



Effect of Local Crude Oil Refineries On The Environment Of Southern Ijaw Local Government Area of Bayelsa State, Nigeria

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ABSTRACT

Local refineries activities also called artisanal refining is the use of local facilities to refine stolen crude. These activities are dangerous and therefore have several socio-economic implications and have done a great damage to the environment of Southern Ijaw local Government Area. Activities of local refineries involve the burning of the crude oil in an open atmosphere where various chemical compounds are released into the air, on the land and in the rivers. This unprofessional way of refining the crude is detrimental to human health and greatly affecting the source of income and livelihood to the people of Southern Ijaw local Government area. The study gathered information from both primary and secondary source. From the information gathered it was discovered that local refining has affected the human health, contaminated rivers thereby killing its inhabitants, destroyed soil (farm lands) by eroding or killing the nutrients. The findings of the study revealed that despite these dangers the activities are still on the rise. From analysis made it was discovered that people involve in such dangerous activities because of abandonment of oil producing communities by Government and oil companies. Thus the researcher at the concluding part suggested some recommendations among which is from the Government and oil companies to responsibly render their sole expected role through empowerment, creation jobs and other social amenities.

Keywords: Crude Oil, Refineries, Environment, Farmlands

INTRODUCTION

The use of local refineries in the Niger Delta region is illegal. Illegal oil bunkering and artisanal refining are on the rise in various communities in the Niger Delta particularly southern Ijaw local Government Area in Bayelsa State, and this worsen the ecological destruction and social conflict caused by the oil industry. It is estimated that between 200,000 and 300,000 barrels of oil is lost daily to theft, known in the country as illegal bunkering (Obenae, 2014).

The majority of the stolen crude oil is taken to large ocean-going tankers waiting offshore, which export the oil refineries outside the country to the rest of the world. Stolen oil is also refined in makeshift individual facilities into low quality petroleum products. Elsevier, (2011) opined that while acknowledging the seeming social and economic advantages that local refining bring to the host communities, and the argument that local refining actually represents an opportunity which could be harnessed by the Government to enhance economic and social opportunities in an environment of high unemployment and poverty, especially in the oil-producing areas of the country, the disadvantages far outweigh the seeming advantages both to the community and the environment at large. According to Fuster and Barbera (2010) despite the dangers involved in local refining of the crude oil, youths in the

Niger Delta Region has seen it a best and lucrative occupation. They further argued that the high level of involvement is as a result of the level of poverty in the said areas. In line with this, (Laffon, 2008) argued that government and oil companies' abandonment of oil producing communities has resorted to the high rate of youths' involvement in oil theft and local refining. Most youths use such neglect from government and oil companies as an excuse to break oil pipes in the name of fighting for resource control.

According to Blankson (2009) environmental degradation is the most visible and direct impact of illegal refining and oil theft. Photographic evidence gathered at sites visited in areas in Southern Ijaw show the terrible impacts of local refining to the local environment. Vegetation is visibly affected by the resulting pollution; crude saturates the mangroves and oil disturbs the surface water. The report of Agbogidi et al. (2009) also showed the damaging effects of crude oil on plants. The environmental destruction associated with illegal oil refining harms traditional livelihoods tied to the land and water. Thus, the researcher would like to examine the concept of local (artisanal) refining and oil theft and their environmental implications and finally, to examine why such activities are so ramped despite the great dangers involve. No doubt oil bunkering and artisanal refining are on the rise in various communities in the Niger Delta and worsen the ecological destruction and social conflict caused by the oil industry. Activities of crude oil refining locally despite its legal implications is still increasing in the Niger Delta region particularly Southern Ijaw Local Government Area. Artisanal refining of the crude is dangerous to both human health and other live stocks.

Oil pollution is a significant barrier to cooperative integrated fish farming, one of the few businesses that could provide sustainable employment and incomes. Nigeria spent over ₦100 billion on the importation of frozen fish in 2010, some of which is necessary for Niger Delta communities to replace the fish they once caught. Oil theft and artisanal refining has significant health risks for those involved and the environment as well. The handling and heating of the crude oil pollutes the air. The camps have a toxic feel and the health impacts of those working there are unknown. Communities are constantly exposed to inhalation of poisonous gases, causing coughing and breathing problems. However, many are in denial about the potential medium to long-term health implications because of the short term economic gains.

The amazing issue is that despite all these disadvantages hundreds of youths are still involved in local refining, thus the question is could youth involvement be as a result government and oil companies neglect on the oil producing communities? Could unemployment or youths' idleness be one of the reasons for local refining? These and many more are the troubling issues that led to this research work. The use of Local (artisanal) refineries in refining crude oil has a great hazardous impact on the environment, to both human and other organisms living in and around such environment where the crude oil refining is taking place. But despite the dangers there is a great involvement of communities in such activities, thus the primary aim of this study is to examine the effect of local crude oil refineries on the soil of Southern Ijaw Local Government Area. The study focused on the followings:

- i. To investigate into the effect of such activities on the water and its inhabitants.
- ii. To investigate into the general effect of such activities on human health.
- iii. To investigate into the reasons of community involvement in such activities despite the dangers.

Study Area

Southern Ijaw is a local government area of Bayelsa State, Southern part of Nigeria. it's headquarters' is in the town of Oporoma in the northern part of the L.G.A. it is located on latitude $4^{\circ} 40' 36''$ to $4^{\circ} 67' 68''$ north and longitude $5^{\circ} 56' 50''$ to $5.94^{\circ} 16''$ east of the Greenwich meridian longitude 0° . (see figure 1).

Southern Ijaw has a land area of 268 km² approximated and a population of 319,413 persons (NPC Census, 2006) (National Pollution Census, 2015). Southern Ijaw L.G.A has a riverine and estuarine setting. A lot of her communities are often completely surrounded by water, hence making these communities inaccessible by road. The study area lies in the heaviest rainfall area in Nigeria with heavy rainfall almost all years round and a short dry season. The area's climate supports the cultivation of oil palm, cocoa rice, banana, yam, cocoyam, coconut, cassava, sugarcane etc. the amount of rainfall is adequate for a year round crop production. The vegetation of Southern Ijaw is composed of ecological zones which include coastal barrier island forest, mangrove forest, and fresh water swamp. The difference

with various soil units in the area and they constituted part of the eco-systems. The socio-economic activities of the people in Southern Ijaw may be considered under three main headings namely, primary occupation, secondary occupations and tertiary occupations. The major traditional primary occupations include fishing, commerce and water transportation. However, crude oil exportation by multinational companies and the local crude oil refining, have since become the major sources of socio-economic activities in the area. The area also has higher educational institutions like the Niger Delta University (NDU) in Amassoma and Federal Polytechnic Ekowe, amongst others.

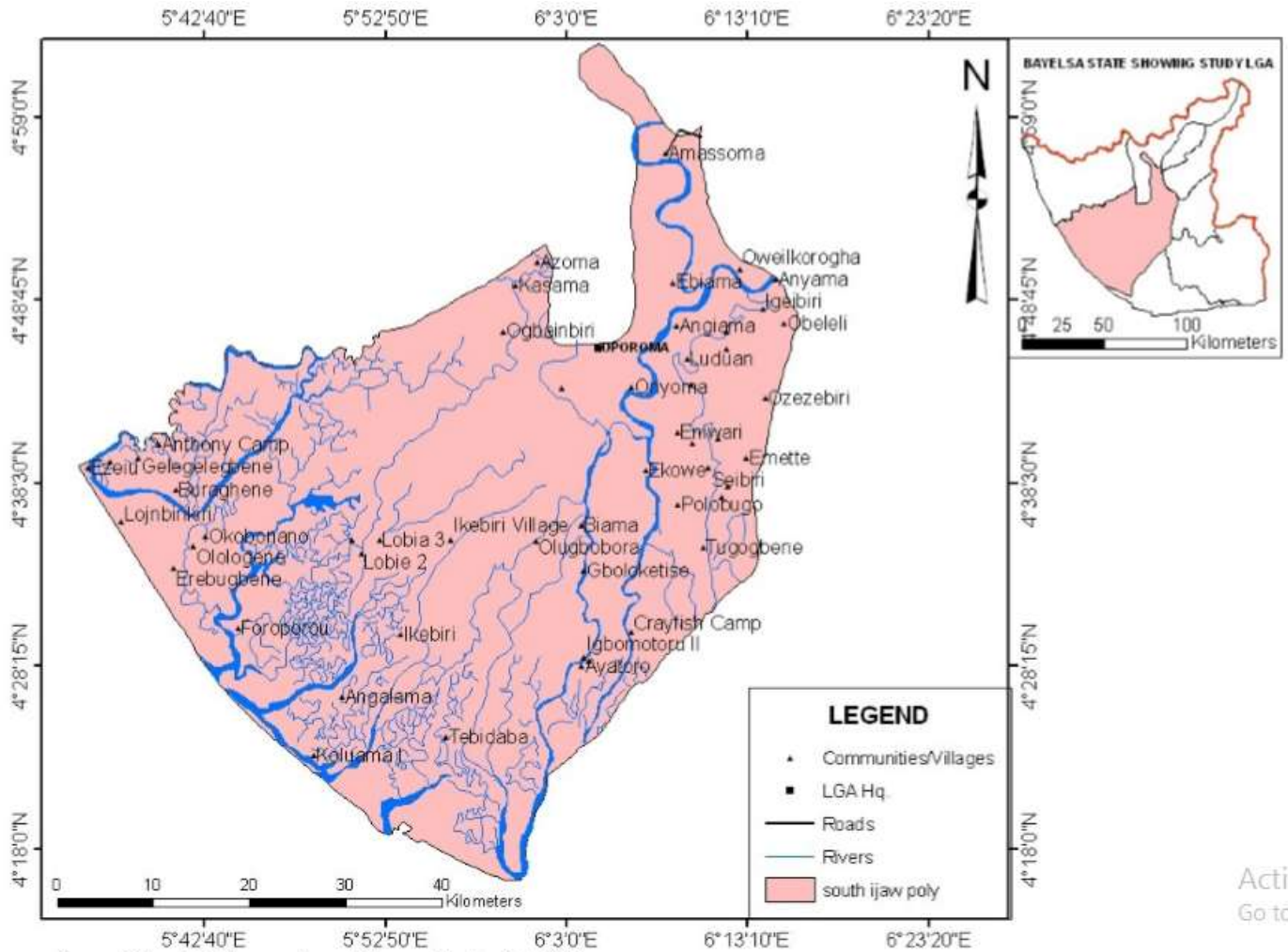


Figure 1: Map of Southern Ijaw Local Government Area
Source: Bayelsa State Ministry of Land and Housing

RESEARCH METHODS

The data collected from the primary source which is the use of structure questionnaire is presented on a tabular form and analyzed using simple mean. The presentation is only concerned with the research questions and the test of hypothesis. Chi-square statistical technique was used analysed the data set.

RESULTS AND DISCUSSION

Table 1: Analysis of Demographic Data

Sex	No.	%	Age bracket	No.	%	Qualification	No.	%
Male	110	73	20 – 30	50	33.3	FSLC	40	25.3
Female	40	27	31 – 40	65	43.3	SSCE	40	25
			41 – 50	20	13.3	ND & above	70	46.7
			51 and above	15	10			
Total	150	100		150	100		150	100

Table 1, indicates that 110 males representing 73% are actively involved in local crude refining while 40 females representing 27% are into local refining. This implies that more of males are involved in local refining activities.

The table also indicates that there are more of youths in local refining activities than old people. 50 were between the ages of 20 — 30 while 65 were between the ages of 31 — 40, 20 of the respondents fall between the age of 41 — 50 and 15 were between the ages of 51 and above.

The table also revealed that majority of people who are into these activities are employable persons with certificates. 70 respondents possess ND and above while 40 has First School Leaving Certificate while 40 has SSCE.

Research Question One: *Does the use of local refineries have any negative effect on the soil?*

Table 2: Data Collected in Relation to Research Question One.

S/N	STATEMENT	SA	A	U	D	SD
1	Grasses and plants around the area where local refining is done not to survive as a result of toxicity of crude oil.	70	60	5	10	5
2	The crude makes the top soil black killing all the nutrient in the soil there by living the plant dead.	80	60	5	5	0
3	If 1 and 2 are correct, then local refineries have negative impact of the soil significantly.	90	60	0	0	0

Table 3: Computation of Simple Mean

S/N	Questionnaire item	SA	A	U	D	SD	N	Σx	\bar{x}	Decision
1	Grasses and plants within the areas where local refining is done cannot survive as a result of toxicity of crude oil.	70	60	5	10	5	150	630	4.2	Agree
2	The crude makes the top soil black killing all the nutrients in the soil thereby living the plants dead.	80	60	5	5	0	150	665	4.4	Agree
3	If 1 and 2 are correct then local refineries have negative impact of the soil significantly.	90	60	0	0	0	150	690	4.6	Agree

The data presented in table 3 indicates that item 1, 2 and 3 with the mean score of 4.2, 4.4 and 4.6 respectively are significant as they are above the cut off mark of 3.0. This implies that local refineries affect the oil negatively. Below showing the local crude oil refining and its effect on the soil).

Research Question Two: Does the use of local refineries contaminate the water thereby killing it inhabitants?

Table 5: Data collected in relation to research question two.

S/N	STATEMENT	SA	A	U	D	SD
1	Oil waste contains chemicals that are toxic to the survival of fish and other food chain lives in water	70	60	5	10	5
2	Oil spillage on water contaminates the water making it unsafe for human consumption	80	60	5	5	0
3	If 1 and 2 is correct, then local refineries have contaminates water thereby killing it inhabitants.	80	70	0	0	0

Table 6: Consumption of Simple Mean

S/N	Questionnaire item	SA	A	U	D	SD	N	$\sum x$	\bar{x}	Decision
1	Oil waste contains chemicals that are toxic to the survival of fish and other food chain lives in water.	70	60	5	10	5	150	630	4.2	Agree
2	Oil spillage on water contaminates the water making it unsafe for human consumption.	80	60	5	5	0	150	665	4.4	Agree
3	If 1 and 2 is correct, then local refineries have contaminates water thereby killing it inhabitants.	80	70	0	0	0		680	4.5	Agree

The table 6, above showing the various means of 4.2, 4.4 and 4.5 respectively are more than the cut off mark of 3.0 which indicates that local refineries significantly affect or contaminates the water. This also means it has the ability of reducing food chain in the water thereby making survival difficult for people living in such environments. (see below showing the local crude Oil refining and its effect on the water

Research Question Three: Do the chemicals released into the air pollute the air and making it unsafe for humans and living organisms?

Table 7: Data Collected in Relation to Research Question Three.

S/N	STATEMENT	SA	A	U	D	SD
1	Crude oil burning releases poisonous elements into the air which make the air unsafe for human breathing.	70	60	5	10	5
2	The smoke and vapors from oil burning contain toxic hydrocarbon and other toxic components which contaminate the air.	80	60	5	5	0
3	Oil smoke from evaporation if inhaled can cause headaches, dizziness, nausea, vomiting, eye and throat irritation, etc.	90	60	0	0	0
TOTAL		240	180	10	15	5

Table 8: Computation of Simple Mean

S/N	Questionnaire item	SA	A	U	D	SD	N	$\sum x$	\bar{x}	Decision
1	Crude oil burning releases poisonous elements into the air which make the air unsafe for human breathing.	70	60	5	10	5	150	630	4.2	Agree
2	The smoke and vapors from oil burning contain toxic hydrocarbon and other toxic components which contaminate the air.	80	60	5	5	0	150	665	4.4	Agree
3	Oil smoke from evaporation if inhaled can cause headaches, dizziness, nausea, vomiting, eye and throat irritation, etc.	90	60	0	0	0	150	690	4.6	Agree

From the table 8, the data presented indicates that item 1, 2 and 3 with the mean score of 4.2, 4.4 and 4.6 respectively are significant as they are above the cut off mark of 3.0. This implies that local refining contaminate the air thereby causing air pollution which is not safe for breathing. The variables also indicates that crude oil refining causes a number of diseases such as headaches, dizziness, nausea, vomiting, eye and throat irritations, etc. (see below showing local crude oil refining and its effect on the air).



Plate 1: A carrying crude oil to the local refinery.

Research Question Four: *Why the involvement of such activities despite the dangers involved?*

Table 9: Data Collected in Relation to Research Question Four.

S/N	STATEMENT	SA	A	U	D	SD
1	Many people involve in local refining of crude oil because it fetch them quick money	80	60	2	5	3
2	Many people involve in local refining because of poverty.	90	60	0	0	0
3	People involve in crude oil theft due to the abandonment of their terrain by government.	85	65	0	0	0
TOTAL		255	185	2	5	3

Table 10: Computation of Simple mean

S/N	Questionnaire item	SA	A	U	D	SD	N	$\sum x$	\bar{x}	Decision
1	A self-employed person needs less of government employment	80	60	2	5	3	150	659	4.4	Agree
2	An entrepreneurially minded person is a job creator and not job seeker.	90	60	0	0	0	150	690	4.6	Agree
3	A successful entrepreneur is totally self-reliant person	85	65	0	0	0	150	685	4.6	Agree
TOTAL		225	185	2	0	3	450	2034	13.6	Agree

The data presented in table 10, indicates that item 1,2 and 3 with the mean score of 4.4, 4.6 and 4.6 respectively are significant as they are above the cut off mark of 3.0. This implies that though local refining is risky and poses various danger to human life yet many communities go into it because of various factors such as government abandonment, abject poverty, for quick money, etc.

Test of Hypotheses

Decision Rule

The results generated were tested using the chi-square analysis. According to Nwobi (2003), the decision to be reached is that the Null hypothesis (H_0) is rejected if Chi-Square calculated is greater than Chi-square tabulated ($X^2_{cal} > X^2_{tab}$) Nwanchukwu (2008) concurs to this decision rule.

The hypotheses stated in this research work are therefore tested using the chi-square as followings;

H_{01} : There is no significant impact of local refineries/refining on the soil.

Table 11: Data Collected in Relation to hypothesis one

S/N	STATEMENT	SA	A	U	D	SD
1	Grasses and plants within the areas where local refining is done cannot survive as a result of toxicity of crude oil.	70	60	5	10	5
2	The crude makes the top soil black killing all the nutrients in the soil thereby leaving the plant dead	80	60	5	5	0
3	If 1 and 2 are correct, then local refineries have negative impact on the soil significantly.	90	60	0	0	0

Table 12: Computation of Chi-square

Responses	Fo	Fe	(Fo – Fe)	(Fo – Fe) ²	(Fo – Fe) ² /Fe
SA	70	80	-10	100	1.25
A	60	60	0	0	0
U	5	3.33	1.67	2.7889	0.8375
D	10	5	5	25	5
SD	5	1.67	3.33	11.0889	6.6401
SA	80	80	0	0	0
A	60	60	0	0	0
U	5	3.33	1.67	2.7889	0.8375
D	5	5	0	0	0
SD	0	1.67	-1.67	2.7889	1.67
SA	90	80	10	100	1.25
A	60	60	0	0	0
U	0	3.33	-3.33	11.0889	3.33
D	0	5	-5	25	5
SD	0	1.67	-1.67	2.7889	1.67
TOTAL	450	450	0	28.3334	27.4851

From the analysis above in table 12 using the Chi-square tests, the calculated chi-square value 27.4851 is greater than the Chi-square tabulated 15.5 hence; the null hypothesis which state there is no significant impact of local refineries/refining on the soil is rejected while the alternative hypothesis is accepted. This therefore means, local refining has significant effect on the soil negatively.

Ho₂: There is no significant negative effect of local refineries on the water

Table 13: Data Collected in Relation to Hypothesis Two

S/N	STATEMENT	SA	A	U	D	SD
1	Oil waste contains chemicals that are toxic to the survival of fish and other food chain lives in water.	70	60	5	10	5
2	Oil spillage on water contaminates the water making it unsafe for human consumption.	80	60	5	5	0
3	If 1 and 2 is correct, then local refineries have contaminates water thereby killing it inhabitants.	80	70	0	0	0

Table 14: Computation of Chi-square.

Responses	Fo	Fe	(Fo – Fe)	(Fo – Fe) ²	(Fo – Fe) ² /Fe
SA	70	80	-10	100	1.25
A	60	60	0	0	0
U	5	3.33	1.67	2.7889	0.8375
D	10	5	5	25	5
SD	5	1.67	3.33	11.0889	6.6401
SA	80	80	0	0	0
A	60	60	0	0	0
U	5	3.33	1.67	2.7889	0.8375
D	5	5	0	0	0
SD	0	1.67	-1.67	2.7889	1.67
SA	90	80	10	100	1.25
A	60	60	0	0	0
U	0	3.33	-3.33	11.0889	3.33
D	0	5	-5	25	5
SD	0	1.67	-1.67	2.7889	1.67
TOTAL	450	450	0	28.3334	27.4851

From the table 14, the value of the calculated Chi-square is 27.4851 which is greater than that of the tabulated value of chi-square 15.5. Therefore, the null hypothesis which state there is no significant effect of local refining on the water is rejected while accepting the alternative hypothesis which proves there is a significant effect of local refining on the water.

Ho₃: There is no significant impact of local refineries on the air.

Table 15: Data Collected in Relation to Hypothesis Three

S/N	STATEMENT	SA	A	U	D	SD
1	Crude oil burning releases poisonous elements into the air which make the air unsafe for human breathing.	70	60	5	10	5
2	The smoke and vapors from oil burning contain toxic hydrocarbon and other toxic components which contaminate the air.	80	60	5	5	0
3	Oil smoke from evaporation if inhaled can cause headaches, dizziness, nausea, vomiting, eye and throat irritation, etc.	90	60	0	0	0
TOTAL		240	180	10	15	5

Table 16: Computation of Chi-square

Responses	Fo	Fe	(Fo – Fe)	(Fo – Fe) ²	(Fo – Fe) ² /Fe
SA	80	85	-5	25	0.2941
A	60	61.67	1.67	2.7889	0.0452
U	2	0.67	1.33	1.7689	2.6401
D	5	1.67	3.33	11.9889	6.6401
SD	3	1	2	4	4
SA	90	85	5	25	0.2941
A	60	61.67	1.67	2.7889	0.0452
U	0	0.67	0.67	0.4489	0.67
D	0	1.67	1.67	2.7889	1.67
SD	0	1	1	1	1
SA	85	85	0	0	0
A	65	61.67	3.33	11.0889	0.1798
U	0	0.67	0.67	0.4489	0.67
D	0	1.67	1.67	2.7889	1.67
SD	0	1	1	1	1
TOTAL	450	450	20	92	20.8186

The analysis presented in the table 16 using Chi-square tests, showing the calculated chi-square value of 20.8186, which is more than the Chi-square tabulated 15. Thus, the null hypothesis is rejected while the alternative is accepted. This therefore implies that local refining has a significant impact on the air.

Local refining has had several negative impact on the environs of Southern Ijaw Local Government Area. The effect ranges from soil degradation to air pollution and the contamination of rivers, lakes and streams. These effects in turn have had socio-economic effect on the people living in the area. The analysis revealed in table 2, that local refining causes soil degradation and that the chemicals and oil waste on the soil kills the nutrient in the soil thereby making it difficult for plants to grow. A spillage on any farm land leaves the plants dead and the damage on the soil is long lasting. Oil waste contain chemicals that are toxic to water inhabitants, this was shown in table 4, which revealed that spillage or waste of crude oil into rivers, streams, lakes, etc. contaminates the water thereby killing its inhabitant (see plate 2). Oil contaminated water is not safe for human consumption as well. This therefore means local refineries has great effect on human and the environment where these activities are carried out.



Plate 2: Showing water and air pollution by local refinery

Local refineries' activities have never left the atmosphere safe human by contaminating the air thereby affecting the health of people. From the analysis it was discovered that the hydrocarbons released into the air through oil burning contaminates the air thereby causing health problems. Table 6, revealed that Oil smoke from evaporation if inhaled can cause headaches, dizziness, nausea, vomiting, eye and throat irritations, etc. Oil refineries activities has despite the short benefits had long term damages in several aspect of human endeavors and despite these negative impacts community involvement in these activities are still on. Table 8, revealed that most people involve in local crude oil refining because of poverty while some due to the neglect of government on oil producing areas and does that as a form of getting their share from the national cake. This therefore proves that local refining has great impact on the environment negatively.

The Niger Delta region is the crude oil and natural gas hub of Nigeria with several networks of product pipelines (both surface and subsurface) which has created a social problem of vandalization of the product pipelines for the purpose of stealing the product. Oil theft and local refining in the Niger Delta are massive and growing problems, it is estimated that between 200,000 and 300,000 barrels of oil is lost daily to theft, known in the country as illegal bunkering.

This review examines the activities and impacts of local refineries on the Southern Ijaw environment. The researcher concludes that while acknowledging the seeming social and economic advantages that it brings to host communities and locals the disadvantages far outweigh the seeming advantages both to the community and the environment at large.

Local refining has had several environmental problems which were stated in the statement of the problem of this study. The review of several literatures also revealed that there are socio-economic dangers ranging from soil degradation to water and air pollution which affects human health, source of income and food. (See plate 3).



Plate 3: Showing the effect of gaseous pollution on the environment

Local refining activities have destroyed the soil fertility, food chain in lakes, rivers, streams, etc. Accidents of local refineries are always disastrous such as fire outbreak killing young men and women. It is as dangerous as that, but communities are still into it. The analysis revealed that such involvements are as a result of several factors which include; outright abandonment of oil producing communities, poverty and economic benefits of illegal bunkering.

CONCLUSIONS

Severe damage is done to the environment as a result of local refining. The refining process leads to a significant quantity of wastage being dumped in rivers and streams or on land — two drums of crude oil translate into one drum of product once refined. The distilleries are heated on open fires fed by crude oil that is tipped into pits in the ground. As a reasonable quantity of the oil bums away, some seeps into the

ground during the process of refining. The resulting oil spills from broken pipes and wastes from tens of thousands of makeshift refineries combine to produce enormous environmental pollution on land and in the creeks. Apart from the high risk of self-harm from local refining — a large number of accidents, fires and explosions occur. (See plate 4).



Plate 4: Showing the impact on local refinery on the soil

It has been reported that petroleum refining contributes solid, liquid, and gaseous wastes in the environment. Some of these wastes could contain toxic components such as the polynuclear aromatic hydrocarbons (PAHs), which have been reported to be the real contaminants of oil and most abundant of the main hydrocarbons found in the crude oil mixture. Once introduced in the environment, PAHs could be stable for as short as 48 hours (e.g. naphthalene) or as long as 400 days (e.g. fluoranthene) in soils. They thus, resist degradation and, remain persistent in sediments and when in organisms, could accumulate in adipose tissues and further transferred up the trophic chain or web.

Acute exposures to aromatic hydrocarbons, which are common constituents of oil, are known to cause respiratory symptoms and high molecular weight PAHs are of significant concern because of the mutagenicity, carcinogenicity and bioaccumulation in organic tissues due to their lipophilic character. Increasing evidence, mainly from the Prestige oil spill, suggests that human population exposed to risks may experience long term respiratory effects and chromosomal damage.

Conclusively, the activities from local refineries have a significant negative impact on soil fertility, air pollution, water pollution, human health, and other socio-economic activities. It is also concluded based on the findings that oil producing communities from onset has been abandoned by Government which is a great influence in the involvement of illegal bunkering.

RECOMMENDATIONS

From the conclusions drawn, the following are recommended;

- i. There is a strong need for government to build refineries in the oil producing places by so doing, many that would have refined it illegally would be employees to refineries.
- ii. Addressing the socio-economic foundation of illegal bunkering through an attack on poverty, and job creation targeted at the youth who must be made to come out of the creeks;
- iii. Pipeline protection through community-based surveillance programme, which replaces the present private contract or surveillance system. The ineffectiveness of private contract has been glaring and, in fact, some of them have been allegedly implicated in oil theft. By this approach, the communities will take over the surveillance of the pipelines.
- iv. The oil companies and the government to provide socioeconomic activities including health care programmes, economic and social empowerment scheme.
- v. Sabotage and oil bunkering can be stopped through proper engagement and empowerment of the youth and women groups and also through proper and adequate monitoring of pipeline and oil installations/facilities.

- vi. There is a need for the government to collaborate with Shell and other MNOCs to take immediate and decisive step to fully implement the UNEP report without further delay. This is imperative to build trust and restore the much needed confidence in the oil producing communities who are the major stakeholder. Where relationship exists between the various stakeholders it becomes lots feasible to gain access to the cleanup site particularly wherever there is major spills.
- vii. There is urgent need for the government to expedite action and put necessary measure in place to control and prevent oil theft for illegal refining, sabotage and to carry out regular maintenance and replacement of ageing oil pipelines which causes environmental pollution.
- viii. There should sensitization programmes to create enlightenment on the socio-economics implications of local refineries.

REFERENCES

- Abii, T.A; Nwosu, PC (2009). The Effect of Oil Spillage on the Soil of Eleme in River State of the Niger Delta Area of Nigeria. *Res J. Environ* 3(3): 316-320.
- Achi, S.S. and Shide EG (2004). Analysis of Trace metals by Wet Ashing and Spectro-photometric Techniques of Crude oil samples. *J. Chem. Soc. Nigeria*, 29(11): 11-14.
- Agbalino, S.O. (2000). Petroleum Exploration and the Agitation for Compensation by oil mineral producing communities in Nigeria. *J. Environ, Policy Issues*, vol. 1: 11.
- Agbogidi, O. M., N. U. Ureigho and E. M. Okechukwu (2009) Eco-physiological assessment of crude oil pollution using avocado pear (*Persea americana* Miller) *International Journal Biological and Chemical Sciences* 3(1): 75-80
- Akpofure, E.A, M.L. Efere and P. Ayawei, (2000). The Adverse Effects of Crude Oil Spills in the Niger Delta. *Urhobo Historical Society*.
- Amaize, E. (2007). Crises from the Creeks. *Saturday Vanguard Newspapers* (www.vanguardngr.com). March 17. Pp 11-13.
- Atubi, A. O.; Onokala, Pc (2006). The Social-Economic Effects of Oil Spillage on Agriculture in the Niger Delta. *J. Environ. Stud.* 2: 50-56.
- Brain, K. (2000). *Soil processes*. 1st edition. Allen George Unwin. London.
- Bremmer, JM (1996). Nitrogen-Total. In D.L. Sparks (ed). *Methods of Soil Analysis, Part 3. Chemical methods*. Soil science society of America Book series number 5. American society of Agronomy, Madison WI. Pp 1085-1121.
- Blankson, O. (2009). Blankson, Public relations in sub-Saharan Africa," *Global public relations: spanning borders, spanning cultures*. London: Routledge.
- By Mind (2012). Cytogenetic effects induced by prestige oil on human populations: the role of polymorphisms in genes involved in metabolism and DNA repair," *Mutation Research*, vol. 653, pp. 117-123.
- Ekundayo E.O., Obuekwe C.O (2001). Effects of Oil Spill on Soil physio-chemical properties of a spill site in a typical udipsamment of the Niger Delta Basin of Nigeria. *Environmental monitoring and assessment*; 60(2): 235-249.
- Elsevier, E. (2011) Multinationals and corporate social responsibility in developing countries: a case study of Nigeria," *Corporate Social Responsibility and Environmental Management* vol. 11, pp. 1-11,
- Ha et al, (2008). Determination of the contamination of groundwater sources in Okrika mainland with polynuclear aromatic hydrocarbons (PAHs)," *British Journal of Environment & Climate Change*, vol. 1, pp. 90-102,
- Henry, JG; Heinke, GW (2005). *Environmental Science. and Engineering*, 2nd ed. Prentice Hall, India, New Delhi 110001, 64-84.
- Hoff, R. (1998). Bioremediation: An Overview of its Development and use for Oil Spill Clean Up. *Mar. POLLUT. Bull.* 26, 476-481.
- Ibru, G. (2001). Hotel and tourism development potentials in Delta State, A paper presented at the 2nd anniversary of the administration of James Onanefe Ibori,

- Executive Governor Delta State at the conference hall; Hotel excel, NNPC Road, Effurun, Nigeria, June and 2001.
- Jekel et al, (2007). Potential health hazards of toxic residues in sludge. In sludge-health risk of land application," Ann. Arbon. Sci. Publ. Inc, pp. 85-102, 1981
- Micheal, A.M., Ojha, T.P (2006). Principles of Agricultural Engineering Vol. 11 5t", Edition, Jain Brothers, New Delhi, pp. 331-390.
- Levy et al (2011). Polycyclic aromatic hydrocarbons and aromatic plasticizer materials in the seawater of Alexandria coastal area. ," Egyptian J. of Aquat Res., vol. 31, pp. 15-24,
- Liu, C; Evett J.B. (2000). Soil properties: Testing, measurement and evaluation, 4t" edition. Prentice Hall, New Jersey.
- Lyons et al, (1999). Health changes in fishermen 2 years after clean-up of the prestige oil spill," Annals of Internal Medicine, vol. 153, pp. 489-498, 2010.
- Nelson, O.W., Sommers, L.E., (1996). Total Carbon; Organic Carbon Organic matter. In O.L. Sparks (ed). Methods of Soil Analysis part 3, Chemical methods. Soil Science Society of American Book Series Number 5. American Society of Agronomy, Madison WIE, pp 961-1010.
- Nwillo, P.C. and O.T. Badeyo, (2005): Oil Spill problems and management in the Niger Delta International Oil Spill Conference, Miami, Florida, USA. O
- Obenae, M. (2014). Oil industry and the health of communities in the Niger delta of Nigeria," Encyclopedia of environmental health. Burlington: Elsevier, 2011
- Odulara, O. (2008). Illegal oil refining in the Niger Delta." Available www.stakeholderdemocracy.org.
- Odugwu, E.C; Onianwa, A.T. (2002). Environmental Impact Assessment — A Case Study of Utorogu 1984 16 Delivery Line Spillage. Proc. Int Sem on Pet Int. of the Nig. Environ. Pp 228-301.
- Ojha, O. Health changes in fishermen 2 years after clean-up of the prestige oil spill," Annals of Internal Medicine, vol. 153, pp. 489-498, 2010.
- Okoro, D, Ikolo A.O (2005). Compositional patterns and sources of polynuclear aromatic hydrocarbon in water and sediment samples of Ogunu creek of the Warri River. Proc. 28th Annual Int. Conf. Chem. Soc. Nigeria. 2(1): 168-171
- Orisakwe O.E., Njan A.A (2004). Investigation into the Nephrotoxicity of Nigerian Bonny Light Crude Oil in Albino rats. Int. J. Environ. Res. Public Health: 1(2): 106-110.
- Ozekhome, (2001). Health changes in fishermen 2 years after clean-up of the prestige oil spill," Annals of Internal Medicine, vol. 153, pp. 489-498, 2010.
- Pawpaw and Amadi et al (1999). Biodegradation of petroleum hydrocarbons in contaminated soils, Microbial Biotechnology: Energy and Environment. Wallingford, Oxfordshire: CAB International, 2012.
- Peight, J. (2000). The Chemistry and Technology of Petroleum. Marcel Dekker.
- Roche, P. (2003). Acute health effects of the sea empress oil spill," Journal of Epidemiology and Community Health, vol. 53, pp. 306-310, 1999.
- Salako (2004). Potential health hazards of toxic residues in sludge. In sludge-health risk of land application," Ann. Arbon. Sci. Publ. Inc, pp. 85-102, 1981
- UNEP, (2011) Environmental assessment of Ogoni land, Nairobi. Kenya: United Nations Environment Programme.
- WHO (1948). "Crude theft: Economic implication & mitigation strategies." Available www.oceanuguy.com/wp-content/uploads/2011/03/law-2.jpg [Accessed 13/06/2014].
- Wikipedia, (2016). www.oil-spillage-and-its-environmental-implications.
- Wilson and Lablanc GA (2000). Petroleum pollution. Rev. Toxicol. 3:77-112.