

The Effects of Oil Spillage on Aquatic Environment in Ilaje Community, Nigeria

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Abstract: Nigeria is an oil producing nation with greater percentage of her foreign earning generated from oil exploration and exploitation. The effects of oil exploitation and exploration on the communities along the coastal area, creeks and mangrove cannot be undermined. The consequences of environmental degradation and ecological problems due to oil companies' activities have led to massive unemployment, joblessness, health hazard, increasing death rate and incessant communal clashes. The compensations paid by the oil companies and government are not sufficient enough to sustain the means of livelihood of the affected people in the long run. The objective of this research is to carry out a preliminary investigation into the problems of oil spillage in the oil producing communities in Nigeria with a view to finding a lasting solution to the perennial problem. This task would be achieved partly through the use of questionnaires to sample the opinions of the people in some of the communities in Ilaje local government area of Ondo State. The empirical data collected during the exercise would be analyzed to determine the prospect of the proposed research work.

Key-Words: oil exploration, and exploitation, environmental degradation, ecological problems and health hazard

1. Introduction

Crude oil spills in marine environment have gone exponential due to deep sea dredging and crude oil transportations by petroleum industries across the globe. The spilled constituents have chronic tendencies of causing extensive alteration of the ecosystem of marine organisms from the smallest plankton to the largest whale. Oil spill has the tendency of spreading through the entirely affected ocean creating untoward havoc to the aquatic organisms. In the marine, it breaks into many different chemical and physical components that floats on the surface of water, suspends in the column or sinks to the bottom of ocean. The resultant effects are enormous which include toxicity of sea bed, killing and displacement of aquatic animals, stunt growth, etc. [1]. Crude oils are basically categorized as paraffins, naphthenes, aromatics depending on their hydrocarbon chain. They could also be classified as Paraffin base or asphalt base depending on residue fraction of

the crude oil. The physical and chemical characteristics of crude oils determine their hazardous impacts on the environment. The physical characteristics include density, specific gravity, viscosity, pour point, surface tension, flash point and emulsibility. The chemical characteristics are boiling points, relative solubility and aromatic content [2]. The first large oil spill occurred in March 18, 1967, when Torrey Cornwall, spilled 81,000 tons {919,000 barrels} of crude oil in United Kingdom (UK). The second fatal event occurred in 1970 in Sweden when 438,000 barrel of crude oil was spilled into Tralhavet Bay after a collision involving the Othello [3]. Since then, accidental discharge of crude oil into the sea has been on increase. Initially, occurrences of oil spillage were at the average of one per year since the 1967 episode until 1993 when five large oil spills occurred across American and Europe. After 1993, the situation went up sporadically with several cases of sea and land pollutions due to shipping, leakages due to corrosion and vandalism [3]. In

the year 2000, about twenty four (24) cases of large crude oil spillages were recorded around the world including South Africa when a bulk carrier called Treasure carrying about 1,400 tonnes of oil sank off the coast of Cape Town [3]. Crude oil spillage came to focus in Nigeria in January 12, 1998 when 40,000 barrels of crude oil from a ruptured pipeline at Mobil terminals polluted the rivers and water ways causing serious ecological damages and environmental hazard to the humans and aquatic organisms in Ogbudu, River state [4]. Another major oil spill in Niger Delta area was recorded on May 26, 1999 at Gana settlement of Urhobo ethnic nationality in Ughelli-North Local Government Area of Delta State. The area hosts Shell's famous Eriemu oil field which consists of 20 oil wells, pipeline network facilities/ installations and the multibillion dollars Nigerian National Petroleum Corporation's (NNPC's) Gas project. The traumatized situation affected some of the communities in area. They include Opherin, Owevwe and Onah communities in Ughelli North LGA ; Iyede and Emevor communities in Isoko North LGA [5].

Similarly, on 23rd December, 1999, Nigerian National Petroleum Corporation's (NNPC's) pipelines transporting premium motor spirit (PMS) from Warri in the Delta to Kaduna, Spewed Premium Motor Spirit around Adeje Town, in Warri South Local Government Area of Delta State destroying the surrounding vegetation, nearby streams and creeks which the natives depend on for fishing, drinking etc. [5].

Furthermore, on Sunday, 26th July, 1998, the entire stretch of the river, canals and streams in all the communities in Ilaje area of Ondo State were covered with oil slick due to the Chevron's deep water exploration activities in the Atlantic Ocean along the axis [5]. It was also on record that large volume of crude oil erupted in the same area on 8th May, 2002, from Chevron's Well A and B located between Ojumole and Ikorigho communities in Ilaje, Ondo State [6].

Ilaje local government in Ondo state is one of the oil producing areas in Nigeria. The area is located in the southern

part of Ondo state and it has a vast stretch of coastal line of about 180km long. It is bounded in the in the north by Okitipupa local government; the Atlantic ocean in the south; ijebu waterside local government in Ogun state in the west; and Delta state in the east (Olujimi and Emmanuel, 2011). Oil exploitation and exploration began in the area in 1977 and, as at then, the exploitation activities were dominated by Gulf oil Company, presently known as Chevron. As at 2005, many oil companies and oil servicing companies have spread across the region with vast installations and exploration activities. Some of the oil companies in the reverine areas include Chevron-Texaco Nigeria ltd; Shell petroleum Development Companies; Cronicle, Express Petroleum and Gas Company / Conoco Energy Nigeria limited, Consolidated Oil and Allied Energy [7]. Also included are Agip Oil Nigeria Limited, Oil and Industrial Services Limited, Global Pipeline [8]. The effect of oil exploration and exploitation in communities in Ilaje depends on prevalence of oil exploration activities. Some of the communities with oil installations and wells in Ilaje are listed underneath their respective kingdoms.

Table 1a Oil producing communities in Ilaje

S/NO	Kingdoms			
	Ugbo	Mahin	Aheri	Etikan
1	Awoye	Mahin		
2	Ojumole	Mahin 1		
3	Odofado	Mahin II		
4	Molutehin			
5	Bela			
6	Opuekeba			
7	Isekelewu			
8	Jiringho			
9	Ikorigho			
10	Odonla			
11	Ago			
12	Parabe			

Source: OSOPADEC, Ondo State

The level of destruction was determined by applying equation (2) to the numerical equivalent of the respondents' answers. The outcome is depicted in table 1b and the graphical representation is indicated in figure 1b. The analysis shows that Ugbo kingdom is mostly affected with 41.4% level of destruction, while, Mahin kingdom has 32.6% as the estimated level of destruction. Aheri kingdom is the least with 27.7 %. The two majorly affected kingdoms play host to majority of oil exploration activities in the axis .In Etikan kingdom, the blank space shows uncertainty or indirect impact of oil spillage on the communities in the kingdom. This further corroborates the fact obtained from OSOPADEC that Aheri and Etikan are not yet being prospected by oil companies.

Table 1b Level of destruction by oil spillage in Ilaje

S/N	$\bar{x} = \sum \frac{x_i}{n}$	$\frac{\bar{x}}{T} \times 100 \%$
Aheri	522	27.7
Ugbo	823.75	41.3
Etikan	Uncertain	-
Mahin	650	32.6
	1995.75	100

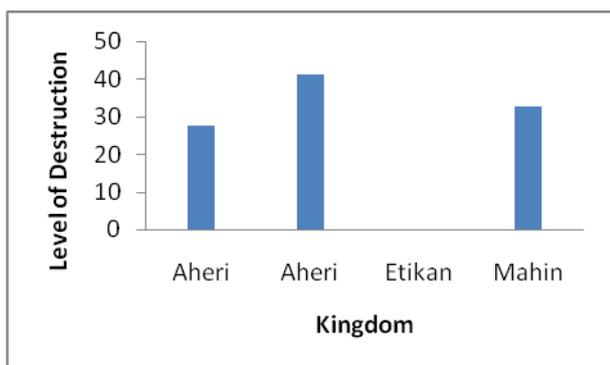


Figure 1b Approximated average volume spread in Ilaje local government area, Ondo State

3.2 Companies responsible for the oil spillages

It is clearly shown in the graphical analysis in figure 2 that Chevron is seemly the majorly responsible for greater percentage of oil spillage in ilaje, and the trauma is largely felt

in Ugbo kingdom with 46.2% aggregate estimated exploration activities of oil companies in the axis. The reason is not far fetch because Ugbo kingdom plays host to majority of the oil giants such as Chevron, Shell, and Mobil. The aggregate effects of pollutions from the oil companies are responsible for the worst situation in the axis. Mahin kingdom is also affected by the hazardous impact of oil spillage with an estimated value of 42.2% aggregate estimated oil exploration activities. Aheri and Etikan kingdoms are least affected by oil spillage because of the same reason earlier mentioned.

Table 2 Aggregate pollutions by oil companies

	Chevron (%)	Shell (%)	Mobil (%)	Agip (%)	Aggt. Pollution (%)
Aheri	3.8	0	0	0	3.8
Ugbo	15.4	15.4	15.4	0	46.2
Etikan	0	0	7.7	0	7.7
Mahin	34.6	0	3.8	3.8	42.2
	53.8	15.4	26.9	3.8	

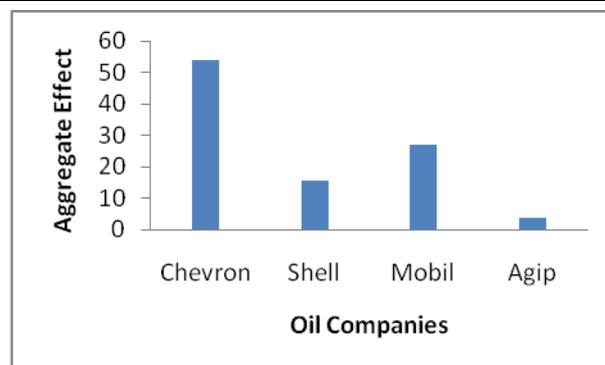


Figure 2 Rate of pollution by oil companies

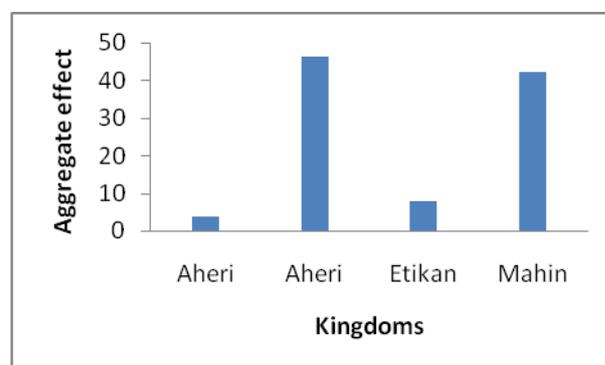


Figure 3 Aggregate effects of oil exploration and exploitation in the Ugbo kingdoms

3.3 Extent of pollution

The aggregate effects of oil spillage on the economic activities across ilaje are shown in figures 4 and 5. These, perhaps, are indication of the rate of unemployment and economic hardship caused by oil exploration. It is also a pointer to the fact that 41.1% of the sea are polluted and 23.5% of the land are affected, mostly those along the shoreline. The population of the fishes has been reduced to 17.6% because majority of the fishes had migrated to far places where hydrocarbon toxicity is minimal and resistible. The aggregate effects of the oil spillage are largely felt in Ugbo kingdom as indicated in figure 5. It is also seriously felt in Mahin kingdom. It could be adduced that the rate of unemployment and economic hardship in Ugbo kingdom is higher than any exploration site in Ilaje, Ondo State. Non indication of any response in Aheri and Etikan kingdoms does not mean that they are total insulated from the menaces of oil spillage. It is only an indication that the areas are yet to be exploited by oil companies.

Table 3 Aggregate economic damage in Ilaje, Ondo state

S/N	SP (%)	LP (%)	DM (%)	KF (%)	KA (%)	DF (%)	AED (%)
Aheri	0	0	0	0	0	0	0
Ugbo	23.5	17.5	5.9	11.9	0	5.9	64.6
Etikan	0	0	0	0	0	0	0
Mahin	17.6	5.9	0	5.9	5.9	0	35.3
	41.1	23.5	5.9	17.6	5.9	5.9	

Meaning of abbreviations in table 3.

SP = Sea Pollution

LP = Land Pollution

DM = Destruction of Materials

KF = Killing of Fishes

KA = Killings of Animals

DF = Damage of Farmland

AED = Aggregate Economic Damage

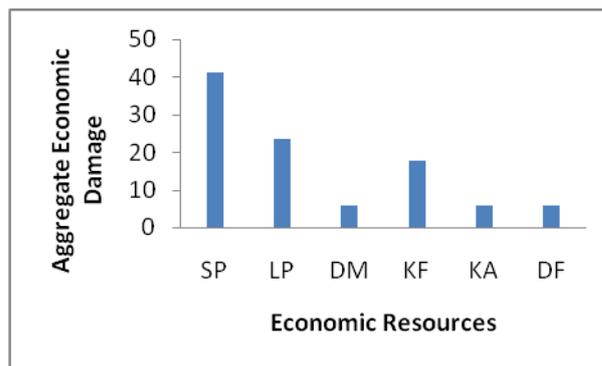


Figure 4 Graphical representation of extent of oil spillage

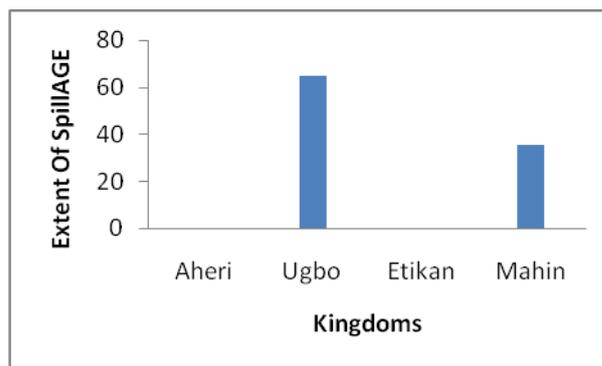


Figure 5 Extent of oil spillage

Table 4 Mean value for frequency of pollution

S/N	Mean value of yearly spillage $\left[\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \right]$	Rate of frequency (%)
Aheri	1.00	23.6
Ugbo	1.83	43.3
Etikan	0	0
Mahin	1.40	33.1
	4.23	100

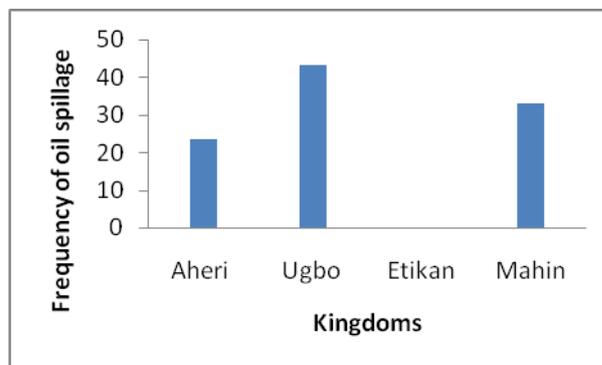


Figure 6 Yearly Frequency of pollution

3.4 Frequency of oil spillage

It is apparent that oil spillage is not a common phenomenon in ilaje local government area but the lingering effects and hazardous impacts cannot be undermined. In effect, table 4 and figure 6 show that the arithmetic mean or mean value for yearly frequency of oil spillage in each kingdom falls within an interval of 1-2 years. The yearly frequency of oil spillage is 43.3% in Ugbo kingdom which is higher than Mahin kingdom which was estimated as 33.1%. It is lower in Aheri kingdom and uncertain in Etikan kingdom. These could be attributed to indirect impact of oil spillage.

3.5 Causes of oil spillage

There are several causes of oil spillage in ilaje local government area as indicated in figure 7 and 8 but the major cause of oil spillage in ilaje local government area is oil exploration. This shows that oil exploration has the tendency of aggregate estimated value of 36.3% [or probability of 0.363] of causing sea pollution in the axis. Pipeline leakages contribute 18.3% of oil spillage in the axis. Oil companies' negligence and poor maintenance are other key factors adding large quantities of hydrocarbon to the sea. The hydrocarbon quantity in this respect is estimated as 13.5 % while other rare cases such as pipeline explosion, waste from oil companies and pipeline vandalism are 4.5% by volume respectively.

The total volume spill of hydrocarbon is 36.2% in Ugbo kingdom. This is due to high exploration activities of oil companies in the axis and high propensity of oil spillage during transition. Mahin kingdom has 27.1% volume of hydrocarbon input into the sea, most of which are due to pipeline vandalisms and oil explorations. The rate of sea pollution is less effective in Aheri and Etikan kingdoms and the estimated volume of hydrocarbon input are 9 and 9.1% respectively. This is due to non commencement of oil exploration activities in the areas.

3.6 Government intervention

The aggregate effect of government intervention to oil spillage in ilaje local government as indicated in figure 9 show that government does not usually intervene immediately

to rescue the victims of oil spillage in ilaje. This is indicated by 52.3% rarely intervention against 48.6% non frequent intervention. In addition, low frequency of government intervention to oil spillage cases indicates high level of

Table 5 Aggregate causes of oil spillage in Ilaje, Ondo State

S/N	PE	CP	PL	PVU	OE	WC	AE
Aheri	0	4.5	0	4.5	0	0	0
Ugbo	4.5	4.5	13.6	0	13.6	0	36.2
Etikan	0	0	0	0	9.1	0	9.1
Mahin	0	4.5	4.5	0	13.6	4.5	27.1
	4.5	13.5	18.1	4.5	36.3	4.5	

Meaning of abbreviations in table 5.

- PE = Pipeline Explosion
- CP = Company's Negligence or Poor Maintenance
- PL = Pipe Leakages
- PVU = Pipe Vandalism or Unemployment
- OE = Oil Exploration
- WC = Waste from Oil Companies
- AE = Aggregate Effect

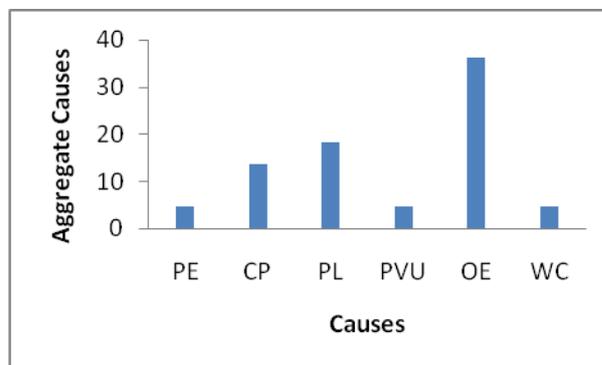


Figure 7 Aggregate causes of oil spillage in Ilaje community

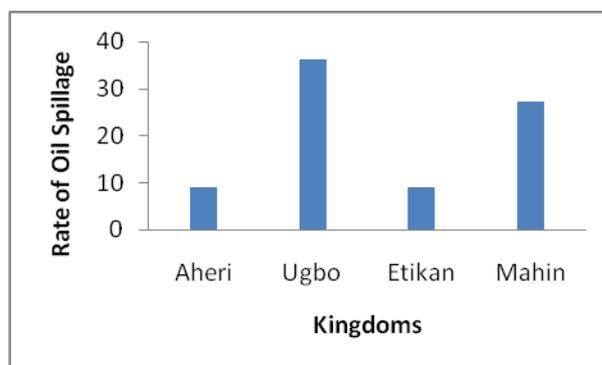


Figure 8 Rate of oil spillage in Ilaje, Ondo state

government negligence to the hardship undergoing by the oil producing communities in ilaje local government. In figure 10, Ugbo kingdom where majority of oil companies are situated, the level of government intervention does not commensurate with the impact of oil spillage. Similarly, in Mahin kingdom, it was below expectation. In Etikan and Aheri, the situations are much lower.

3.7 Companies' interventions

The aggregate interventions of oil companies to oil spillage in

Table 6 Aggregate interventions of government to oil spillage

S/N	Rare (%)	Not frequent (%)	Frequent (%)
Aheri	9.5	4.8	0
Ugbo	19.0	19.0	0
Etikan	0	9.5	0
Mahin	23.8	14.3	0
	52.3	47.6	0

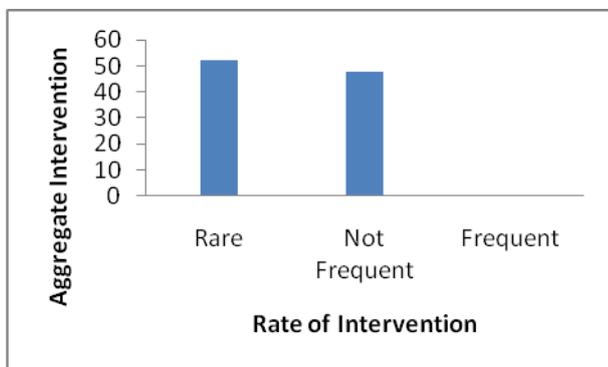


Figure 9 Aggregate interventions of government to oil spillage

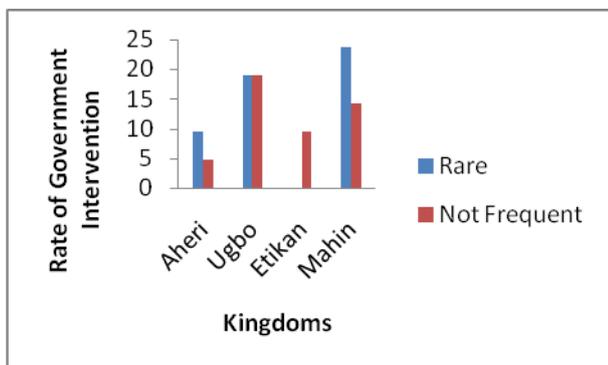


Figure 10 Government interventions to oil spillage

ilaje local government area are generally poor. This is indicated by 33.3% non frequent intervention in figure 11 against 66.6 % rarely response by oil companies. In figure 12, the wide disparities in comparative graphical analysis are indications that interventions from oil companies are very difficult to achieve. Also, in Ugbo and Mahin kingdoms where oil exploration activities of the oil companies are very high, the oil companies' interventions to impact of oil spillage on hosting communities are far below expectation. Aheri and Etikan kingdoms are less affected because the areas are yet to be prospected.

3.8 Sources of drinking water

In figure 13, it is apparent that the major sources of water readily available to people in the oil communities are sea, river, and canal and creek water. These represent 30.3% by volume of the water needed for daily usage. The next available source of water is buying of water which stands at

Table 7 Aggregate interventions of oil companies in ilaje local government area

S/N	Rare (%)	Not frequent (%)	Frequent (%)
Aheri	14.3	0	0
Ugbo	28.6	4.8	0
Etikan	0	9.5	0
Mahin	23.8	19.0	0
	66.7	33.3	0

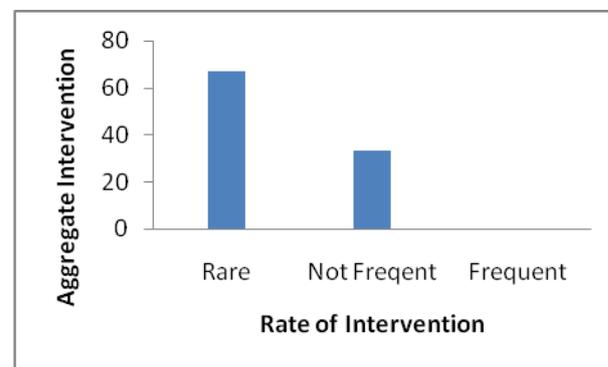


Figure 11 Aggregate interventions of oil companies in ilaje local government area

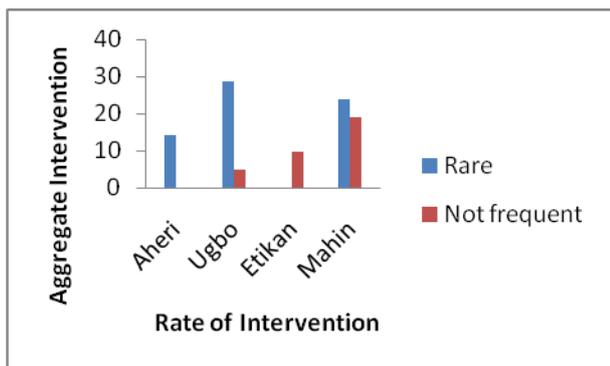


Figure 12 Oil companies' interventions to oil spillage

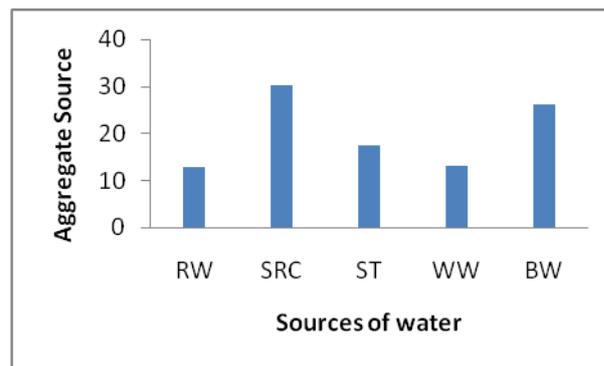


Figure 13 Aggregate sources of drinking water in Ilaje local government area

Table 8 Aggregate sources of drinking water in Ilaje local government area

S/N	RW (%)	SRC (%)	ST (%)	WW (%)	BW (%)	ASDW (%)
Aheri	4.3	4.3	0	0	0	8.3
Ugbo	4.3	4.3	8.7	0	4.3	21.6
Etikan	0	0	0	8.7	0	8.7
Mahin	4.3	21.7	8.7	4.3	21.7	60.7
	12.9	30.3	17.4	13.0	26.0	

Meaning of abbreviations in table 8.

RW = Rainy Water

SRC = Sea, River, Canal and Creek

ST = Stream

WW = Well Water

BW = Buying of Water

ASDW = Aggregate Sources of Drinking Water

26% by volume for daily usage. Water from the stream supplies 17.4% by volume while well and rainy water are 13 and 12.9 % by volume respectively. In figure 14, the aggregate accessibility to sources of drinking water in Ugbo kingdom is estimated as 21.6%. While, Mahin kingdom has 60.7% accessibility to different sources of drinking water due to its geographical advantages. In Etikan and Aheri kingdoms, the sources of drinking water are minimal because of relatively low pollution of surface and underground water. In Etikan, well water is still serving as one of the major sources of drinking water.

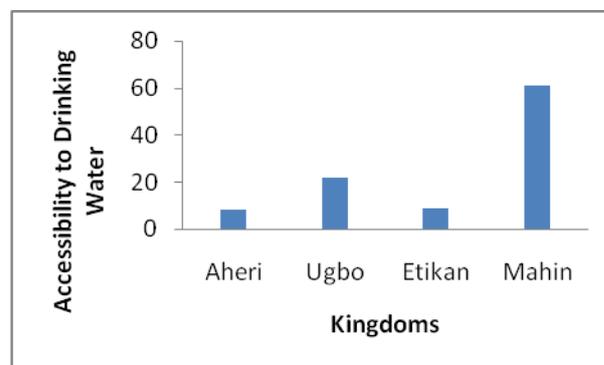


Figure 14 Sources of drinking water in Ilaje local government area

3.9 Health hazard

The major health problems frequent among the entire people of ilaje in the riverine area of Ondo state are diarrhea, cholera, malaria, vomiting, and fever. These sicknesses are estimated to exhibit 72.5% rate of occurrence among the people as indicated in fig. 3.15. Other sicknesses such as cough, asthma, rheumatism, skin diseases, cancer and eye blindness are less than 10% rate of occurrences. The aggregate effects of the health problem in Ilaje are highly felt in Mahin kingdom as indicated in figure 16. This represents 45% estimated value above Ugbo Kingdom which stands at 30%. This is evident by the fact that Mahin kingdom is exposed to water borne diseases due to their much reliance on underground water which in most cases may be contaminated. Unlike Ugbo Kingdom, underground water is not one of the sources of drinking water therefore they are more insulated from water

borne diseases than Mahin kingdom. (See table 8). In Aheri and Etikan Kingdoms, the health problems are minimal because of less contamination due to non existence of oil exploration activities in the areas.

3.10 Extent of water contamination

The aggregate effects of water contamination in ilaje local government area are indicated in figure 17. These show that an estimated volume of 68.4% of both surface and underground water are contaminated. This represents the section of ilaje where accessibility to drinking water is extremely difficult. Most of these areas lie along the coastal line where oil exploration activities and uncontrollable introduction of hydrocarbon into the sea are enormous. Also, an estimated volume of 21.1% of the geographical landscape of Ilaje has polluted surface water and drinkable underground water, while 10.6% of the landscape has polluted underground water and drinkable surface water. The aggregate effects of water contamination are very highly in Mahin kingdom which represent 47.4% estimated value as indicated in figure 18.

In Ugbo Kingdom, the estimated level of contamination is 31.7% inspite of heavy exploration activities in the area. In Aheri and Etikan kingdoms, the effect of water contamination is estimated to be 10.5% which is very low due to non-commencement of oil exploration activities in the areas.

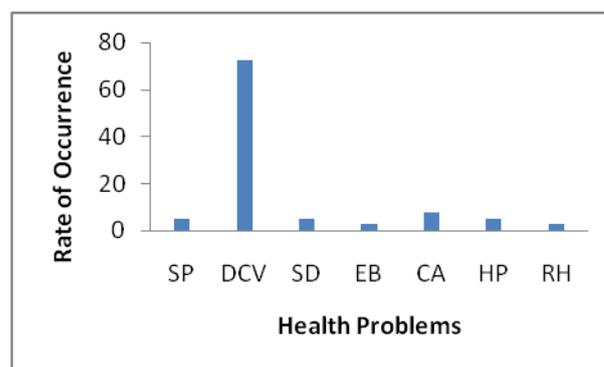


Figure 15 Estimated rate of occurrence of health problems in ilaje local government area

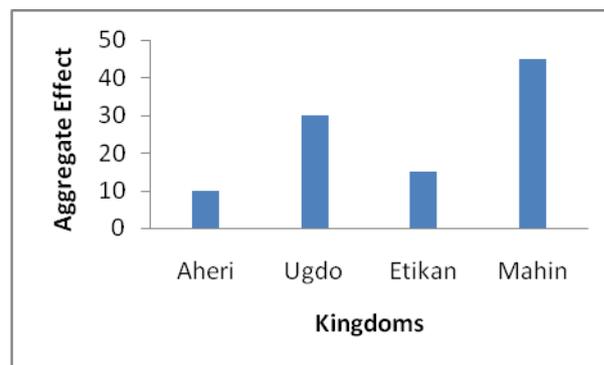


Figure 16 Aggregate effect of health problem in Ilaje local government area

Table 9 Aggregate effect of health hazard

S/N	SP (%)	DCV (%)	SD (%)	EB (%)	CA (%)	HP (%)	RH (%)	AE (%)
Aheri	0	7.5	2.5	0	0	0	0	10
Ugbo	0	20	2.5	2.5	0	5	0	30
Etikan	0	15	0	0	0	0	0	15
Mahin	5	30	0	0	7.5	0	2.5	45
RO	5	72.5	5	2.5	7.5	5	2.5	

Meaning of Abbreviations in table 9.

SP = Stomach Pains

DCV = Diarrhea, Cholera, Vomiting, Malaria and Fever

SD = Skin Disease and Cancer

EB = Eye Blindness

CA = Cough and Asthma

HP = Heart Problem and Hypertension

RH = Rheumatism

AE = Aggregate Effect

RO = Rate of Occurrence

Table 10 Aggregate level of water contamination

	Surface Water	Underground water	Both	Aggt. Effect
Aheri	0	0	10.5	10.5
Ugbo	5.3	5.3	21.1	31.7
Etikan	10.5	0	0	10.5
Mahin	5.3	5.3	36.8	47.4
	21.1	10.6	68.4	

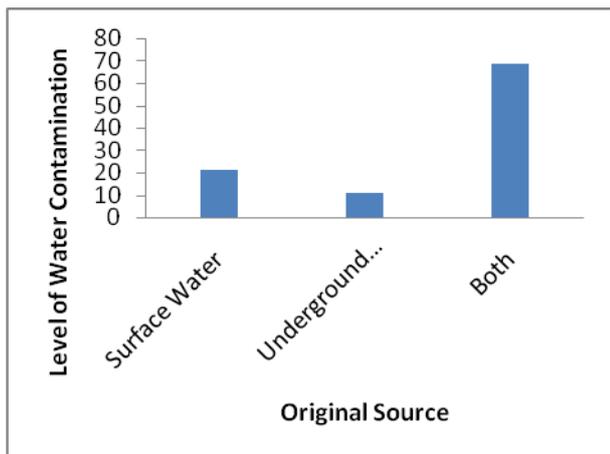


Figure 17 Aggregate level of water contamination

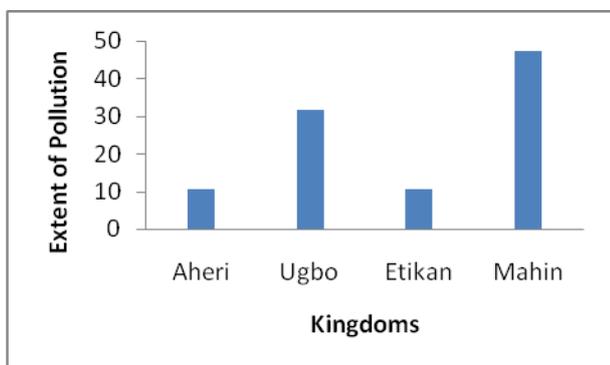


Figure 18 Extent of water contamination

4. Conclusion

The effects of oil spillage were thoroughly examined using critical elements which are relevant to socio – economic impact, health hazard, welfare and wellbeing of the people. These, to a large extent, confirmed the enormity of the hazardous impacts of hydrocarbon contamination on marine lives and inhabitants of the affected areas. This is largely due to hydrocarbon toxicity which polluted sea surface and underground water thereby constituting health hazard for marine animals and human beings. The ecological effects include physical contamination of habitants, distorted growth, toxicity, increase in mortality rate and destruction or modification of the entire ecosystem. The socio-economic impacts of oil spillage are enormous, particularly, on the well being of the inhabitants of the affected communities. These include destruction of means of livelihood, pollution of surface and underground water making drinking water

extremely difficult to come by, destruction of economic trees, vegetations and forests along the water ways and shorelines. In effect, the well-being and livelihood of individuals are greatly hampered. These include health hazards (such as diarrhea, cholera, cancer, blindness, heart attack etc.), displacement, famine, joblessness, restiveness, poverty and distortion of cultural norms and values. The implications of the economic hardship on oil communities are adversely manifesting as confrontation or restiveness between the oil producing communities and government in Nigeria as well as oil pipeline vandalism, indiscriminate attack, killing and kidnapping of oil workers.

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