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IDENTIFICATION OF GAS FLARE SITES ACROSS NIGER DELTA REGION

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Abstract

This research focused on identification of gas flaring in Niger Delta. The study was carried out in 15 local government areas of Bayelsa, Delta and Rivers States based on the geographic Niger Delta. All the data collected from the questionnaire was analyzed using Statistical Package for Social Sciences (SPSS) version 3.1 to analyze the data using ANOVA, student's T-test, frequency and simple percentages The likert questionnaire was adopted while the Global Positioning System (GPS) was used to derive the coordinates of the gas flare sites across the study area with the results displayed in maps. The community proximity to the enumerated gas flare sites was analyzed using Google imagery deference, in the ArcGIS environment to see the relationship between phenomena on the ground and that of the image.

KEYWORDS: Gas flaring, GIS, Pollution and Disaster

1.0 Introduction

Soil is the basic element of the environment on which an important human activity, agriculture and others depends on. Soil been an important natural resource, According to Jakin and Rao (2011) explained that soils are top covering of the surface of the earth and have been formed by wear and tear of

rocks. It also contains the decay of vegetable and animal matter, it is significant to note that the importance of soil lies with its fertility and is the drive of this research work.

Impact of gas flaring on soil fertility cannot be undermined due to the obvious damage gas flaring has caused the environment, mainly when considered on the basis of convolutional period the ONELGA environment has faced gas flaring. One of the important aspect of soil is the exchangeable cations which is important chemical property of soil fertility. According to Alakpodia (2000) and Ogidiolu, (2003) showed that exchangeable cations or base found in soils within gas flaring is low, this findings by them also agrees with Sada, (1988). In his work on Development and the Environment, Ogidiolu (2003) looked at the vegetation characteristics and soil characteristics in relation to the effects from gas flaring and observations were made that there are reductions in total nitrogen and organic matter around the sites where gas is flared. But with increased distance from the flare there is decline; according to the study he suggested that the decline is due to intense heat, and that this heat has an effect to the formation processes of nitrogen formation and organic matter. Alakpodia (2000) also shares the same view when he noted in the work, varying averages of 0.08% and 1.83% of total nitrogen and organic matter respectively of soils which are subjected to under gas flaring. Alakpodia (2000) added that there is increase in the acidity of the soil due to the flaring of gas. One major effect of gas flaring on the chemistry of the soil is increase in acidity, this will mean that high acid level in the soil renders soil unproductive agriculturally as the soil's ability to take in of nutrients goes down (Ogidiolu, 2003).

It is also pertinent to note that the high rate of population has led to urban

flight, Achebe and Epstein, (2004) said the main cause of rural migration to places with urban set up is as a result of land and soil population or soil depletion. Also while the yield in crop was reducing progressively is a factor as well, the companies' oil operation has resulted to land and soil depletion in quality in many ways, as this resulted to high handedness these companies within the area by toxic substance dumping and build up which has led to reduction in soil nutrient stakes. The soil's physical property is affected because of the reduction in the organic matter which includes the water holding capacity, aeration and structure of the soil in the Niger Delta. Also intense heating associated with gas flaring has also resulted in reduction in soil chemical properties and organisms. According to Abiodun, (2004) in his study of Human Right Violation and Environmental Retardation in the Niger Delta noted that environs which contains the oil where flaring of gas is carried out has lost valuable wet land due to oil prospecting and production.

2.0 Literature Review

Global Efforts in Gas Flare Impact Mitigation

One of the mitigation strategies is the location of gas flare stations far away from the community. This will definitely mitigate the calamitous effects of gas flaring in the area. But some of the multinational oil companies exploring for oil in the area have not adopted this environmental friendly measure. Thus, some gas flare stations in some parts are sited very close to the community. Thus, the volatility of some of the flared gas cause stampede in the area. Thus, if the gas flare station is sited far away from the community the hazardous effects would be curtailed. Another mitigation strategy is the installing of a device that reduces the volume of noise. Thus, if such a devices are installed, it will muffle the rumbling noise of the gas flares to enhance

the good help of the people. But none of the multinational oil giants in the region has adopted this measure.

Emoyan et al, (2008), states that several technological options are available to oil and gas companies to mitigate the hazardous effects of gas flare, under various circumstances, there are certain variables that determine the most efficient and economic viable technology to apply, such as technical geographical and commercial factors. The Air Task force (2015) recommends Ammonia Production, Compressed Natural Gas (CNG), Trucking, and Natural Gas Liquids (NGL) recovery. Other mitigation strategies are gas injection to underground reservoirs, gas to power grid, gas to power (local) and Gas- To-Liquids, Methanol (GTL-MT). On a different study of Russia, Khazakhstan, Turkmenistan, and Azerbaijan, Carbon Limits AS, recommended five basic technological solutions which include Associated Petroleum Gas (APG) gathering system, gas treatment and processing, on-site use, conversion processes and transport options (Carbon Limits AS, 2013). The conversion process is an ideal solution for oil companies operating in Niger Delta region due to long product value chain of associated gas in the region. But the oil giants in the regions have not really adopted these technologies. (Virtually all of them have only applied the one of gas injection to underground reservoirs.

Another strategy for mitigating the long term exposure to gas flare in the region is the putting in place of ever-ready-emergency-team. Such emergency unit dive into action to tackle any form of disaster whenever gas flare becomes volatile. The emergency unit exists under the auspices of the safety department. The staff should be equipped to the teeth targeted at the swiftness intervention to mitigate any form of spillage or leakage or excess pressure. All

the oil firms in the region has adopted this strategy which has somewhat yielded fruitful results in respect of fulfilling the purpose for which it is established. The oil companies operating in the area have also applied the strategy of burying pipelines that gush natural gas to the gas flare stations to forestall any calamity in respect oil spills and pollution. Furthermore, warning signals are placed along the pipelines with the slogan **"WARNING HIGH PRESSURE GAS-DO NOT EXCAVATE**. This strategy has the potential of scaring people from fiddling the pipelines that supply natural gas to the gas flare stations. This has also played a pivotal role to mitigate the hazardous risks of long term exposure in the oil producing areas of Bayelsa, Rivers and Delta states.

Companies in the oil and gas section have in most cases team of staff working round the clock monitoring the functioning of the gas flare device. Whenever, it is volatile, the staff of the control room dispatch warning signal to the safety staff for swift intervention.

Regulatory policies and requisite legislations put in place by the federal government, over the years also constitute veritable tools for mitigating the adverse risks of long term exposure to gas flare in the region. But this approach has not really yielded fruits in the area of study due to the fact that the oil firms have failed to heed regulatory policies or enforce anti-gas flare legislations.

To substantiate the foregoing contention, Ukala (2011) states that the federal government of Nigeria recognized the use of legislative measure as a proactive tool to end gas flaring and enacted several legislations such as the Petroleum Act of 1969 and Associated Gas Re- Injection Act No 99 of 1979. He added that, characteristically like other numerous legislations in the country, these regulations are yet to achieve any significant result on the ground that gas flaring has persisted with

all amount of alacrity in the Niger Delta region, with series of target dates for the ending of or reduction of gas flaring in the country the hope has continued to recede as they are either extended or exempted.

Effects of Longterm Gas Flaring

Otokiti (1999) conducted a study focusing on the hazardous effect of long term gas flaring in Rivers between 1990-1998. The study was carried out in 8 oil producing local government areas of the state. The likert scale questionnaire was applied while the stratified sampling technique was adopted to select 800 respondents from the area of the study. Questionnaire approach was employed and responses were analyzed through the standard deviation and means score while the hypotheses were tested through the Analysis of Variance (ANOVA) method. The research found out that gas flaring has devastated the ecosystem coupled with health hazards in the areas of the study, under the period of review.

Ndiokwerre (2002) conducted a study titled “Risk assessment of gas flaring and mitigation strategies in Delta State”. The likert scale questionnaire was applied while the multi-stage sampling technique was applied to select and study 600 respondents from 6 oil producing local government area of the state. The research questions were analyzed through the simple percentage method while the hypotheses were tested through the chi square method. The study found out that the oil companies operating in the area of study have woefully failed to apply the appropriate mitigation strategies of the hazardous effects of long term exposure to gas flare in the area of the study.

Ukala (2011) conducted a study titled “The effect of gas flare on the

environment in Rivers State". The study was carried out in 6 oil producing areas of the state. The random sampling technique was applied simultaneously with the likert scale questionnaire, 600 respondents were selected from the study area. The research questions were tested through the standard deviation and mean score while the hypotheses were tested through X – test method. The study found out that flare, over the years, has devastated the ecosystem of the area of the study.

Mabogunje (2004) conducted a study focusing on the effect of long term gas flare on the health of the people in Akwa Ibom state. The study was carried out in 6 oil producing local government areas of Akwa Ibom state. The likert scale questionnaire was applied while the random sampling technique was applied to select and study 500 respondents from the area of the study. The standard deviation and mean score was applied to analyze the research questions. The study found out that gas flare has caused a lot of illness to the people of the area of study.

Oluka (2005) carried out a research titled "The mitigation strategies of the adverse effect of gas flaring in Edo State". The study was conducted in the 3 oil producing areas of Edo state. The stratified sampling technique was applied simultaneously with the likert scale questionnaire in which 500 respondents were selected from the study area. The Simple percentage method was applied to analyse the research questions while the hypotheses were tested through the Z- test method. The study concluded amongst others that the multinational oil giants operating in the area have woefully failed to apply the appropriate mitigation strategies to tackle the adverse effect of gas flaring in the area of the study.

Nnanna (2006) carried out a study titled "Oil exploration and the Ecosystem in

Akwa Ibom State. (1990-2005)". The study was carried out in 4 oil producing local government areas of the state. The likert scale questionnaire was applied, the cluster sampling technique was applied to select and study 500 respondents. The simple percentage method was applied to analyze the research questions while the hypotheses were tested through the Analysis of Variance (ANOVA) method. The study found out that gas flare has greatly devastated the environment of the study areas under the period of review. Figure 2.1 to 2.3 illustrate the nature of gas flaring in the study region, the effect and damage on the sited area of study.

Figure 2.1: A depleted valuable wet land due to oil prospecting and production

Figure 2.2: A visual image showing the depletion in the vegetal health of a wet land

Figure 2.3: **A visual image showing a land and soil depletion in quality**

3.0 Methodology

The Global Positioning System will be used to derive the coordinates of the gas flare sites across the study area and the results displayed in Maps. The community proximity to the enumerated gas flare sites will be analyzed using Google imagery dereferenced in the ArcGIS environment to see the relationship between phenomena on the ground and that of the image. The ArcGIS environment will aid the buffering of rings around the gas flare sites to determine the population density of communities within the study area and also the Landsat imagery will help in observing the variation in temperature and vegetal health of the study area. The Likert scale

questionnaire shall be the main research instrument of the study. It will be formulated to elicit appropriate requisite information from the respondents focusing on risk assessment, livelihood alteration and mitigation strategies of communities exposed to gas flaring in Bayelsa, Rivers and Delta communities in the Niger Delta region of Nigeria. In this vein, the Likert scale questionnaire shall be deemed fit to enhance a proper analysis of the problem under investigation.

4.0 Results on Gas flare sites

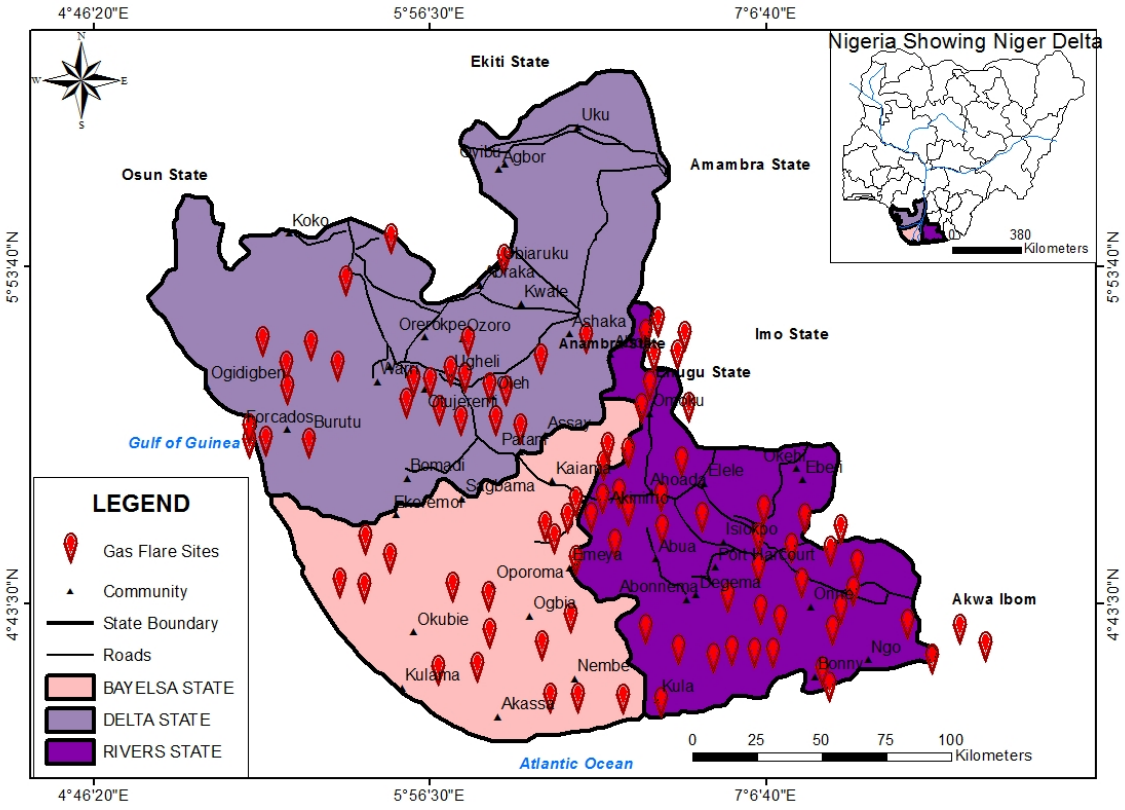

Fig. 4.1: Gas flare sites across the study area

The figure 4.1 shows the distribution of gas flare sites across the study areas using red tongues symbols. From the figure as shown in table 4.6; Rivers state has the highest number of gas flare sites (45) which represents 4.5% of the 10% sample population of the gas flare sites in the

region. This implies that with this number of gas flare sites, the environment condition of situation of the host environment (Niger Delta) will be altered by continual emission of hydrocarbon as flared gas across the study area. This situation is worsened by the fact that air pollution cannot be localized as subjected to the trend of prevailing wind creating more regional instability and affecting the people and their livelihood.

Table 4.1: Where Are the Gas Flare Sites Across The Study Area

	Bayelsa (Gas Flare Locations= 20)	**Delta (Gas Flare Locations= 26)**	**Rivers (Gas Flare Locations= 45)**
1	Benisede	Uzere	Idama
2	Clough Creek	Olomoro	Ekulama i
3	Opukushi	Kokori	Ekulama ii
4	Ogbainbiri	Utorogu	Robertkiri
5	Nembe Creek i	Afiesere	Soku I
6	Nembe Creek ii	Eriemu	Soku II
7	Nembe Creek iii	Oroni	Ubie
8	Nembe Creek iv	Osioka	Adibawa
9	Obama	Odidi I	Oshi
10	Santa Babara	Batan	Onne
11	Etelebou	Warri River	Rumuekpe I
12	Gbaran i	Ogini	Rumuekpe II
13	Gbaran ii	Otumara	Obirikom
14	Tebidaba	Esaravos Beach	Obiafu
15	Nun River	Ogidigbe	Obagi
16	Brass Terminal	Saghara	Idu I
17	Diebu Creek	Amukpe	Idu II
18	Belema	Opuma	Awoba

19	Kolo Greek	Oweh	Agbada I
20	Odeama Creek	Asemoke	Agbada II
21		Okpai	Umuechem
22		Kwale	Cawthorne Channel I
23		Umusadege	Cawthorne Channel II
24		Jones Creek	Alakiri
25		Beneku	Oloma
26		Obodugwa	Bonny LNG Plant
27			Ebocha
28			Belema North
29			Ngo Ima
30			Isimiri
31			Ahia
32			Ogbogu
33			Obite
34			Jokka
35			Rumuji I
36			Rumuji II
37			Obigbo
38			Obele
39			Imo River
40			Obigbo North 4
41			Nkali
42			Inda
43			Otakikpo
44			Rumuji III
45			Bonny Oil Gas Terminal

From the table 4.1 shows the total number of gas flare site across the study area is (91) distributed as follows: Bayelsa (20), Delta (26) and Rivers state (45). Therefore Rivers State has 4.5% of the sample population of the gas flare sites, while Bayelsa State has 2.0% and Delta State has 2.6% of the total gas flare sites in the region.

5.0 Conclusion

It was concluded that gas flaring subsumed under crude oil exploration in Bayelsa, Delta and Rivers state has increased in volume since the late 50s when the exploration of crude oil started in commercial quantity in Oloibiri. The emergence of crude oil in the country substituted agriculture which was the mainstay of the economy.

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