

Sound and Air Quality Evaluation of Ham Logistic Base Abuloma Rivers State, Nigeria

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Abstract -- Sound and air quality evaluation was conducted of HAM logistic base Abuloma. The East bollard co-ordinate is on 510554.43 to 510429.80 and Northings between 85136.50 to 85030.84. The noise evaluation covered the work site, jetty, workshop, marine traffic and administrative block, while the air quality had two stations, one within the premises and the control at a school field. The sound survey shows that the highest reading of 87dBA was found at the welding workshop. The offices recorded an average of 62dBA from facilities. On the air quality; the suspended particulate matter (SPM) ranged between 224.9µg/M³ and 262.9µg/m³ as against 60.5 µg/m³ at the control, possibly due to the high density of population and activities within the region. The recommendation is for regular environment auditing for the multiple companies of the region by the regulatory organ to save the workers and community from major health hazards.

I. INTRODUCTION

Noise and air pollution are issues for ethical consideration because of the silent impact on the human race occasion by the spread over distance.

The physics behind it is wave propagation by pressure variation and diffusion theory based on density and temperature gradient.

The aim of the study is to generate data base and create environmental consciousness for environmental friendliness. The study established that the issues of pollution are tied to the activities that help to boost the economy of the people and cannot be eliminated but should work within the confine of recommended standards for sustainability.

Few studies in the area of sound pollution and radiation which is subsumed under air quality include Babisch et al (2005), Banjo et al (2008), Barnes and Greenbaum (2007), Beiojevic et al (2008). Bodin et al (2009), Broste et al (1989), Chagnaud et al (1999), Cherry (2000), De-luliis et al (2013), Eger et al (2004),

Enyinna and Onwuka (2014), Femie and Reynolds (2005), Hart et al (2012), Heikkinen et al (2011), Hutter .etal (2006), Navaro et al (2003), Nylund and Leszynski (2006), Panagopoulos et al (2008), Santini et al (2003).

II. METHODS

Two major instruments were used. The noise level meter and Hi-volume sampler.

2.1 Noise Assessment

A CEL 231 and CEL 254 digital sound (noise) level meter was used to take readings at cardinal measurement. The meters were held at arm's length at distance of 1 – 3 meters from noise source depending on convenience and at a height of about 1.2 meters from ground.

2.2 Air quality

Two sites were selected for the air quality measurement as described below:

Station 1: Located within premises
Station 2: Control site, located outside and North West of the Company

The following air quality parameters relevant to RAM's activities were determined:

- ❖ Suspended particulate matter (SPM)
- ❖ Sulphur oxides (SO_x)
- ❖ Nitrogen dioxide (NO₂)
- ❖ Carbon monoxide (CO)
- ❖ Hydrogen sulphide (H₂S)

S/No	Parameters	Analytical Methods
1.	Suspended particulate matter (SPM)	Hi-volume sampler and Gravimeter
2.	Nitrogen dioxide (NO ₂)	Wet Methods
3.	Carbon monoxide (CO)	Portable CO monitor
4.	Sulphur oxides (SO _x)	Wet Methods
5.	Noise	Sound level meter (portable)

Table 1: Summary of Methods Used for the Air Quality Study

III. RESULTS AND ANALYSIS

1. Noise (Sound):

The noise readings were recorded against the measurement position and reflected in the site outlay map. The result of the noise survey is as shown in table2.

S/No	Noise Sample Site	Decibel Level dBA	FEPA STD. (dBA) for 8hrs.
1.	The main generator unit	92	90
2.	The office complex	72	„
3.	The East Bollard	66	„
4.	Maintenance workshop	76	„
5.	The landing point or quay	75	„
6.	Inboard the dredger	72	„
7.	The west Bollard boarder to B&B Ltd.	72	„
8.	Instrument position II East	62	„
9.	The tractor storage house	68	„
10.	HCG yard	63	„
11.	Naval quarters residential	(62 - 64)	„
12.	Easter boarder with HCG yard	58	„

Table 2: Noise Survey Result of the HAM Logistic Base

- ❖ Noise at the main generator unit is slightly above the FEPA standard of 90 dBA for a 8-hour working period. It shall therefore require relocation from West to East or reduction of the noise by an acoustic louver to about 70 dBA in view of its closeness to the office complex blocks at its west location at the time of investigation.
- ❖ The office complex with Air "Conditioners (AC) and Refrigerators working recorded a noise level below 60 dBA. The 72 dBA noise level measured at the up platform is due to the influence of the noise from the generator house about 5m away, the carpentry unit 2 metres down and the compressor blast at the maintenance unit 3 metre down.
- ❖ The East Bollard also has very high noise level possibly due to increase noise production by multiple reflections on the boundary wall with B and B Company Limited.
- ❖ In summary the Company recorded an average noise level of 68.8 dBA which is within FEPA standard of 90 dBA and WHO standard of dBA for work sites. At the residential unit where the naval team is housed. The noise level was found to be 65dBA \pm 5 which is within WHO standard.

2. Air Quality Evaluation:

Within the premises of the Company, sources of air pollution can be identified as:

- ❖ Boat traffic
- ❖ Vehicular emission
- ❖ Utilities (diesel powered generators)

The air quality data for the study are presented in Table 3 and 4 below.

Parameter Concentrations in $\mu\text{g}/\text{m}^3$ (lhr)							
Stations	SPM	NO ₂	SO ₂	H/C	H ₂ S	COmg/m ³	
Station 1 (Premises)	1-1	238.5	2.3	<25.	8.9	ND	4.6
	1-2	173.4	2.3	36.7	7.1	ND	4.6
	1-3	262.9	3.0	29.4	6.3	ND	3.4
		224.9±	2.5±	33.0.	7.4.		

		37.8	0.4	±13.7	±1.1		
Station 2 (Control)	2-1	59.6	ND	<25.0	14.3	ND	3.4
		63.7	ND	<25.0		ND	3.4
	2-2				8.0		
	2-3	58.3	1.3	32.3	15.0	ND	2.3
		60.5±2.3	1.3±0.0	32.3±0.1	12.4±3.1		5.1±0.5
FEPA std (1hr)		600.0	75-113	260.0	NS	NS	40.0*

Table 3: Air Quality Data within and around HAM Dredging Nigeria Ltd, in August 1999

The sound survey data is as shown in Fig 1.1 while the air quality data is shown in tables 1.2 and 1.3.

Parameter Concentrations in µg/m ³ (1hr)							
Stations		SPM	NO ₂	O ₂	H/C	Comg/H ₂ S m ³	
Station 1 (Premises)	Range	173.4-262.9	2.3-3.0	<25.0-36.7	6.3-8.9	ND	3.4-4.6
	Mean	224.9±37.8	2.5±0.4	36.7	7.4±1.1		4.2±0.5
	N	3	3	3	3	3	3
Station 2 (Premises)	Range	58.3-63.7	ND-1.2	<25.0-32.3	8.0-15.0	ND	2.3-3.4
	Mean	60.5±2.3	1.3±0.0	32.3±0.1	12.4±3.1		3.1±0.5
	N	3	3	3	3	3	3

Table 4: Statistical Summary of Ambient Air Quality Data for HAMDredging Nigeria Limited in August 1999.

- N = Number of readings
- ND = Not detectable
- * = USEPA 1hr Std.

IV. DISCUSSION

1. Suspended Particulate Matter (SPM):

The Suspended Particulate Matter data shown in table 1.2 varied from 173.4 - 262.9µg/m³ in the premises with a mean of 224.9µg/m³ at the base, outside the HAM premises, SPM varied from 58.3- 63.7µg/m³ with a mean of 60.5µg/m³. These results indicate a significantly higher level of SPM in the Ham site than on adjoining control sites. The relatively higher SPM levels on HAM site is due to activities like generator, vehicular source and welding. It is evident that SPM is the predominant pollutant in the HAM environment although this is well below FEPA limits in table 2.

2. Gases:

The acidic gas, NO₂, ranged from 2.3-3.0µg/m³ within the premises. It was generally not detectable at control sites except a value of 1.3µg/m³ measured in one instance.

Sulphur dioxide (SO₂) ranged from 25.0-36.7µg/m³ in station 1 while at station 2, it ranged from 25.0-32.3µg/m³. Hydrogen sulphide was not detected generally in the two stations.

V. SUMMARY

The details of study are reflected in table 2 and 3. The area of study is peaceful as at the time of investigation and good housekeeping by the operators. The data is to inform and guide developers on the best technological alternative to improve on work standard, particularly in the area of sound and noxious discharges from vent and effluent discharges where applicable.

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