx	H_2S
			Ldl: 10µg/m^3	Ldl: 25µg/m^3	-
1	10-03-12	P W D Building(Astore)	<10	<25	ND
2	10-03-12	Astore Bazar	<10	<25	ND
3	11-03-12	Sundus Skardu	<10	<25	ND
4	11-03-12	Aliabad Skardu	<10	<25	ND
5	11-03-12	Gangopi Skardu	<10	<25	ND
6	12-03-12	Barah	<10	<25	ND
7	12-03-12	Khaplu Bazar	<10	<25	ND
8	13-03-12	KKH (Chilas)Beesham Hotel	<10	<25	ND
9	13-03-12	Pine, Chilas	<10	<25	ND

ANNEXURE 3: STACK EMISSION MONITORING RESULTS

STACK EMISSION MOITORING

Date of Intervention: **06-Mar-12**
Place of Intervention: **Gilgit**
Monitoring Point: **Sonikot**
Time of Intervention: **23:15 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	6.84	6.85	6.85	-
O_2	%	11.40	11.30	11.30	-
CO	mg/Nm^3	1,870.00	1,870.00	1,870.00	800
SO_2	mg/Nm^3	3.00	3.00	3.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	3.00	3.00	3.00	-
NOx	mg/Nm^3	3.00	3.00	3.00	1,200
Smoke	Ringleman Scale	2.00			2
Particulate Matter	mg/Nm^3	121.58			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **06-Mar-12**
Place of Intervention: **Gilgit**
Monitoring Point: **Barmas Bala**
Time of Intervention: **13:00 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	7.28	7.27	7.27	-
O_2	%	14.20	14.30	14.30	-
CO	mg/Nm^3	1,704.00	1,704.00	1,704.00	800
SO_2	mg/Nm^3	3.00	3.00	3.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	5.00	5.00	5.00	-
NOx	mg/Nm^3	5.00	5.00	5.00	1,200
Smoke	Ringleman Scale	3.00			2
Particulate Matter	mg/Nm^3	133.25			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **07-Mar-12**
Place of Intervention: **Gilgit**
Monitoring Point: **Khomar Damote**
Time of Intervention: **13:05 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	7.64	7.65	7.65	-
O_2	%	9.80	9.70	9.70	-
CO	mg/Nm^3	2,214.00	2,215.00	2,215.00	800
SO_2	mg/Nm^3	2.00	2.00	2.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	7.00	7.00	7.00	-
NOx	mg/Nm^3	7.00	7.00	7.00	1,200
Smoke	Ringleman Scale	1.00			2
Particulate Matter	mg/Nm^3	164.98			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **08-Mar-12**
Place of Intervention: **Ghizer**
Monitoring Point: **Damas**
Time of Intervention: **23:12 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	5.42	5.43	5.43	-
O_2	%	10.60	10.50	10.50	-
CO	mg/Nm^3	2,330.00	2,330.00	2,330.00	800
SO_2	mg/Nm^3	2.00	2.00	2.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	18.00	18.00	18.00	-
NOx	mg/Nm^3	18.00	18.00	18.00	1,200
Smoke	Ringleman Scale	1.00			2
Particulate Matter	mg/Nm^3	132.85			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **09-Mar-12**
Place of Intervention: **Hunza**
Monitoring Point: **Hyderabad**
Time of Intervention: **22:40 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	8.42	8.41	8.41	-
O_2	%	6.70	6.80	6.80	-
CO	mg/Nm^3	7,351.00	7,351.00	7,351.00	800
SO_2	mg/Nm^3	10.00	10.00	10.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	23.00	23.00	23.00	-
NOx	mg/Nm^3	23.00	23.00	23.00	1,200
Smoke	Ringleman Scale	3.00			2
Particulate Matter	mg/Nm^3	172.00			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **10-Mar-12**
Place of Intervention: **Astore**
Monitoring Point: **Astore**
Time of Intervention: **13:20 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	13.36	13.37	13.37	-
O_2	%	6.72	6.73	6.73	-
CO	mg/Nm^3	10,874.00	10,874.00	10,874.00	800
SO_2	mg/Nm^3	83.00	83.00	83.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	97.00	98.00	98.00	-
NOx	mg/Nm^3	97.00	98.00	98.00	1,200
Smoke	Ringleman Scale	4.00			2
Particulate Matter	mg/Nm^3	169.43			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **11-Mar-12**
Place of Intervention: **Skardu**
Monitoring Point: **Sundus**
Time of Intervention: **14:08 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	4.08	4.07	4.07	-
O_2	%	15.20	15.30	15.30	-
CO	mg/Nm^3	6,361.00	6,360.00	6,360.00	800
SO_2	mg/Nm^3	3.00	3.00	3.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	15.00	15.00	15.00	-
NOx	mg/Nm^3	15.00	15.00	15.00	1,200
Smoke	Ringleman Scale	3.00			2
Particulate Matter	mg/Nm^3	141.00			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **11-Mar-12**
Place of Intervention: **Skardu**
Monitoring Point: **Aliabad**
Time of Intervention: **15:30 PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	5.42	5.44	5.44	-
O_2	%	15.40	15.30	15.30	-
CO	mg/Nm^3	1,474.00	1,474.00	1,474.00	800
SO_2	mg/Nm^3	3.00	3.00	3.00	1,700
NO_2	mg/Nm^3	2.00	2.00	2.00	-
NO	mg/Nm^3	15.00	15.00	15.00	-
NOx	mg/Nm^3	17.00	17.00	17.00	1,200
Smoke	Ringleman Scale	4.00			2
Particulate Matter	mg/Nm^3	147.92			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **12-Mar-12**
Place of Intervention: **Ghanche**
Monitoring Point: **Khaplu**
Time of Intervention: **21:50PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	4.23	4.22	4.22	-
O_2	%	14.10	14.20	14.20	-
CO	mg/Nm^3	5,402.00	5,402.00	5,402.00	800
SO_2	mg/Nm^3	6.00	6.00	6.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	16.00	16.00	16.00	-
NOx	mg/Nm^3	16.00	16.00	16.00	1,200
Smoke	Ringleman Scale	2.00			2
Particulate Matter	mg/Nm^3	151.66			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

STACK EMISSION MONITORING

Date of Intervention: **13-Mar-12**
Place of Intervention: **Chilas**
Monitoring Point: **Beesham Hotel, KKH**
Time of Intervention: **21:00PM**
Fuel Type: **Wood**

Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per NEQs
CO_2	%	6.74	6.73	6.73	-
O_2	%	13.80	13.90	13.90	-
CO	mg/Nm^3	3,662.00	3,662.00	3,663.00	800
SO_2	mg/Nm^3	1.00	1.00	1.00	1,700
NO_2	mg/Nm^3	0.00	0.00	0.00	-
NO	mg/Nm^3	6.00	6.00	6.00	-
NOx	mg/Nm^3	6.00	6.00	6.00	1,200
Smoke	Ringleman Scale	3.00			2
Particulate Matter	mg/Nm^3	145.17			500

ND: Not Detected

***NOx limits as per NEQS:**

Gas Fired: **400**
Oil Fired: **600**
Coal Fired: **1200**

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **Sonikot**
Date of Intervention: **March 06, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0333
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Point: **Barmas Bala**

Date of Intervention: **March 06, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0333
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Point: **Khomar Damote**

Date of Intervention: **March 07, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.025
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Point: **Damas**

Date of Intervention: **March 08, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0333
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Point: **Hyderabad**

Date of Intervention: **March 09, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.025
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **P.W.D Office**
Date of Intervention: **March 10, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.1749
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **Sundus**
Date of Intervention: **March 11, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0416
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **Aliabad**
Date of Intervention: **March 11, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0465
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **Khaplu**
Date of Intervention: **March 12, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0499
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL LABORATORY

Sampling Identification: **Thimble Sample**
Sampling Point: **Beesham Hotel K.K.H**
Date of Intervention: **March 13, 2012**

Sr. #	Parameters	Method	Unit	LDL	Test Results
1.	Copper (Cu)	Based on APHA-3111-Cu B	mg/m^3	0.01	<0.01
2.	Lead (Pb)	Based on APHA-3111-Pb B	mg/ m^3	0.01	<0.01
3.	Zinc (Zn)	Based on APHA-3111-Zn B	mg/ m^3	0.01	0.0333
4.	Antimony (Sb)	Based on APHA-3114 B	mg/ m^3	0.01	<0.01
5.	Mercury (Hg)	Based on APHA-3120 B	mg/ m^3	0.1	<0.1
6.	Arsenic (As)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01
7.	Cadmium (Cd)	Based on APHA-3120 B	mg/ m^3	0.01	<0.01

CHEMICAL ANALYSIS REPORT

Description of Sample: **Air Samples**
No. of Samples: **10**
Sample Condition upon Receipt: **Satisfactory**

Sr. #	Sample Collection Date	Sampling Location	Parameters	Unit	Test Results
1.	6/3/2012	Sonikot	Hydrogen Halides	mg/Nm^3	5.43
2.	6/3/2012	Barmas Bala			21.71
3.	7/3/2012	Khomar Damote			16.28
4.	8/3/2012	Damas			5.43
5.	9/3/2012	Hyderabad, Hunza			16.28
6.	10/3/2012	Astore P.W.D Building			5.43
7.	11/3/2012	Sundus, Skardu			5.43
8.	11/3/2012	Aliabad, Skardu			10.66
9.	12/3/2012	Khaplu, Ghanche			5.43
10.	13/3/2012	Beesham Hotel, KKH, Chilas			10.86

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