THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Environmental Problems Associated with the Operations of Oil and Gas Companies in Niger Delta: Implications and the Way Forward

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Abstract:
This study examined environmental problems associated with the operations of oil and gas companies in Niger Delta: Implications and the way forward. The objectives of the study were to determine oil spill incidence in the Nigeria's Niger Delta, the volume of gas flared in the area as well as the drilling waste discharge volume in the region. Data related to the study were retrieved from the Department of Petroleum Resource Oil and Gas Annual Report. Findings revealed that oil spills are common events in Niger Delta; natural gas flaring is another major issue of concern associated with the operations of oil and gas companies in Nigeria's Niger Delta; though there is a reduction in drilling waste discharge volumes, incidents of the discharge of petroleum-derived chemicals abound. The study concludes that although, a good number of the oil and gas companies operating in the Niger Delta area are beginning to institute measures to ensure quality oil exploration and production practices, environmental problems emanating from oil and gas operations are widespread in oil-producing communities. The need for petroleum companies to adequately implement environmental maintenance practices in line with global best practices in the oil and gas industry is recommended.

Keywords: *Environmental, problems, Niger delta, oil and gas, operations*

1. Introduction

The Niger Delta is the major oil producing region in Nigeria and is located at the apex of the Gulf of Guinea on the west coast of Africa. The region covers an area of about 75,000 km^2 and makes up 7.5% of Nigeria's land mass (Ite, Ibok, Ite & Petters, 2013). The people of Niger Delta occupy an area which cuts across about 800 oil-producing communities with a large system of connected oil wells and oil exploration and related operations. Thus, it is the richest part of Nigeria considering the large quantity of petroleum resources and the ecosystems in the area. On a global scale, The Niger Delta has one of the world's largest tertiary delta system as enormous deposits of petroleum and related products are derived from this region (Ogbaje, 2009). The adequately endowed ecosystem of the Niger Delta that can sustain both human, plant and animal life is threatened by the operation of some oil and gas companies in the region.

Although petroleum exploration and production in the Niger Delta region has considerably enhanced the Nigerian economy, oil and gas companies' operations in forms of exploration, development and production have been reported to have negative impacts on the ambient environment of the people in the region. A good number of Individuals, families and groups in the oil producing communities laments over what they describe as environmental breakdown, a threat to their subsistence and survival. Communities in the Niger Delta regions of Nigeria have continued to experience a breakdown of its ecosystem. Water bodies are increasingly being polluted; vegetations and agricultural lands are destroyed on day-to-day basis by oil spills from petroleum operations and related activities.

According to Ite, Ibok, Ite and Petters (2013), some of the environmental issues associated with oil production and exploration include gas flaring and venting, oil spills, contamination of controlled water sources, discharges of petroleum–derived chemical wastes, contamination of soil and sediments, the destruction of the land and water environment. Thus, the operation of some oil and gas companies characterized by poor and unsustainable negative practices has exerted some impacts on the physical and socio-economic environment as well as human health and safety in the Niger Delta. Though, some multinational oil and gas companies are taking measures to sustaining the environment where they operate, their environmental remediation achievements still leaves much to be desired. Given the fore going, this study examines the environmental problems associated with the operations of oil and gas companies in Niger Deltawith a view to determining oil spill incidence in the Nigeria's Niger Delta, the volume of gas flared in the Niger Delta region as well as the drilling waste discharge volume in the region. Quite a good number of studies have been conducted on environmental issues in the Niger Delta region of Nigeria; however to the best of the researcher's knowledge no research has examined oil spill incidence, gas flare and drilling waste volume in one study. This present study will fill the knowledge gap. The study was conducted in the nine (9) oil–producing states in Nigeria (Niger Delta) which includes Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Ondo, Imo and Rivers.

2. Materials and Methods

Data on oil spill incidence, gas flare and drilling waste discharge in the Nigeria Niger Delta was retrieved from the Department of Petroleum Resource Oil and Gas Annual Report and presented in table to allow for better understanding of findings.

4. Results and Discussion

4.1. Results

Years	Number of Spills	Quantity Spilled (Barrels
2010	537	17,658.10
2011	673	66,906.84
2012	844	17,526.37
2013	522	4,066.20
2014	1087	10,302.16
2015	753	32,756.87
2016	434	1,658.98

Table 1: Oil Spill Incidence between 2010 and 2016
Department of Petroleum Resource Oil and Gas Annual Report, 2016

Table 1 reveals a reduction in oil spill incidence between 2010 and 2016 as the number of spills in 2010 and 2016 were 537 and 434 respectively indicating a reduction in the barrels of oil spilled.

Spill Incidents											TNS	VS
Month	N/A	C	EF	S	HE	YTBD	Mystery	E/W/L	OM	S/B		
Jan		1	2	15	1	16	2	1	1	1	40	25.60937
Feb		2	4	5		6	1	2	0		20	0.15252
Mar		1	3	11		5	4	4	4		26	5.31251
April		2	7	7				0	1		31	27.58
May		1	5	13		10	3	0	1		33	674.2961
June		0	2	16		6	2	0	0		26	61.73231
July	2	2	4	19		10		0	4		41	46.947
Aug		1	5	24		14	4	0	0		48	106.4848
Sept		1	3	23		16	5	1	0		50	53.03967
Oct			3	19		8	11		4		45	87.5607
Nov		5	5	31		5	2	0	0			271.4222
Dec		2	3	11		4	5	0	0		25	258.8453
Total	2	18	46	194	1	100	39	8	15	1	434	1618.9825

Table 2: 2016 Oil Spill Incidence Report Based on Causes
Department of Petroleum Resource Oil and Gas Annual Report, 2016

Table 2 shows that the cause of a significant number of oil spill incidents are yet to be determined. However, majority of oil spill incidents in the Nigeria's Niger Delta are caused by corrosion.

Year	Gas produced	Gas utilized	Gas flared	% Flared
2014	3,048,546,486 Mscf	2,654,706,650 Mscf	393,839,836 Mscf	12.92
2015	3,003,179,000 Mscf	2,672,247,000 Mscf	330,933,000 Mscf	11.02
2016	2,711,803,036 Mscf	2,404,095,859 Mscf	288,917,198	10.65
			Mscf	

Table 3: Gas Produced, Utilized and Flared between 2014 and 2016
Department of Petroleum Resource Oil and Gas Annual Report, 2016

Table 3 shows the volume of gas produced, utilized and flared between 2014 and 2016. It shows a reduction in the quantity of gas flared between 2012 and 2016 from 393,839,836 Mscf to 288,917,198 Mscf

Months	Sum of WBMC (MT)	SUM of OBMC (MT)	SUM of SPENT WBM (MT)	SUM of SPENT OBM (MT)
Jan	7,087.69	7,035	27,542	7,945
Feb	1,818	3,134	50,300	30,800
Mar	603.8	1,029	826.4	1,624
Apr	2,450		3,636	
May	634	342	3,957	975
Jun	1,154	1,385	1,878	4,938
Jul	6,800	1,297	22,684	3,864
Aug	52,325	7,622.03	220	800
Sept	744	469	900	658
Oct	5,003		317	
Nov	1,146		2,288	
Dec	2,290	2,549.6	1,565	7,400
Grand Total	82,055.5	24,862.6	116,113	59,004

Table 4: Drilling Waste Volumes In 2016
Department of Petroleum Resource Oil and Gas Annual Report, 2016

Table 4 reveals that the sum of WBMC (MT) was 7,087.69 in January 2016 and 2,290 in December 2016; sum of OBMC (MT) was 7,035 in January 2016 and 2,549.6 in December 2016; sum of spent WBM (MT) was 27,542 in January 2016 and 1,565 in December 2016; sum of spent OBM (MT) was 7,945 in January 2016 and 7,400 in December 2016 respectively.

5. Discussion

5.1. Oil Spill in the Nigeria's Niger Delta

Results from Table 1 showed that oil spills are common events in Niger Delta. This implies that the spill of oil is a highly reported environmental problem associated with the operations of oil and gas companies in the Niger Delta. This finding is consistent with the United Nations Development Report Programme that a high number of oil spills incidents (6, 817) between 1976 and 2001. A significant proportion (69%) of these spills took place off-shore (a quarter in swampy areas and 6% occurring on lands) (UNDP, 2006). By implication, large quantity of oil is spilled yearly in the Niger Delta. Though the findings show a reduction in oil spill incidence, the World Bank (2007) submits that the actual quantity of oil spilled into the Niger Delta community in Nigeria could be as much as ten times the claimed amount when examined holistically.

Table 2 revealed that majority of oil spill incidents in the Nigeria's Niger Delta are caused by corrosion. This result totally agrees with the assertion of Nwilo and Badejo (2001) that about half of cases of oil spills are linked with corrosion of tankers and pipelines due to poor quality control as some of the operational facilities are rarely inspected or maintained. The submission of Manby (1999) that most issues of oil spills in the Niger Delta region are caused by pipeline corrosion also supports the study results. According to Manby (1999), in a significant number of oil producing communities in Niger Delta, most of the pipelines are as old as twenty to twenty five years.

The spill of oil by any means exerts negative impacts on the physical environment and the overall ecosystem. Mangrove forest and vegetations are destroyed by oil spills. In Nigeria, an estimated 5 to 10% of mangrove ecosystem is affected and the rain forest is not left out (Manby, 1999). The spill of oil in areas that are populated most time spreads, thereby destroying plants, crops, vegetation and aquacultures as the ground waters and soil are contaminated. There is also the problem of depletion of fish population as most of the bacteria feeding on the spilled oil consumed dissolved oxygen that would have been utilized by the fish population. In communities where agriculture is the mainstay of the people food production and supply is reduced drastically. The general environment is becoming uninhabitable by the day because of the reckless nature of oil operations in the Nigeria's Niger Delta.

With oil spills, increasing number of agricultural lands are degraded with associated shoreline erosion and landscape destruction. According to Olujimi and Adewunmi (2011), a large portion of land in the Niger Delta are rendered useless thus exacerbating the already existing poor living condition and economic hardship in rural communities in the region. The mangrove forest species are being forced to go into extinction through deforestation leading to other problems such as soil erosion, siltation of streams and reservoirs. In fact, a good number of farmlands are lost to oil spills. According to Baird (2010), individuals in communities that have oil spill issues most time reports health problems such as respiratory difficulty, skin lesions and social challenges like losing basic human rights such as health, access to food, clean water, and ability to work.

5.2. Natural Gas flaring in the Nigeria's Niger Delta

The study findings in Table 3 revealed that natural gas flaring is another major issue of concern associated with the operations of oil and gas companies in Nigeria's Niger Delta. This suggests that though the practice of natural gas flaring is increasingly being discouraged generally, reports of gas flaring abounds in the oil-producing communities of Niger Delta This results is in consonance with the assertion of Olujimi and Adewunmi (2011) that gas flaring is a high

ranking environmental problem associated with oil and gas operations which has received significant public and international agencies' attention.

Large amounts of methane are released by flaring gases and this has a high potential for global warming. Flaring of gases exerts harmful effects on the health of individuals, families and groups in the community since they release toxic substances and chemicals into the environment. Some of these chemicals could trigger asthma and related respiratory disorders, promote the development of blood-related disorders and potentiate already existing health problems. Gas flaring occurs sometimes in places close to residential areas that lacks protection as the environment most times are polluted.

5.3. Drilling Discharges and Petroleum–Derived Chemical Wastes in the Niger Delta

Results in Table 3 shows that though there is a reduction in drilling waste discharge volumes, incidents of the discharge of petroleum-derived chemicals abound. This result agrees with the assertion of Johnse net al. (2004) that drilling waste is relatively discharged into the marine ecosystem, a situation which threatens survival. Roach, Carr and Howard (1992) asserts that drilling discharges exerts adverse effects on mangrove vegetation which hampers agricultural activities in communities.

6. Conclusions

Degradation of the environment has over the years been associated with the operations of oil and gas companies in the Nigeria's Niger Delta region. This situation impacts environment and in fact the entire ecosystem negatively. Poor operational practices associated with oil exploration and production in the Niger Delta has led to socio-economic problems which makes life and ultimately survival difficult. Although, a good number of the oil and gas companies operating in the Niger Delta area are beginning to institute measures to ensure quality oil exploration and production practices, environmental problems emanating from oil and gas operations are widespread in oil-producing communities. There is therefore the need for petroleum companies to adequately implement environmental maintenance practices in line with global best practices in the oil and gas industry. Government and international agencies should from time to time monitor and evaluate the activities or operations of oil and gas companies in the Nigeria's Niger Delta. Urgent remediation of petroleum contaminated communities should be carried out.

7. Acknowledgement

We are thankful to the Department of Petroleum Resource for making available the data used in this study.

8. Abbreviations

OP	Operational maintenance
SB	Sunken barge
E/W/L	Erosion/Wave/Land
YTBD	Yet To be Determined
NA	Natural Accident
C	Corrosion
EF	Equipment failure
S	Sabotage
HE	Human Errors
TNS	Total Number of Spills
VS	Volume spilled

Table 5

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