



## Environmental sound quality of some selected flow Stations in the Niger delta of Nigeria

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**ABSTRACT:** The measurements of environmental sound quality of some selected flow stations in the Niger-Delta area of Nigeria were carried out to obtain the noise distribution pattern of the stations. An *in situ* approach was adopted using direct reading calibrated digital noise level meters. The results show an average of 81.72 dB (A) and 84.74dB(A) for the East and West of the Niger-Delta respectively. The results are slightly below the FEPA recommended permissible limit for maximum of 8 hours, but the day and night continuity of the sound could therefore classify the results as hazardous and environmentally unfriendly to the host communities @ JASEM

The quest for oil fields development and exploration in the Niger-Delta of Nigeria has led to various forms of environmental degradation that tend to perturb the fragile ecological and biophysical systems and the socio-economic political structures. Environmental pollution from oil activities can result from seismic operations, gas flaring, drilling/rig works, earth work/construction of facilities and production processes. The effects of gas flaring on the host communities have been previously reported (Ebeniro and Avwiri, 1995). Industrial noise can impact company personnel and the ecosystem of the host environment by its numerous psychological effects; noise can startle, annoy and disrupt concentration, sleep and relaxation; interference with communication by speech and as a consequence interference with job performance and safety) and physiological effects such as noise-induced loss of hearing or aural pain (Peterson and Gross, 1974). The hazardous nature of industrial noise laid credence to the formulation of permissible noise levels/standards by the Federal Environmental Protection Agency (FEPA) to which an employee may be subjected to (FEPA, 1991). The FEPA guideline is shown in Table 1.

A study of noise in an oil drilling environment was carried out, and report showed that both the levels and durations were easily exceeded everywhere in the rig environment (Menkiti, 1994). Measurements carried out in an oil servicing company involved in pipeline coating and production revealed a gross deviation from these standards especially in the mechanical workshop and coating yard (Ebeniro and Abumere, 2001). The oil-rich Niger-Delta of Nigeria plays host to a number of gas plants, flow stations, three refineries and the Nigeria Liquidified Natural Gas Ltd (NLNG). Most of these installations flare gas continuously with associated acid rain phenomenon and industrial noise (Sciven, 1984). The noise from gas/flow stations results from the gas pressure at the stack nozzle, explosive nature of the ensuing combustion and mechanical operations. The impacts of these continuous noise on the host communities has partly been a case for incessant demonstrations, protest, shut down of operation and other forms of sabotage in the Niger-Delta. This paper, therefore, qualitatively examines the level of noise degradation in some flow stations across the area and to ascertain the health implications of the noise levels.

Table 1: Noise Exposure Limits For Nigeria (FEPA, 1991)

Duration Per Day (Hours).	Permissible Exposure Limits (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 hr less	115

### METHODOLOGY

The noise levels were measured *in situ* using three well-calibrated meters (Quest model 2400, CEL 231 and CEL 254 digital noise level meters) set on the A-weighting. The A-weighting was used because of its recommendation for industrial and environmental studies (Peterson and Gross, 1974). Usually, the meters were held with their microphones facing the station at a uniform distance of about 500m from it. The meters provide digital numerical readout, which stabilizes after about five minutes. Several readings were taken at a point and the average recorded.

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## RESULTS AND DISCUSSION

Statistically, the assessment of noise impact on an environment or individual is dependent upon the level that equates with continuity ( $L_{eg}$ ) and noise pollution level ( $L_{np}$ ). The noise pollution level can be calculated using the relation (ISO/R131-1959).

$$L_{np} = L_{eg} + 2.565\sigma$$

Where  $\sigma$  is standard deviation which has the values of 7.4dB for A - weighted level in ranking in which a

variety of common noises are involved for their loudness (Peterson and Gross, 1974). The values of  $L_{eg}$  are the same as the measured value since noise is invariant.

The readings obtained and the computed values of  $L_{eg}$  are presented in Tables 2 and 3 for the East and West of the Niger-Delta respectively.

Table 3: Noise levels of flow stations (west), 2001.

S/n	Station	Av. Noise level / $L_{eg}$ (dBA)	$L_{np}$ (dBA)
1	Uzere	79.00	91.03
2	Oroni	62.00	74.03
3	Ogini	77.00	89.03
4	Oweh	63.00	75.03
5	Eriemu	73.00	85.03
6	Utorogu	79.00	91.03
7	Oleh	79.00	91.03
8	Osiola	68.00	80.03
9	Kokori	74.00	86.03
10	Afiesere	71.00	83.03
11	Evwrenf	76.00	88.03
12	Otumara	74.00	74.03
		Average	88.74

Table 2: Noise levels of flow stations (East), 2001.

S/n	Station	Av. noise level / $L_{eg}$ (dBA)	$L_{np}$ (dBA)
1	Alakiri	73.00	85.03
2	Cawthron channel	70.00	82.03
3	Diebu creek	74.00	86.03
4	Ekulama 1	65.00	77.03
5	Ekulama 11	68.00	80.03
6	Nembe 1	72.00	84.03
7	Nembe 11	76.00	88.03
8	Nembe 111	67.00	79.03
9	Opumami	69.00	81.03
10	Otapete	76.00	88.03
11	Soku	74.00	86.03
12	Imo river	62.00	74.03
13	Nkali	60.00	72.03
		Average	81.72

The mean average noise pollution levels of 81.72dB(A) and 84.74dB(A) obtained for the East and West of the Niger - Delta Area are lower than the FEPA recommended value of 90dB(A) for 8 hours and within the previously reported ranges for the Niger-Delta Area (NDES 1999). Ordinarily, these values may not induce psychological and physiological effects on the populace if the time limits of FEPA are observed.

The study showed that for company personnel that run 8 hourly shift periods, the effect is minimized. But for the host communities, these values could be considered as hazardous due to the day-long exposure period for the inhabitants. Also, for stations situated outside residential areas, farmers and fishermen spend more than 8 hours daily around the stations without any form of Personal Protective Equipment (PPE). We therefore recommend that oil companies should provide sound insulations with good average sound reduction index, mean transmission coefficient and good discontinuity around the stations, replace pumps with electric motors and the use of sound-proof generators instead of the conventional noisy types.

**Conclusion:** This study revealed that the noise levels status of the selected flow stations are within the FEPA recommended permissible limits and could not induce hearing loss or aural pain, and other psychological effects on the company personnel. But these values could have long-term effects on the host communities that are exposed continuously. We therefore further recommend that Environmental Trainer Programmes of oil companies should be extended to the host communities and contract staff to guide them on noise safety and other pollution impact matrixes in their work and living environments.

**Acknowledgment:** We hereby appreciate the support given by Shell Petroleum Development Company (SPDC) and the kind approval of the Department of Petroleum Resources (DPR) in carrying out this research.

## REFERENCES

- Ebeniro J. O. and Abumere O. E. (2001) 'Environmental noise assessment of an Industrial plant' Nig. Jour. of physics, Vol. 11, 41-45.

- Ebeniro J. O. and Avwiri G, O (1995):  
'Environmental Impact of Gas Flaring At  
Obrikom Area Of Rivers State (Nig.)' Nig Jour.  
Of Phy., Vol. 7, 72-75.
- FEPA (1991), National Interim Guidelines and  
standard for industrial effluents, gaseous  
emission and hazardous waste in Nigeria.  
Federal Environmental Protection Agency  
(FEPA), 52.
- SO/R131-1959, Expression of the physical subjective  
magnitudes of sound or noise
- Menkiti A. I.(1994), "Noise studies in oil-drilling  
environment" Nig. Jour. of Physics, Vol. 6, 22-  
26.
- NDES (1991 ) ,Niger-Delta Environmental Survey),  
phase I Report (Revised edition) Vol. 1, 48-68.
- Peterson A. P. G. and Gross E. G (1974). Handbook  
of noise Measurement, 7<sup>th</sup> Ed., Genkand  
publishers, USA, 46-50.
- Sciven A. R(1984), The Scottish wildlife Trust. An  
open conference on the acid rain enquiry, 4-6.