Research Paper Open Access

IMPACT OF LOSS OF WATER SUPPLY IN OGONI LAND AS A RESULT OF OIL EXPLORATION AND PRODUCTION

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ABSTRACT : Due to oil exploration and other human activities in Ogoniland, there are evidences of environmental degradation all over the area. These exploration and production activities has local detrimental effects and considerable imprint on the ambient quality of air, soils and sediments surface and ground water marine environment, bio-diversity and sustainability of both the marine and the terrestrial ecosystems of the oil producing communities in Ogoniland. It has affected the socio-cultural aspects of the environment, not only leading to extinction of different viable plant species and water pollution but also affects the quality of life and health of the people in the host communities.Streams, wells and rain water harvesting have traditionally been used as sources of water supply before the exploration of oil in Ogoni Land. However these traditional sources of water supply have been severely contaminated by the oil exploration and production activity thus limited the options of the locals in accessing clean water. The purpose of this study therefore is to ascertain the impact of loss of water supply source in Ogoniland as a result of Oil exploration and production. A case study design was adopted for this research. It employed a positivist, quantitative approach to the development questionnaires. These questionnaires were developed and administered to the household heads in the study area. A total of 392 questionnaires were administered across eight sampled communities for the study. Out of the 392 sampled questionnaires administered, a total of 361 were successfully retrieved. The data gathered from the field was analysed using descriptive techniques The research revealed that the loss of water supply in the study area has led to an increase in the cost of accessing water, increased usage of unclean water, decrease in the general usage of water, loss of sources of income and general increase in health bills as a result of waterborne diseases.   It is therefore recommended that more proactive steps be initiated to clean the impacted sites affected by the oil spills, while comprehensive groundwater monitoring be carried out to ascertain the present state of the groundwater as the clean up exercise continues. Moreso governments and its agencies should provide an easily accessible water supply scheme to provide sufficient safe water to meet community needs. This will drastically reduce the impact of contaminated water that may complicate existing health issues within the study area.

KEYWORDS: *Environment, Water Supply, Petroleum Exploration and Production*

I. INTRODUCTION
The expansion of the country's petroleum industry combined with an increasing growth rate in human population and a lack of enforcement of environmental regulations and commitment on the part of government has led to substantial damages to Nigeria's environment, especially in the Niger Delta Region (Badejo and Nwilo, 2008). Although Nigeria is among the most productive and successful oil producing countries in the world, and the commodity provides the main sources of foreign exchange, its exploration, production, distribution and marketing have been the major cause of environmental damages in the host communities within the Niger Delta region (Aniefiok, Udo, Magaret and Sunday, 2013).

Oil spills have occurred repeatedly for decades in the Niger Delta and large parts of the land and wetlands are chronically affected by oil spills. Due to the influence of the tides and at times floods in connection with rains, spilt oil is rapidly distributed over large areas and remobilized with rising tides. The oil originates from leaking pipelines, wellheads, and flow stations; from spills in connection with transport of mostly stolen oil; from illegal tapping of the wells; and from artisanal refining under very primitive conditions. As a result of the contamination of oil in mangroves and wetlands as well as on land, oil has penetrated into soils down to several meters and has contaminated ground waters over large areas. This has resulted in the contamination of water wells as a particularly serious concern from a human health perspective (UNEP 2011).

Petroleum exploration and production operations such as seismic investigation, drilling, construction, production and transportation have a wide range of environmental and social impacts. The impacts vary from change in land use, disruption in local hydrology, bisecting ecosystems, air pollution from gas flares and pollution of soil and ground water (Amaniye,2006; Aniefiok, *et al,* 2013). These impacts can be provoked by environmental incident such as oil spills and blow outs. The spills which are the foremost challenges in the exploration and production of petroleum impinge on all aspects of the environment of host communities. There are quite a lot of other environmental impact linked with the interruption of forest and floor surface from related activities including clearance, construction of roads, tank farms, and pipelines and different land modification factors required for exploration, drilling and production wells and construction of production facilities (Asthana and Ashung, 2003). Oil Spills, gas flaring and venting, discharges of petroleum derived chemical wastes, contamination of managed sources of water, contamination of soil and sediments, the devastation of farmlands and the marine environment, the extinction of valuable forest resources are prevalent and evident in the study area.

The Ogoni People have suffered all forms of pollution and environmental degradation as a result of petroleum exploration and production activities in the region since oil was discovered in Nigeria in the 1950s. The Ogoni people are known for their farming, lumbering and fishing activities as their sources of livelihood but the land, vegetation and water on which they depend have been threatened and subsequently devastated by petroleum exploration and production operations in the area. In some cases, farm lands, natural water source and in some extreme cases the entire ecosystem have totally been destroyed leaving the natives without means of livelihood and survival (Amanyie, 2006).

Water as a universal solvent is indeed a necessity of life and as such maintaining the quality of drinking water cannot be over-emphasized. This is because poor quality of drinking water can predispose citizens to many food and water-borne diseases. Prior to the SDGs promulgation in Nigeria, a lot of researches were carried out in the area of quality drinking water supply. The findings of these studies revealed poor quality of the drinking water sources in. Generally, groundwater quality in Nigeria has been reported to be influenced by the geology and geochemistry of the environment, rate of urbanization, industrialization, landfill/dumpsite leachates, heavy metals, bacteriological pollution, and seasonality (Ocheri, 2014)

An important environmental component is water, which is an essential ingredient for sustainability and survival of every life form on earth. Therefore, need for water is constantly increasing due to high rates of population growth, urbanization and other anthropogenic factors. Water is also a necessity to humans who need plenty of water intake per day for survival (Nester, 2004). Ideally, drinking water should be safe and acceptable to all

Streams, wells and rain water harvesting have traditionally been used as sources of water supply before the exploration of oil in Ogoni Land. Streams were hitherto a viable source of clean water and afforded the children in the communities' recreational options where they go and swim. Rainwater in the study area is collected,convey and stored from relatively clean surfaces such as a roof for later use. The collected water which is generally stored in buckets or water tanks or directed into other channels provides water for consumption and other domestic uses. It also reduces water bill and lessen the manpower required to walk the distance to get water from other sources.

The UNEP 2011 report revealed that these streams have all been contaminated by spills and are no longer viable sources for clean water. Investigation also established the surface water throughout the creeks in Ogoni land contains hydrocarbons, Including floating layers of oil which vary from thick black oil to thin sheets (UNEP, 2011)

These losses of water supply sources have led to considerable economic hardship for the inhabitants of the study area as the streams which were major sources of water for both domestic and other uses have been contaminated by the oil activities. This study therefore aims to investigate the impacts occasioned by the loss of water supply sources in Ogoni Land as s result of oil exploration and production activities.

THE STUDY AREA
Ogoni land is a region covering some 1,000 km in the south-east of the Niger Delta basin (Map). It has a population of close to 832,000, according to the 2006 National Census, consisting mainly of the Ogoni people.
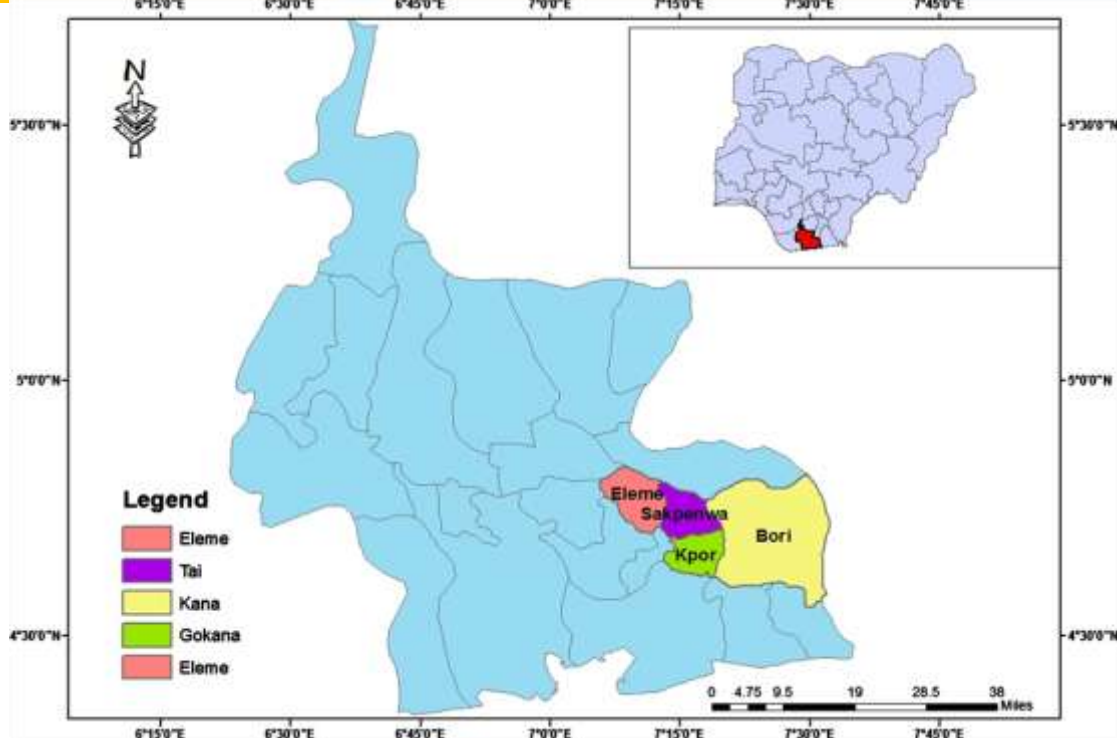
The region is divided administratively into four local government areas: Eleme, Gokana, Khana, and Tai. Traditionally the area is formed by six kingdoms (Babbe, Eleme, Gokana, Ken-Khana, Nyo-Khana and Tai) with His Majesty King Godwin N.K. Gininwa as the area's Paramount Ruler (UNEP, 2011). While to the outside world the communities of Ogoni land may appear similar, they have distinctive differences, including traditional institutional structures, languages and cultural features.

The Ogoni people are known as an agricultural and fishing society. They are also involved in active exploitation of timber and non-timber forest products. They cultivate the land for different types of food stuffs for consumption and sale. Because of the availability of rivers and creeks, they are fully involved in fishing activities most especially artisanal fishing which is carries out in the coastal wet land.

The vegetation of the Ogoni people comprise the fresh water mangrove swamp forest and the rain forest enriched with a variety of tree species and the most common being the Rhizophoral mangrove dominating the deposited mud (Needam. 2010).

II . LITERATURE REVIEW

Aside from the ultimate benefit of national economic development, petroleum exploration and production are known worldwide for their harmful environmental consequences; at the indigenous level, destruction of indigenous peoples' or peasants' lands, health related problems, loss of rainforest ecosystem, pollution of water sources, air and massive extinction of wild life and endangered species, depletion of wet land and aquatic habitats, and alteration of the socio cultural structure of host communities. (Aghalino, 2001, Bedejo and Nwilo, 2005). The above have been summed up by the findings of different researchers.

Akujuru (2014) observed that Nigeria's economy and its development, depends on the oil/gas industries which are the main economic activities dominating the Niger Delta region of Nigeria's landscape. He also noted that with the expansion of oil production, the incidence of oil spills has increased in the region, causing a severe environmental contamination, especially to the wetlands.

United States Environmental Protection Agency (2001) described oil spills as one incidence that endangers public health, imperil drinking water, devastate natural resources, and disrupt the environment.

It further highlighted that when oil is spilled into an aquatic environment, it can harm organisms that live on or around the water surface and those that live under water. Spilled oil can also damage parts of the food chain, including human food resources. More so, the severity of the impact of an oil spill depends on a variety of factors, including characteristics of the oil itself. Natural conditions, such as water temperature and weather, also influence the behaviour of oil in aquatic environments.

Oil production activities in the Niger Delta affect not just the use goods, but to a larger extent, the non-use goods such as wetland, clean air, water, wildlife, natural heritage sites, recreation sites, natural scenic views and a host of other goods that have direct positive impact on the life of the people. According to Obot, Antonio, Braide, Dore, Wicks, and Steiner (2006) oil spills/pollution has been a major source of damage to wetlands in the Niger Delta Region over the years. In their study, a total of 220 hectares were damaged by oil pollution in Bayelsa State, 105 hectares in Delta State and 202 hectares in Rivers State.

The sudden discharges of petroleum hydrocarbons in to the surrounding environment of the various host communities in the Niger Delta and indeed Ogoni land often expose human population of the affected areas to potential dangerous toxic substances capable of causing significant health effects (UNEP, 2011).

According to Amanyie (2005), the Ogoni's have suffered from significant environmental degradation and health impact including increase in respiratory diseases and cancer cases. The United Nations Environmental Programme (UNEP, 2011) opined that the health of several Ogoni's has been severely compromised as a result of surface and ground water contamination associated with petroleum exploration and production operations. UNEP (2011) further explained that there is the incidence of respiration disorder, skin diseases, resulting from bathing in polluted water and cancer has dramatically increased in the region.

According to Aniefiok et al, (2013), petroleum contamination has negatively impacted agricultural productivity and people who originally engaged in farming and fishing are facing loss of livelihood via contaminated land and water bodies.

Nwilo and Badejo (2008) observed that damages caused by oil spills to nature in riverine communities have normally been linked to damages to farm lands and vegetation, demise of aquatic lives and contamination of natural water sources. Oil exploration and production have over the years disastrously impacted the socio-physical environment of the petroleum producing communities.

Nwilo and Badejo (2005) further observed that Oil spillage has led to pollution of drinkable water, destruction of the ecosystem, death of marine fishes and animals in the Niger Delta. More so, the lack of strict compliance to existing environmental protection rules and regulations, with the inability of governmental and non-governmental agencies to enforce these laws has contributed to the pollution of the ecosystem of the Niger Delta.

Nwankwo N and Ifeadi C.N. (1998) observed that water produced with crude oil contains some chemicals injected to inhibit corrosion or enhance separation of oil from water. The disposal of produced water causes environmental pollution especially in freshwater environs. Industrial wastes like mineral, metals glass and plastic pollutes where they are dumped. Refinery wastes characteristically pollute water and air. Atmospheric contaminants include oxides of nitrogen, carbon and sulphur. Liquid refinery effluents contain oil and grease, phenol, cyanide, sulphide suspended solids, chromium and biological oxygen.

The main objective of the study was to highlight the impact of loss of water supply in Ogoniland as a result of oil exploration and production activities.

III.   METHODOLOGY

A case study design was adopted for this research. This research employed a positivist, quantitative approach to the development of its key research instrument (questionnaires). These questionnaires were developed and administered to household heads in the study area. Data were obtained through the use of questionnaires backed with interviews from respondents. The research adopted multi-staged simple random sampling from the local government level to the communities and to household heads. There were a total of about 831,726 inhabitants in Ogoni Land according to the 2006 National Census in four (4) Local Government Areas namely Gokana, Khana, Tai and Eleme. However, the study adopted the 1991 National Population Census report as the 2006 population report did not have a breakdown of population results by communities. The 1991 National Population Report with a population of 557,745persons was projected to 1,422,251 using the exponential growth model with a 3.4% annual growth rate (National Population Commission 2019). Eight (8) communities identified in the UNEP report with high level of water contamination in the study area were purposefully selected for sampling. The communities selected are Ogale (Eleme), Alode(Eleme), Korokoro (Tai), Bara –Ale (Tai), Mogbo (Gokana), Bodo (Gokana), Kwara (Khana) and Kpean (Khana).These eight (8) communities were purposefully selected from the study area. The simple sampling technique was employed to choose the respondents (household heads) from the eight (8) communities selected for the study. The total number of household from the 8 communities was determined to be 20,422 adopting a household size of 7 persons per household in the study area (National Population Commission 2019).Furthermore, to obtain the number of questionnaires to be administered in the selected communities in the study area, proportion of the questionnaires in each of the communities were determined from the number of households. Out of the 392 questionnaires sampled, 361 representing 92. 1%   of the questionnaires were validly answered and returned. The researchers sought to access the impact of loss of water supply in Ogoni land as a result of oil exploration and production.

IV.   RESULTS

Environmental consequences of Oil Spill in Ogoniland

Table 1.1

Consequences of Oil Spill	Frequency	Percentage
Contamination of Land	119	32.96
Contamination of Air Quality	69	19.11
Contamination of Water Supply	107	29.64
Loss of Biodiversity	35	9.70
Loss of Sources of Income	27	7.48
Others	4	1.11
Total	**361**	**100**

Source: Field Work, 2020

The table above revealed the response of respondents on the consequences of oil spill in the environment. 119 persons representing 32.96 of the respondents indicated that contamination of land is the most severe consequences of oil spill on the environment. 29.64% (107 persons) indicated Contamination and Pollution of water supply as there most preferred response to the question asked. Also, 19.11% and 9.70% responded that Contamination of Air quality and Loss of Biodiversity respectively are the major implications of oil spill within the study area. It was also observed that 7.48% of the respondents indicated Loss of income while 4 persons   (1.11%) indicated other reasons as the   major consequences of the spills in the environment.

Primary sources of water supply before the oil spills in Ogoni land?

Table 1.2

Primary Sources of Water Supply	Frequency	Percentage
Stream	119	32.96
Well	137	37.95
Borehole	86	23.82
Rain water	19	5.27
Total	**361**	**100**

Source: Field Work, 2020

The table shows the primary sources of water supply before the advent of oil spills in Ogoniland. It revealed that streams were the major sources of water supply before the advent of oil spills in the study area with a percentage of 32.96% while rain water was the least source of water supply. Also, Wells and Boreholes were also considered as sources of water supplies before the spills occurred. Streams and rain water were most preferred in the study area as there was no financial implication involve in harvesting and utilising these sources hence the local were more disposed to these sources.

Primary sources of water supply after the occurrence of oil spills in Ogoniland?
Table 1.3

Primary Sources of Water Supply	Frequency	Percentage
Stream	14	3.88
Well	64	17.73
Borehole	246	68.14
Rain water	37	10.25
Total	**361**	**100**

Source: Field Work, 2020

The table above shows the sources of water after before the advent of oil spills in the study area. It revealed that Boreholes were the most preferred sources of water supply in the study area with a percentage of 68.14% while streams were the least source of water supply. These were due to the fact that other sources of water supply previously exposed to the local had witness considerable exposure to the oil spills hence are contaminated.

Household Monthly Water Consumption
Table 1.4

Number of Litres	Frequency	Percentage
Less than 2000 litres	26	7.20
2000 – 4000 litres	64	17.73
4000- 6000 litres	53	14.68
6000 – 8000 litres	106	29.36
8000 – 10000 litres	68	18.84
10000 litres and above	44	12.19
Total	**361**	**100**

Source: Field Work, 2020

Table above show the amount of water that a household consume monthly within the study area. It revealed that about 7.20 % of household consumes less than 2000 litres of water monthly while 12.19% consumes more than 10,000 litres of water monthly. According to World Health Organisation 2010, a person needs about 50 to 100 litres of water per day to ensure that most basic needs are met. It further shows that 17.71% consumes between 2,000 and 4,000 litres monthly while 14.68% consumes between 4,000 and 6,000 litres of water monthly. Also, 29.36% consumes between 6,000 and 8,000 litres monthly while 18.84% consumes between 8,000 and 10,000 litres of water monthly.

Household monthly water consumption after the oil spills
Table 1.5

Number of Litres	Frequency	Percentage
Less than 2000 litres	109	30.19
2000 – 4000 litres	66	18.28
4000- 6000 litres	76	21.05
6000 – 8000 litres	58	16.07
8000 – 10000 litres	24	6.66
10000 litres and above	28	7.75
Total	**361**	**100**

Source: Field Work, 2020

Table 4.14 show the amount of water that a household consume monthly within the study area after the oil spills. Analysis of the data revealed that about 30.19 % of the households consume less than 2000 litres of water monthly while 7.75% consumes more than 10,000 litres of water monthly. It further shows that 18.28% consumes between 2,000 and 4,000 litres monthly while 21.05% consumes between 4,000 and 6,000 litres of water monthly. Also, 16.07% consumes between 6,000 and 8,000 litres monthly while 6.66% consumes between 8,000 and 10,000 litres of water monthly.

Household monthly water consumption after the oil spills

Table 1.6

Number of Litres	Frequency	Percentage
Less than 2000 litres	109	30.19
2000 – 4000 litres	66	18.28
4000- 6000 litres	76	21.05
6000 – 8000 litres	58	16.07
8000 – 10000 litres	24	6.66
10000 litres and above	28	7.75
Total	**361**	**100**

Source: Field Work, 2020

Table 4.15 show the amount of water that a household consume monthly within the study area after the oil spills. Analysis of the data revealed that about 30.19 % of the households consume less than 2000 litres of water monthly while 7.75% consumes more than 10,000 litres of water monthly. It further shows that 18.28% consumes between 2,000 and 4,000 litres monthly while 21.05% consumes between 4,000 and 6,000 litres of water monthly. Also, 16.07% consumes between 6,000 and 8,000 litres monthly while 6.66% consumes between 8,000 and 10,000 litres of water monthly. The observation from the table reveals that there is a reduction in the average volume of water consumed by household in the study area. Interview from household heads confirms this observation as they revealed that because of the contamination of the streams and the poisonous nature rain water after the spills, they are constrained into exploring other source for water which comes with financial implication attached to it

Monthly water expenditures before and after the oil spills
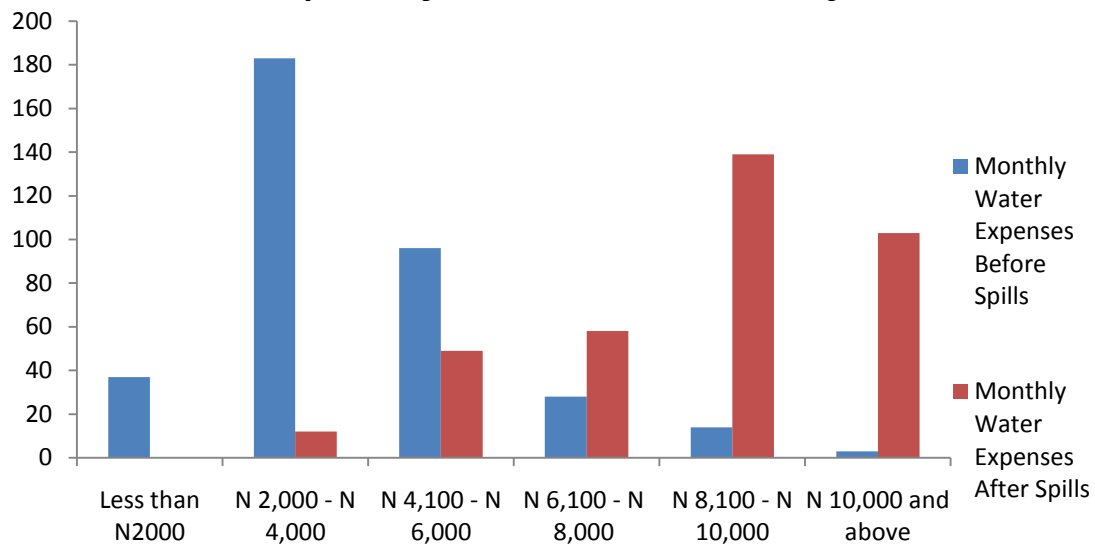

Chart above reveals the amount expended on water before and after the oil spill in Ogoniland. From the chart above, 37 respondents spent less than N-2,000 while 183 respondents spent between N-2,000 and N-4,000 before the spills. However, none of the respondents admitted to have spent less than N2000 monthly since the occurrence of the spills. It further shows that 96 respondents spent between N-4,000and N-6,000 while 28 persons spent between N-6,000and N-8,000 all before the oil spills incidences. 14 of the respondents indicated that they spent between N-8,000 and N-10,000 while 3 persons responded that they spend above N-10,000 monthly on water. 12 of the respondents spend between N2,000 and N-4,000 while 49 respondents spend between N4,100 and N-6,000 after the oil spills. It further shows that 58 persons spend between N6,100 and

₦8,000 while 139 respondents spend between ₦8,100and ₦10,000. 103 of the respondents indicated that they spend above ₦10,000 monthly on water since after the spills.

V.   DISCUSSION

Impact of Loss of Water Supply in Ogoni Land
5.1 Increase in the Cost of Accessing Water
The study reveals an increase in the average cost of accessing water before the oil spills and after the spills. This was because the streams, rain water and other natural sources of water supply in the study area which hitherto afforded the locals access to water at no cost were severely impacted by the oil exploration activities. Streams and rainwater harvesting within the study area which provided water for consumption and other domestic uses also reduced water bill and lessen the manpower required to walk the distance to get water from other sources. However, because of the level of contamination in the study area and the frequent gas flaring in its environment, the locals are not totally enthusiastic towards harvesting rainwater and streams as they are revealed to contain acid rains and hydrocarbon particles respectively (UNEP,2011)

The pollution of the traditional sources of water supply known to the Ogoni people necessitated individuals to invest in the construction of boreholes and other sources of water with profit motives. These boreholes are constructed and water is sold to members of the communities. It cost an average of ₦300,000 (625USD) to construct a borehole within the study area and not many household can afford this sum comfortable.

The study also observed that besides having to pay to access water in most cases, women and children walk very long distance to access water, therefore wasting valuable man-hours and strength.

5.2 Reduction in the general usage of water
 The study identified a reduction in the volume of water households consume monthly in the study area. Analysis revealed that only 7.75% of the study population consumes 10,000 litres and above after the oil spill while 30.19% uses less than 2,000 litres of water monthly. The World Health Organisation (2010), advises that an average person needs about 50 to 100 litres of water per day to ensure that most basic needs are met, however, the study observed that water consumption in the study area falls far below the World Health Organisation advisory and may have severe health implications.

The study revealed that because of the contamination of the streams and the poisonous nature rain water after the spills, they are constrained into exploring other source for water which comes with financial implication attached to it because of their financial status.

5.3 Shortage of Food and Loss of Sources of Income

Plate 1.1 Dugout canoe used for fishing sinking into the oily mud, Bodo City (Field Survey 2020)

Farming and Fishing are the most predominant occupation of the people of Ogoni land. One fallout of the contamination of water supply sources including streams and rivers is the destruction of traditional economic support system of fishing and farming. The combination of the effect of oil spill and acid rain resulting from gas flaring has been soil degradation which affects soil yield and harvest. Due to the prevailing widespread pollution of underground water, agricultural lands have been severely impacted causing a reduction in the quantity of harvest and returns from harvest. In addition, because of the direct contact with plants, or indirect contact via the absorption of nutrients from contaminated soils and water bodies, the quality of food has been severely impacted.

The ultimate result of this is the poor crop yield as the soil has been rendered infertile due to absorption of acid rain and poor fish catch as a result of spills. Most fish have been driven into deep waters and the community fishermen do not have the fishing gadgets to do into deep-sea fishing. The whole impact of this is food shortage and which has affected the ability of most of the families in the study area to feed themselves.

Other losses suffered by the communities in the study areas includes contamination of fish ponds and fishing channels, contamination of the mangrove forest resulting in the loss of mangrove and other economic trees, non-timber forest resources like crabs, periwinkles, crayfish and other seafoods usually gathered freely from the mangrove vegetation, and contamination of water sources and fishing gear.

5.4   Increase in Health Bills as a Result of Consumption of Contamination Water
Diseases such as respiratory problems, skin ailments such as rash and dermatitis, eye problems, gastro-intestinal disorders, water borne diseases and nutritional problems associated with consumption of contaminated water are prevalent in the study area and gulp a sizeable amount on their expenses. The usage of these contaminated water sources has led to water-borne diseases such as typhoid fever, cholera, etc

According to The UNEP report, water samples collected from the sea, river, bore holes, in Ogoni Land revealed that more than 70% of the water in the region contains a chemical called Benzo () pyrene, with a high concentration of 0.54 to 4ug per litre, far above the World Health Organisation (WHO) recommendation of 0.7ug/1 for drinking water.

The report further asserted that if the level of the harmful chemicals could be this high in ordinary water, the sediments which fish and other aquatic creatures feed on are definitely higher in Benzo () pyrene concentration, and the people dependent on these marine creatures for food, automatically take in much more higher level of the cancerous chemical.

Unfortunately, though women and children living in the study area are aware of the contamination, they often have little or no access to alternative sources of water and thus use the contaminated river water regardless.

VI.   CONCLUSION

Although Nigeria is among the most productive and successful oil producing countries in the world, and the commodity provides the main sources of her foreign exchange, its exploration, production, distribution and marketing have been the major cause of environmental damages in the host communities within the Niger Delta region. These impacts in Ogoni Land has had local detrimental effects and considerable imprint on the ambient quality of air, soils and sediments surface and ground water marine environment, bio-diversity and sustainability of both the marine and the terrestrial ecosystems. The study revealed that the loss of water supply sources in Ogoni Land has led to increase in cost of accessing water by the locals, reduction in the general use of water, increase in health bills as a result of consumption of contamination water, shortage of food and loss of sources of income. The study recommends more proactive steps be initiated to clean the impacted sites affected by the oil spills while comprehensive groundwater monitoring be carried to ascertain the present state of the groundwater as clean up exercise continues. Furthermore, governments should provide an easily accessible water supply scheme to provide sufficient safe water to meet community needs while frequent medical outreaches is recommended by government and its agencies to attend to the health issues arising from the consumption of contamination water.

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