ASSESSMENT OF THE CONSEQUENCES OF OIL PIPELINE RUPTURE WITHIN HAYIN MAHAUTA COMMUNITY IN GIWA LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, IN PARTIAL FULFULLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN DISASTER RISK MANAGEMENT AND DEVELOPMENT STUDIES

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DECLARATION

I hereby declare that the work in this dissertation entitle ASSESSMENT OF THE CONSEQUENCES OF OIL PIPELINE RUPTURE WITHIN HAYIN MAHAUTA COMMUNITY IN GIWA LOCAL GOVERNMENT AREA OF KADUNA STATE**,** NIGERIA has been carried out by me in the Centre for Disaster Risks Management and Development Studies Department of Geography and Environmental Management under the supervision of Dr. E. Agubamah and Prof. A.A. Hudu the information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any other Institution.

Abdul Abdulkarim	_____	_____
Name of Student	Signature	Date

CERTIFICATION

This Dissertation titled **ASSESSMENT OF THE CONSEQUENCES OF OIL PIPELINE RUP TURE WITHIN HAYIN MAHAUTA COMMUNITY IN GIWA LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA** by ABDUL ABDULKARIM meets the regulations governing the award of the degree of Masters of Science in Disaster Management of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

Dr. E. Agubamah Chairman, Supervisor Committee	Signature	Date
PROF.A.A. Hudu Member, Supervisory Committee.	Signature	Date
Dr. S. Abbass Head of Depatment	Signature	Date
Dr. A.K. Kibon Director (CDRMDS)	Signature	Date
Prof. S. A. Abdullahi Dean School of Postgraduate Studies	Signature	Date

DEDICATION

I humbly dedicated this work to God Almighty, the source and the giver of all knowledge, also to my lovely family for their financial support, encouragement and prayers throughout the time of studies.

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ABSTRACT

Pipeline ruptures/spill and vandalism are the most common incidents that cause oil spillages, water pollution, soil contamination, fires and explosions in Nigeria. This is an important issue to be handled with great concern in order to protect and secure the environment and human health from all possible consequences of oil spillage as a result of pipeline rupture. The aim of this study is to assess the consequences of oil pipeline rupture within Hayin Mahauta community. The objectives of this study are to identify the root causes of oil pipeline rupture, to determine the effects of the oil pipeline hazard, to evaluate coping capacities of the people and introduce possible strategic measures to improve their capacities. Research Design for this study is Participatory Action Research (PAR) approach. Two main sources of data were used for this research work, these are primary and secondary sources. The primary sources include six (6) Focus Group Discussions sessions held within the community, In-depth interviews with thirty (30) key informants in the area and field observation. The secondary sources include report from Oil spill monitor of National Oil Spill Detection and Response Agency, records of oil pipeline spills (2016-2017) from Hayin Mahauta community head, National Bureau of Statistic. Other sources are journals, textbooks, published and unpublished thesis. The technique of data analysis employed was the use of descriptive statistics such as tables and graphs. The findings of analysis revealed that pipeline ageing is the main root cause of oil pipeline rupture within the community with (36.7%). It also revealed that water pollution is the main effect the community faced as a result of pipeline rupture with (40%). Soil contamination and impacted vegetation are the main problems affecting the environment with (33.4%) each. Ground-water well is the main source of water within the community with (73.3%), patent chemist is the main source of health care facility within the community with (73.3%). It was also discovered that diseases such as cholera, diarrhea, and skin ulcer and stomach irritation were observed within the study population. The study revealed that the community has no access to standard schools and good source of power. It was found out the community was never involved in any sort of sensitization or awareness that concerns oil spill hazard management measures. It was also found out that the community currently is vulnerable to oil pollution as a result of persistence pipeline rupture which usually occurs due to pipeline ageing and third-party interference. There is need for appropriate authority to put adequate measures in place to reduce the level of vulnerability and increase the resilience in the community in order to mitigate the consequences. There is also need for stakeholders to collaborate with the host community to ensure a safe environment

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ABBREVIATIONS AND ACRONYMS

NDDC	Niger-Delta Development Commission
NOSDRA	National Oil Spill Detection Response Agency
ROW	Rights of Way
AI	Amnesty International
PPMC	Pipelines and Products Marketing Company
FCT	Federal Capital Territory
GIS	Geographic Information System
FGD	Focus Group Discussion
PAR	Participatory Action Research
TPD	Third Party Damage
ITOPF	International Tanker Owner Pollution Federation
MOC	Multi Oil Companies
SPDC	Shell Petroleum Development Company
OSCPN	Oil Spill Contingency Plan of Nigeria
DPR	Department of Petroleum Resources
JIT	Join Investigation Team
JIV	Join Investigation Visit
NOSCP	National Oil Spill Contingency Plan
VCA	Vulnerability and Capacity Assessment
UNISDR	United Nations Office for Disaster Risk Reduction
NNPC	Nigeria National Petroleum Corporation
USA	United State of America

CA	Coping Capacities
LGA	Local Government Area
NBS	National Bureau of Statistic
NAPRI	National Animal Production Research Institute
PMS	Premium Motor Sprit
GPS	Global Position System
KRPC	Kaduna Refinery and Petrochemical Company
KEPA	Kaduna Environmental Protection Authority

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In an oil pipelines host communities of Nigeria, Oil spillage has caused severe environmental damages, loss of plants, animals and human lives and also loss of revenue to the government as a result of persistence pipeline ruptures. Petroleum exploration, exploitation, production, storage, distribution and transportation activities affect the environment in a conspicuously negative manner. Oil Spillage causes a range of environmental problems which include: contamination of both surface and ground water by benzene, xylene, toluene, and ethylbenzene. Contamination of soil by oil spill and leaks increased deforestation as well as the economic loss and environmental degradation (NDDC, 2001). Oil spill is harmful to both the environment and human health and thus, requires quick intervention. In order to address the problems of pipeline rupture and oil spillage, it is necessary to understand the root causes of the oil pipeline rupture, the effects of oil pipeline hazard and oil spillage on the environment and also to know the appropriate strategies measures to put in place to stop the oil pipelines and oil spills hazard turning to disaster. In view of the above-mentioned problem, assessment of the consequences of oil pipeline rupture remains a high priority due to continued crude and refined oil spillage in to the environment.

Oil pipelines play a significant role in crude oil transportation and bring danger close to communities along their paths. Pipeline accidents happen every now and then due to factors ranging from operational cause to third-party damage. In the Niger Delta pipeline system, interdiction is common; therefore, every length and breadth of land covered by a pipeline is vulnerable to oil pollution, which can pose a threat to land use (NOSDRA, 2015). Weak

enforcement of Rights of Way (ROW) led to encroachment by farmers and human dwellings, thereby bringing people in close proximity to pipelines. (Shittu, Whaanda and JA'afaru, 2014). Pipelines are part of the core infrastructure of oil and gas production. They are necessary for the transportation, storage and marketing of natural gas, crude oil, and refined petroleum products. Available data put the nation's pipeline network at over 3,000 km (Olomola, 2005 and Agbaeze, 2002). Pipelines are used to transport petroleum products from oil refineries and import-receiving jetties to storage depots in Nigeria. In Nigeria, petroleum pipeline traverses the entire country's geo-political zones ranging from the subsea swamp, rain forest to the savannah grass lands and are exposed to diverse climates and soil conditions with varying consequences which include the leaking and seeping of petroleum products with damaging implications for the communities and the environment (Agbaeze, 2002).

Most pipelines in Nigeria are more than 20 years old making them vulnerable to corrosion and leakage (Amnesty international, 2013). Some of these pipelines' networks date back to the 1970s, and the majority of the pipeline's designs have a limited lifespan of 20 years or less, though many of the pipelines still remain operational to date. Some of the pipelines were not properly laid down below the surface and can easily be exposed with little or no erosion. Some of the coastal pipelines are now exposed to the elements due to erosion. Other pipelines were originally laid above ground level further necessitating replacement. Most of these pipelines have been subjected to deterioration due to ageing, aggressive environmental factors, inadequate design and improper protection and maintenance (Ogwu, 2011 and Anifowose, 2012).

According to Nnah and Owei (2005), a petroleum pipeline is an essential mode of transport and is therefore an infrastructure of a highly specialized nature. Unlike other modes of transport such as road, pipelines do not improve access for people in communities through which they pass. Rather, they impose constraints on interactions and when located close to houses, are potentially hazardous to life there. Even when a pipeline is no longer in use, it is left to rust in the open field as the oil companies are not willing to spend money dismantling it. After the construction phase, there is usually no periodic monitoring. Monitoring is an important activity to ensure the integrity of pipelines and safety of people in the vicinity. Whereas oil companies attribute most spills to sabotage, the communities argued it is due to failed pipelines and subsequent leakages (NDDC, 2001).

1.2 STATEMENT OF THE RESEARCH PROBLEM

The recurrence of fatal pipeline incidence in Nigeria has gained global attention as a result of loss of lives, water pollution, soil contamination, air pollution, destruction of the ecosystem (flora and fauna), destruction of proper infrastructures, and loss of crude oil and refined products. The lack of robust safety management systems is one of the major reasons behind the high rate of recurring pipeline accidents which constitute a serious threat to the petroleum industry and the Nigeria economy (Amnesty international, 2013). Pipeline ruptures and vandalism are the most common incidents that cause oil spillages, fires and explosions in Nigeria. Corrosion, lack of regular inspection, lack of proper maintenance, operational failures and natural disasters are among the contributory factors to pipeline ruptures (NOSDRA, 2015).

According to World Bank Report (2004), studies have shown that the poor people are the most vulnerable to disaster situation, and those groups of people are mostly found in rural

settlements and informal settlements. Hayin Mahauta community is a rural community where the major occupation of the settlers is farming, fishing and rearing of animals and the community lives in poor environmental condition as a result of oil pipeline belonging to Pipelines and Products Marketing Company (PPMC) which passes through the community. The houses within the community are devoid of decent shelter and basic infrastructure which resulted in terrible living condition. Also, one of the major features of Hayin Mahauta community is that houses and business premises were built too close to the pipeline Right of Way (ROW) which exposed people to pipeline hazard, whenever pipeline rupture occurs in the community. Oil spilled into the environment contaminates the soil and also seeps into underground water and pollute their well (well pollution), which is the main source of water used for consumption and other domestic activities.

Various studies on oil pipelines Incidents using geospatial techniques have been conducted across Nigeria by researchers in order to find lasting solution to the problem. Shehu, (2016), analyzed the occurrences of oil spill along pipeline in the FCT, Abuja using geospatial techniques, to determine the location of oil spill, temporal distribution of oil spill and areas around the pipeline susceptible to petroleum hydrocarbon contamination and exposure. The results showed that proximity analysis was done based on local and international standards for oil pipeline right of way. Field survey revealed that built up and agricultural activities have encroached into the oil pipeline right of way.

Shittu, Adekola, Adamu, Yahaya and Pandey (2016) assessed the geographical distribution of oil-spills cluster and pattern in Niger Delta of Nigeria. Using three geospatial techniques with

ground data at 443 oil-spill incident sites from 1985-2008. The places with high (high-volume/ large impact/close proximity to communities) and low incident (low-volume/less impact/far distance) are related to the quantity of oil-spills identified within those communities considered susceptible to spill impact. While the average nearest neighborhood analysis showed a probability that oil-spill distribution in the area is clustered (ratio less than 1 with index value 0.19), the Getis-Ord General G test indicated that the oil-spill with high quantities (volume) discharge are significantly clustered within every 400 m. The Moran's *I* index indicated that there is less than 1% likelihood that the clusters are as a result of random chance.

Shittu, Whanda and Ja'afaru (2014) Mapped oil spill on human health risk in Rivers State Nigeria. A method was developed for identifying vulnerable communities within a designated potential pipeline impact radius and generic assessment criteria developed for assessing land use exposure. The GIS based model combines four weighted criteria layers, i.e. land cover, population, river and pipeline buffers in a multi-criteria decision making with analytical hierarchy process to develop an automated mapping tool designed to perform three distinct operations: firstly, to delineate pipeline hazard areas; Secondly, establish potential pipeline impact radius, and thirdly, identify vulnerable communities in high consequence areas. The model was tested for sensitivity and found to be sensitive to river criterion; transferability on the other hand is limited to similar criteria variables.

Oyinloye & Olamiju (2013) assessed the physical impact of oil spillage in Jessy Town, Delta state, using GIS and remote sensing technologies. The study relied majorly on secondary data sources from supervised image classification method. ILWIS 3.2 GIS software was

employed to classify ground cover into oil spill area, bare land/ cultivation, built up areas and vegetation. The findings reveal that oil spillage is increasing unabated in the study area. This study recommends qualitative employee training and preventive maintenance culture as remedy to continuous oil spillage since the principal cause of spills was attributed to human errors and equipment failure.

Considering the above studies, all of the researchers used conventional approach to address the consequences of oil pipeline rupture/spills in their study areas and none of the researchers use Participatory Action Research approach (PAR) to address the consequences. These are the gaps the study bridged, using Participatory Action Research approach of data collection and data analysis, such as focus group discussion (FGD), in-depth interviews and field survey and observation approach to assess the consequences of oil pipeline rupture/spills within Hayin Mahauta community and to find out the lasting proper solution to mitigate the menace. This was also the first research work carried out within the community on oil pipeline rupture incidence.

It is against this background that this study intends to provide answers to these research questions:

1 What are the root causes of oil pipeline rupture within Hayin Mahauta community?

2 What are the effects of oil pipeline hazard within the community?

3 What are the coping capacities of the people when the oil spill strikes the community?

4 What are the possible strategic measures to improve their capacities?

1.3 AIM AND OBJECTIVES

The aim of this study is to assess the consequences of oil pipeline rupture within Hayin Mahauta community in Giwa Local Government Area of Kaduna State. This aim will be achieved through the following specific objectives, which are to:

i. Identify the root causes of oil pipeline rupture in the study area.

ii. Determine the effects of oil pipeline hazard within the study area.

iii. Evaluate coping capacities of the people when the oil spill strikes the area.

iv. Introduce possible strategic measures to improve their capacities.

1.4 SCOPE OF THE STUDY

The spatial scope of this study covers Hayin Mahauta community that is susceptible to oil pipeline rupture in Giwa LGA, Kaduna State of Nigeria. This research is limited to assessment of the consequences of oil pipeline rupture within Hayin Mahauta community, in order to detect the main hazards/problem faced by the community as a result of oil pipeline rupture in the study area. The temporal scope for the study is restricted to a year (2016-2017)

1.5 JUSTIFICATION OF THE STUDY

Pipeline ruptures and vandalism are the most common incidents that cause oil spillages, water pollution and contamination of soil, fires and explosions in Nigeria. As a result, of corrosion, lack of regular inspection, lack of proper maintenance, operational failures, third-party interference and natural disasters are among the contributory factors to pipeline ruptures. But unfortunately, the communities around that are susceptible to oil pipeline rupture are neglected either by the government or oil companies for the impact on their homes, culture, environment,

and health. These people generally see little in the form of compensation from the government or oil companies but pay more attention only to coastal and marine pollution in relation to oil pipeline rupture consequences and less attention to land pollution (Amnesty International, 2013). This is an important issue to be handled with great concern in order to protect and secure the environment and human health from all possible consequences of oil spillage as a result of pipeline rupture. Therefore, this study will equip the community with necessary information on how to improve the management strategies of oil spills incidence within the community; the study uses the Participatory Action Research (PAR). The whole essence was to involve the community in research processes so that both the researcher and the researched build trust on research outcome. The method will also enable the community to acquire the knowledge and use the available resources in their hand to combat the effects of oil pipeline hazard whenever it strikes their community before seeking outside assistance.

CHAPTER TWO

CONCEPTUAL/ THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

This chapter attempts to review some concepts related to the topic of this study and review of previous works that have been carried out by other researchers which were relevant to the present one.

2.2: CONCEPTUAL/ THEORETICAL FRAMEWORK

2.2. 1: Concept of Oil Pipelines and oil Spills in Nigeria

Pipelines are important structural components in industrial and civil facilities. They are used to transport and distribute liquid and gaseous materials such as oil and natural gas in energy assets, hazardous chemicals and gases such as ammonia and ethylene in process plants and water in urban areas. Most hazardous liquid and gas pipelines are buried underground, but there are several major above-ground structures, such as the Trans-Alaska Pipeline System (Ambituuni, A. Hopkins, P. *et al.* 2015).

Oil pipeline spills can be caused by structural failure, operation error and third-party damage (TPD) (Achebe, 2012; Kandiyoti, *et al.*2012). TPD such as accidental rupture of pipelines is a common phenomenon, but recently intentional TPD such as sabotage and illegal bunkering of hostile and conflict pipelines is on the increase in places like Mexico, Columbia, the Middle East, Asia and Africa (Steiner, 2010; Kandiyoti, 2012). The International Tanker Owners Pollution Federation (ITOPF) maintains data of oil spill incidents worldwide; its records indicate that vessel grounding, collision, hull failure, equipment failure, fire, and explosion are the main

sources of oil spillage. Despite global awareness of oil spill incidents, little attention is paid to onshore oil spills compared to offshore (Fingas, 2000; Reible, 2010; Chen, and Denison, 2011).

The demand for oil has increased the movement of crude and petroleum products from production platforms to end users. Movement involves transfers from one mode of transport such as tanker, pipeline, railcar, and truck tanker to another (Fingas, 2000). These inter-model transfers increase the potential for accidental discharge during the transfer and storage operations. The increase in worldwide energy consumption is an indication that more pipelines would be required to transport additional supplies of crude and refined products. For instance, in 2010 global energy consumption increased by 3.8% metric tonnes with the USA leading (Enerdata, 2011), and in 2012 it dropped to 3.7% metric tonnes also with the USA still leading (Enerdata,2013).

2.2.2: Oil Spill in Nigeria

The deteriorating condition of most pipelines constructed over the years is responsible for oil pipeline spills in Nigeria (Steiner, 2010; Benedict, 2011). Other reasons are indiscriminate disposal of oil waste and lack of 'good oilfield practice' by MOCs (Steiner, 2010; Amnesty International, 2013). In 2006, Shell Nigeria claimed an average of 250 oil spill incidents per year since 1997 while the Nigerian National Oil Spill Detection and Response Agency (NOSDRA) could confirm about 327 oil-polluted sites in the Niger Delta region (Shittu, 2014)

2.2.3: Third Party Oil Spills in Nigeria

Although some oil spills are caused by equipment failure and operational error, the Royal Dutch Shell, which is the mother company of SPDC Nigeria, claimed pipeline interdiction accounts for most of its oil spills in Nigeria (Shell, 20014).

These are experienced and well-connected individuals working in collaboration with security agents and oil workers to steal crude directly from pipelines (Shittu, 2014). Large oil spills are rare with this group, because they possess skills required to regulate flow, usually by installing illegal fittings and control valves to control pressure and flow rate (Kandiyoti, 2012). They use hoses to load oil onto barges or smaller ships and then take the oil through the creeks for onward transfer onto international-class 'mother ships' on the high sea for sale in the international market (Katsouris and Sayne, 2013).

i. The Amateur Bunkers (thieves):

This group uses basic tools like a hacksaw to break or loosen pipe manifolds; they are mostly local unemployed youths without much experience or skills to handle large-scale crude theft. The stolen crude is usually collected in small quantities on canoes and small barges for sale to local refineries or companies that use crude oil to power their furnace. They care little about spills caused, as they often leave the ruptured pipes discharging crude oil into the environment (Shittu, 2014).

ii. Saboteurs and Vandals:

These groups are mainly interested in sabotaging operations of the MOCs. They are generally influenced by their grievances against the government and MOCs about the way and manner their agitation is ignored. Some of these groups work in collaboration with community leaders who seek attention or want to impede oil production in their areas (Shittu, 2014). Benedict (2011), who reported the existence of gangs going from one community to another damaging pipeline, corroborates this claim.

2.2.4: Oil Spill Response and Contingency Plan in Nigeria

Oil spill contingency planning is the process of developing a suitable response capability that is in compliance with local regulatory framework and commensurate with the spill risk of a facility. Contingency is a future event or circumstance that is possible but cannot be predicted with certainty. (Nosdra Act 2006).

There are two approaches of oil spill contingency plan in Nigeria; the first manages spills in-house within the affected industry, while the second uses the NOSCP. Under the former, spills of less than 100kg (0.1 tonne) are not reported to the DPR but managed in-house according to tier 1 (Field Interview, 2010). However, spills above 100kg are reported to the DPR and a joint investigation team (JIT) constituted to investigate and appraise the site. The national contingency plan on the other hand is divided into tiers, i.e. company (tier one), cooperative (tier two) and government or major (tier three), based on quantity discharged (NOSCP, 2009).

1. Types of Oil Spill

Tier 1

It is mandatory under this tier for producers and marketers to provide response facilities in their areas of operation. The quantity of oil specified for this tier is less than or equal to 7 tonnes (50 bbl), which must be caused by the company's activities, (Nosdra act 2006)

Tier 2 This category covers oil spills greater than 7 tonnes (50bbl) but less than 700 tonnes (5,000bbl) around the company's vicinity. In this category, other oil industries, government agencies and the Clean Nigeria Associates are involving. [Nosdra act 2006]

Tire 3

This stage activates the national contingency plan if the spill surpasses tier 1 and tier 2 conditions. The quantity involved in tier 3 is greater than 700 tonnes (5,000bbl). The government is directly involved in terms of control and directives through the NOSDRA. Spills are not restricted to the vicinity of the company, but include all areas where the company conducts its operation, (Nosdra act 2006).

2.2.5: Remediation Techniques and Prevention/Control Measures

Oil spills pose an immediate threat to the environment and require quick and thorough responses. The remediation of oil spill has to do with getting rid of the oil in order to avoid or reverse environmental damage. It is important to start removing oil promptly from contaminated areas because as time passes and the oil weathers, it causes more damage to the resources in its path. The various methods employed in the removal of oil from the natural environment are usually referred to as clean-up techniques. Almost all clean-up techniques have the potential to cause additional damage but care has to be taken in employing any remedial method so as not to make matters worse. Zabbey, (2004) asserts that the clean-up technique(s) applied for a particular spill depend largely on the type of oil, and the conditions present at the location and during the time of the spill. The various remediation processes can thus be broadly divided into two categories:

i. Long term process

ii. Short term process

Both these categories are the result of the kind of techniques used for treatment of oil spills and the various advantages and disadvantages of these techniques.

i. Short term processes

Short term processes, as the name implies, are clean-up techniques that are brief. They include the following:

(a) Containment and recovery with booms and skimmers:

This is usually the first measure used to attempt to clean up after an oil spill. Booms are long, floating plastic or rubber barriers placed around floating oil for the purpose of containing (limiting further spreading) and concentrating the oil for recovery. In addition, booms may be used to divert and channel oil slicks along desired paths, making them easier to remove from the surface of the water.

After the oil is contained using booms, 'skimmers' or boats that skim spilled oil from the water surface are used. Skimmers are floating devices used to recover oil from water. They come in different designs. The simplest skimmers are suction devices which remove oil from the water surface directly or via a weir, although these tend to pick up a lot of water at the same time (Uyigue & Agho, 2007).

(b) Use of dispersants: Dispersants are a group of chemicals designed to be sprayed onto oil slicks to promote the formation of tiny oil droplets, and delay the reformation of slicks. Significant environmental and economic benefits can be achieved, particularly when other at-sea response techniques are limited by weather conditions or the availability of resources. In certain situations, dispersants may provide the only means of removing significant quantities of surface oil quickly, thereby minimizing or preventing damage to important sensitive resources.

(c) In-Situ Burning: In-situ burning is the term given to the process of burning oil slicks at sea, at or close to the site of a spill. Burning may be seen as a simple method which has the potential to remove large amounts of oil from the sea surface.

The decision whether or not to burn a slick at sea is often contentious. Issues such as the distance of the oil from the damaged vessel or from a populated area; the potential toxicity of the resultant smoke; the nature of the oil; the likelihood of the burn being successful; and the fate of any unburned residues all require careful attention before attempts are made to ignite the oil (Akpofure, 2008).

(d) Absorption: Absorption is the technique employed in choppy or fast-moving waters, when methods like containment and removal fail. In this method, sorbent materials such as talc, straw, sawdust and synthetic absorbents are added to the oil slick and then removed when they have soaked up some of the oil. These sorbent materials act like a big sponge, removing oil but contaminated absorbent materials must be treated as toxic waste and present disposal problems. Also, straw and sawdust can become waterlogged and difficult to remove.

ii. Long term remediation processes

Long term remediation processes takes longer time than short term processes.

Bioremediation (B1) is the only long term clean-up technique known. This involves the use of microorganisms, such as bacteria, to remove environmental pollutants from soil, water, or gases. In other words, it is a process that uses microorganisms to transform harmful organic compounds, like oil, into nontoxic and less dangerous compounds such as fatty acids and carbon dioxide.

iii. Prevention/control measures

Oil spills remain a persistent cause for concern, damaging the environment, posing health

hazards and disrupting production (Uyigue & Agho, 2007).

The petroleum industry undertakes a good number of measures in order to reduce the likelihood of oil spills. The measures include:

(a) Upgrade of flow stations:

This has to do with the improvement of the quality, standard or performance of the facilities in the station in order to prevent oil spill. Bund walls surround flare pits in flow stations. Flow station bund wall repairs ensure that the stations retain liquids carried in their flare pits until they are evacuated. Also, importance rehabilitation/repairs, replacement and burial of flow lines.

(b) Pigging: This is the removal of debris from pipelines in order to minimize internal corrosion.

(c) Cathodic protection: This is the prevention of electrolytic corrosion of a metallic material by making it the cathode in an electrolytic cell.

2.2.6 Concept of Vulnerability and Capacity Assessment

Vulnerability and Capacity Assessment (VCA) originated in the late 1980s and in one form or another is now widely applied around the world. VCA is a generic term: agencies attach many different names to the different VCA methods they develop (the term Community Risk Assessment is increasingly coming into use to comprise both VCA and risk analysis at community level). Operationally, VCA is used as a diagnostic tool to understand community problems and their underlying causes (UNISDR, 2009).

(a) Vulnerability and Capacity Assessment

Vulnerability and capacity assessment **(**VCA) is a process of participatory investigation designed to assess and address major risks affecting communities. It aims to determine people's vulnerability to those risks, and their capacity to cope and recover from a disaster. CA makes it possible for National Societies to work with vulnerable communities to:

(1) Help them understand the hazards they face.

(2) Assist them in taking the necessary measures to improve the situation, based on their own Skills, knowledge and initiative in its basic form.

(3). VCA enables people to prepare for hazards and prevent them from turning into disasters (Iguisi E. O. 2017).

(b) Vulnerability

Vulnerability is defined as "the extent to which a community, structure, service and/or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster prone area". It is the condition determined by physical, social, economic and environmental factors, which determines the likelihood and scale of damage from the impact of a given hazard. (UNISDR, 2009).

(c) Benefits of Vulnerability and Capacity Assessment

According to United Nations Office for Disaster Risk Reduction. (UNISDR) (2009) VCA is useful in that it helps communities in:

- **i.** Supporting decisions made in relation to disaster preparedness and response reducing the impact of the hazard (through mitigation, preparedness, prediction and warning);
- **ii.** Building capacities that help reduce people vulnerability;

iii. Tackling the root causes that lead to systems of vulnerability.

iv. It has the ability to raise public awareness of hazards, vulnerability and capacities the risk taken by the community.

v. It will give good information about the chosen community.

vi. The process of conducting a VCA will bring all government, agencies in to closer contact with other organizations, both national and international. Once VCA results give a better idea of vulnerabilities, it will be easier to develop activities to build capacities and reduce vulnerabilities.

vii. It can create regional/community disaster preparedness and response activities.

viii. Can help to reduce the vulnerability of the community and increase resilience.

2.3 LITERATURE REVIEW

2.3.1: Overview of oil pipelines Spills in Nigeria

Since the discovery of oil in Nigeria in 1956, the country has been suffering the negative environmental consequences of oil exploration and exploitation. Oil incidents have occurred in various parts and at different parts along our coast. In Nigeria, 50% of oil spills is due to corrosion of pipelines and tanker accidents, 28% is due to sabotage, and 21 % are due to oil production operations while 1% of the oil spill is due to engineering drills, inability to effectively control wells, failure of machines and inadequate care in loading and unloading oil vessels. Oil bunkering is also a source of oil spill. Oil spills have caused a lot of environmental problems in the Niger Delta. Oil spills have degraded most agricultural lands in the area and have turned hitherto productive areas into wastelands. With increasing soil infertility due to the destruction of soil micro-organisms, and dwindling agricultural productivity, farmers have been

forced to abandon their land, to seek non-existent alternative means of livelihood. Aquatic life has also been destroyed with the pollution of traditional fishing grounds, exacerbating hunger and poverty in fishing communities (Gbadegesin, 1997). In a study of the socio-economic impact of oil pollution, stated that crude oil exploitation has had adverse environmental effect on soils, forests and water bodies in host communities in the Niger Delta Farmers have lost their lands, and are consequently forced to emigrate to other communities in search of livelihood exerting additional pressures on natural resources in such areas (Omofonmwan & Odia, 2009). It is noteworthy that, the devastating consequences of oil spill in Niger Delta region with its eventual hazards on both aerial and terrestrial environs tantamount to an irreversible chain effect on both the bio-diversity and safety spills in populated areas affect crops and agriculture through contamination of the groundwater and soils. Spills also contribute to the contamination and death of fishes which affects the economy and human health adversely.

As a mode of transportation, pipelines traverse the landscape of Nigeria's Niger Delta Region and utilizes vast tracts of land whose original ecosystem has been altered. Constant oil spills and gas blow-outs from these pipelines constitute health hazards for both the people and the environment. The surface pipelines alter the ecosystem; reduce available land for agriculture and other development and impede free movement of goods and services (Adejoh, 2014).

The deteriorating conditions of most pipelines constructed over the years are responsible for oil pipeline spills in Nigeria (Steiner, 2010; Benedict, 2011). Other reasons are indiscriminate disposal of oil waste and lack of 'good Oilfield practice' by MOCs (Steiner, 2010; Amnesty International, 2013). In 2006, Shell Nigeria claimed an average of 250 oil spill incidents per year since 1997 while the National Oil Spill Detection and Response Agency (NOSDRA) could confirm about 327 oil-polluted sites in the Niger Delta region. Data from the NNPC pipeline

vandalism steadily decreasing from 2006 to 2010 and a sudden increase in 2011, while pipeline rupture remained steady for the best part of 14 years, except in 2000. There is no particular reason for this, as pipeline vandalism seems to occur across all regions of the country.

Nigeria's oil and gas operations comprises of assets and infrastructure including 5,284 oil wells, 10 gas plants, 275 flow stations and 10 export terminals (Joab, 2004). All of these are connected by a network of pipelines that criss-cross the country. These developments often require a large chunk of the wetland to be reclaimed/ dredged. Oil and gas production have come at a great environmental cost to about 1,500 communities in the Niger Delta where the Nigerian National Petroleum Corporation (NNPC) oil venture partners operate. The impact has been mostly negative to the local communities. The local communities complain of injustice in the distribution of costs and benefits of oil exploration. It is believed that while local communities directly bear the environmental consequences of oil development, such as loss of biodiversity, other regions of the country bear the benefit. Not until the tragic events of Odi (killing and destruction of the village by the military) and Ogoni (killing of Ken Saro Wiwa) (Human Rights Watch, 1999; 2000), many Nigerians appear unaware of the environmental degradation, pollution and neglect that is faced by the oil producing communities. The same pipelines, that bring oil wealth and supply petroleum product to other region of the country is causing untold havoc in the Niger delta. Africa and specifically Nigeria have suffered unprecedented pipeline interdictions, with oil companies like Shell Petroleum Development Company (SPDC) recording an average of about 200 oil spill incidents every year since 2005 (Shell Petroleum Development Company, 2014; Akpomuvie, 2011). In fact, Adebayo & Dada (2008) alluded to the existence of gangs going from one community to other vandalising pipelines in order to impede oil companies' ability to operate smoothly, while demanding compensation for farmlands and rivers

polluted by oil spills. Akpomuvie (2011) claimed that about 324,000 barrels of crude oil was spilled in 1500 incidents from its facilities from 2007-2013; 75% of these spills were attributed to sabotage/theft. The main source of spills in the region is the pipelines used for crude transportation, (Ambituumi *et al*, 2015; Reible, 2010). Since the main purpose of a pipeline is for liquid transportation, any damage can cause serious oil spill incident. Even at that, there are thousand kilometres of onshore pipelines traversing oil producing regions for collecting, distributing and redistributing large quantities of crude oil across the world (Kandiyoti, 2012).

2.3.2: Causes of Oil pipeline rupture/ spills

Oil pipeline spills can be caused by structural failure, operation error, corrosion, natural disaster and third-party damage (TPD) (Achebe *et al.*, 2012; Kandiyoti, 2012). TPD such as accidental rupture of pipelines is a common phenomenon, but recently intentional TPD such as sabotage and illegal bunkering of hostile and conflict pipelines is on the increase in places like Mexico, Columbia, the Middle East, Asia and Africa (Steiner, 2010; Kandiyoti, 2012). The International Tanker Owners Pollution Federation (ITOPF) maintains data of oil spill incidents worldwide; its records indicate that vessel grounding, collision, hull failure, equipment failure, fire, and explosion are the main sources of oil spillage. Despite global awareness of oil spill incidents, little attention is paid to onshore oil spills compared to offshore (Fingas, 2000; Reible, 2010; Chen, and Denison, 2011).

The demand for oil has increased the movement of crude and petroleum products from production platforms to end users. Movement involves transfers from one mode of transport such as tanker, pipeline, railcar, and truck tanker to another (Fingas, 2000). These inter-model transfers increase the potential for accidental discharge during the transfer and storage operations. The increase in worldwide energy consumption is an indication that more pipelines would be required to transport additional supplies of crude and refined products. For instance, in

2010 global energy consumption increased by 3.8% metric tonnes with the USA leading (Enerdata, 2011), and in 2012 it dropped to 3.7% metric tonnes also with the USA still leading (Enerdata, 2013).

2.3.3: Types of Oil Pipeline Spillage

Oil spill is categorized into four groups namely:

(1) Minor spill occurs when the volume of the spilled oil is less than 25 barrels in inland water or less than 250 barrels on offshore or coastal water that does not pose a threat to public health or welfare.

(2) Medium spill takes place when the volume of the spill is 250 barrels or less in inland waters or 250 to 2500 barrels on offshore and coastal waters.

(3) Major spill occurs when the oil discharged to inland water is excess of 250 barrels in inland and excess 2500 in offshore or coastal waters.

(4) Catastrophic spill refers to any uncontrolled well blowout, pipeline rupture or storage tank failure which poses an imminent threat to the public health or welfare (Nosdra act 2011).

2.3.4: Impacts of Pipeline in Nigeria

Most of the pipes run across the rivers, creeks, swamps and farmland in the Niger Delta, an environment that is wetland fragile, and highly sensitive to stress (Ogon, 2006). For instance, the Shell Petroleum Development Company's 95 km trunk line runs from Nembe Creek field to Caw Thorne Channel field passing through thirty-five communities and traversing sixty rivers and creeks of various sizes along its route. Outside the Niger Delta Region, oil and gas pipelines run to petroleum products storage depots in Aba, Enugu, Gombe, Gusau, Ibadan, Ikorodu, Kaduna,

Kano, Lagos, Ilorin, Maiduguri, Markurdi, Ore and Yola. With associated gas gathering ‘programmers at Bonny, Soku and Brass, the pipeline network has increased greatly.

The mangroves of the Niger delta also represent one of the most threatened biologically diverse habitats in the world. Hectares of the mangrove in the region have been cleared often without recourse to local environmental legislations or global environmental best practices. This has led to reduction in habitat area and delineation of natural populations, which in turn distorts biological breeding. Apart from wetland reclamation for pipeline construction, leaks from the pipeline as a result failure or sabotage also threaten the environment. Therefore, the unique biodiversity of the region has changed drastically and many important species have been lost.

In a recent study, thirty interview respondents with knowledge of the area were asked to state the single most important cause of oil spillage in the Niger Delta. Their response underscores the fact that pipelines are a major source of environmental degradation in Nigeria. Specifically, the following are identified environmental impacts:

a) Destruction of seabed by dredging for pipeline installation:

b) Sedimentation along pipeline routes:

c) Water pollution from leaking pipes:

d) Explosion of pipes resulting from vandalism/ and/ or sabotage

e) Destruction of environmentally sensitive estuaries wet lands

f) Occasional cause of erosion and flooding

g) All of the above have serious effects on the health of humans and animals.

2.3.5: Effects of Oil Pipeline rupture/spills

(a). Effects on land.

Effect on Environment The land is the solid base upon where all living things live, the survival of man depend on the productivity or the production capacity of the land available to him for agriculture, habitation, industrialization, transportation and recreation etc. the land hold the soil in trust for man, animal and plant. Once the top soil is destroyed through pollution or the other agents of degradation it is very difficult to repair (Okunade, 1995).

It is not only the water quality that is destroys by oil spillage in oil pipelines areas; the land from where food is produce is equally destroyed. These are some of the effect of oil pollutants on land: -

i. Oil discharged renders the land unsuitable for any form of agricultural activities such as for pastoral agriculture or food crop production (Gordon 1978).

ii. Oil pollution destroys vegetation cover thereby exposing the land to all sorts of agents of environmental degradation like soil erosion etc.

iii. Oil pollution causes desiccation and soil dryness, which make it conducive for important

iv. micro- organism to carry out their activities. (Gordon 1978).

v. Oil pollutants also affect the soil structure and computability thereby increasing the erosive capacity and cases loss of soil fertility and nutrients.

(b). Effect on Sources of Water

The effect of oil pollution on streams, which are overflowing water, is quite different from pollutants effects on lakes that are static.

The presence of this pollutant brings about the decomposition of high energy organic, which leads to a number of changes in the streams or river due to the above reason.

i. Ammonia and hydrogen sulphide among other gas are formed since oxygen is no more present to act as hydrogen acceptor.

ii. Formation of bubbles, which attached themselves with floating solid materials that floats on the water surface.

iii. The water is generally black in colour

iv. Presence of long filamentous growth of fungus.

v. There is increase turbidity, salted solid matter and low dissolve oxygen down streams from the point of gross pollution

vi. There is decrease in aquatic life survival from the point of gross pollution.

It may lead to the outbreak of disease like measles, cholera, cough, dysentery, typhoid and paratyphoid fever when consumed or used by the people in the host community.

Also, the river cannot be useful for irrigational purposes due to the fact that there are some certain toxic chemicals in the oil waste, which may destroy plants cells, which may render the plants useless from bearing crops.

(c). Effect on Human Health

The main problems with oil spill are the negative effects of ingesting toxic metals. Most of the oil spill contaminated sites contain appreciable amount of heavy metals and other contaminants that could affect the health of people living in the neighborhood of such disaster area. The

concentration of trace elements like Cr and Ba detected in oil spill sites during the Gulf war were higher than permissible safe limits. Skin contact with certain chromium compounds can cause skin ulcers. Ingesting large amounts of chromium can cause stomach upset and ulcers, kidney and liver damage and even death. The health effects of barium depend upon the water-solubility of the compounds. Small amounts of water-soluble barium may cause a person to experience breathing difficulties, increased blood pressures, heart rhythm changes, stomach irritation, muscle weakness, changes in nerve reflexes, swelling of brains and liver, kidney and

Heart damage. Serious respiratory problems witnessed in many communities can be linked to environmental pollution. According to Omofonmwan & Odia, (2009), respiratory problems, coughing up blood, skin rashes, tumors, gastrointestinal problems, different forms of cancer, and malnourishment, were commonly reported ailments in many communities.

(d). Effects on Socio- Economic Activities

Most studies regarding the effects of oil spillage on families or communities living in the Niger Delta Region focus on the socio-economic activities of the people.

Gabriel (2007) in his study on environmental issues and challenges in the Niger Delta focuses on its impact on women economic activities in the area. He employed a theoretical approach to highlight the emerging effects of the environmental hazards on the region and concluded that it has adverse effects on women activities. Also, contamination of coastal amenity areas is a common feature of many oil spills, leading to interference with recreational activities such as bathing, boating, angling and diving. Hotel and restaurant owners and others who gain their livelihood from the tourist trade can also suffer temporary losses.

2.3.6: Coping Capacity

Coping capacity: ‘The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters. (Iguisi, E. O. 2017).

(a) Capacities

Capacities: The resources of individuals, households, communities, institutions, and nations to resist the impact of a hazard. The capacities of people in chronically disaster-prone countries facing multiple hazards (such as droughts, locust infestations and/or civil unrest) weaken over time, thereby reducing their capacity to mitigate the effects of the next crisis. The ability to maintain livelihood assets contributes to people’s capacities to resist on-going negative impacts. (Iguisi, E. O. 2017).

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1 INTRODUCTION

This chapter presents the background of the study area and the methodology used for the research work.

3.2 THE STUDY AREA

The study area for this research work is Hayin Mahauta community in Giwa LGA of Kaduna State, Nigeria. It also discusses on its location, size, climate, population and vegetation (see Figure 1 and 2)

3 .2.1 Location and Size

Hayin Mahauta Community is located in Giwa local government area about 2 kilometers to the Local Government Headquarters. It lies between Latitudes $11^0$20' 15" N - $11^0$42' 13'' N and Longitudes $7^0$05' 16'' E -$7^0$40' 52'' E, and is bounded in the North by Ungwan Rimi, in the West by Hayin Mai, in the south by Hayin Madara and in the East by Sabon Gida. **(See Figure 3.2 for more details**). It occupies a land area approximately 3km^2 (Abubakar, 2017).

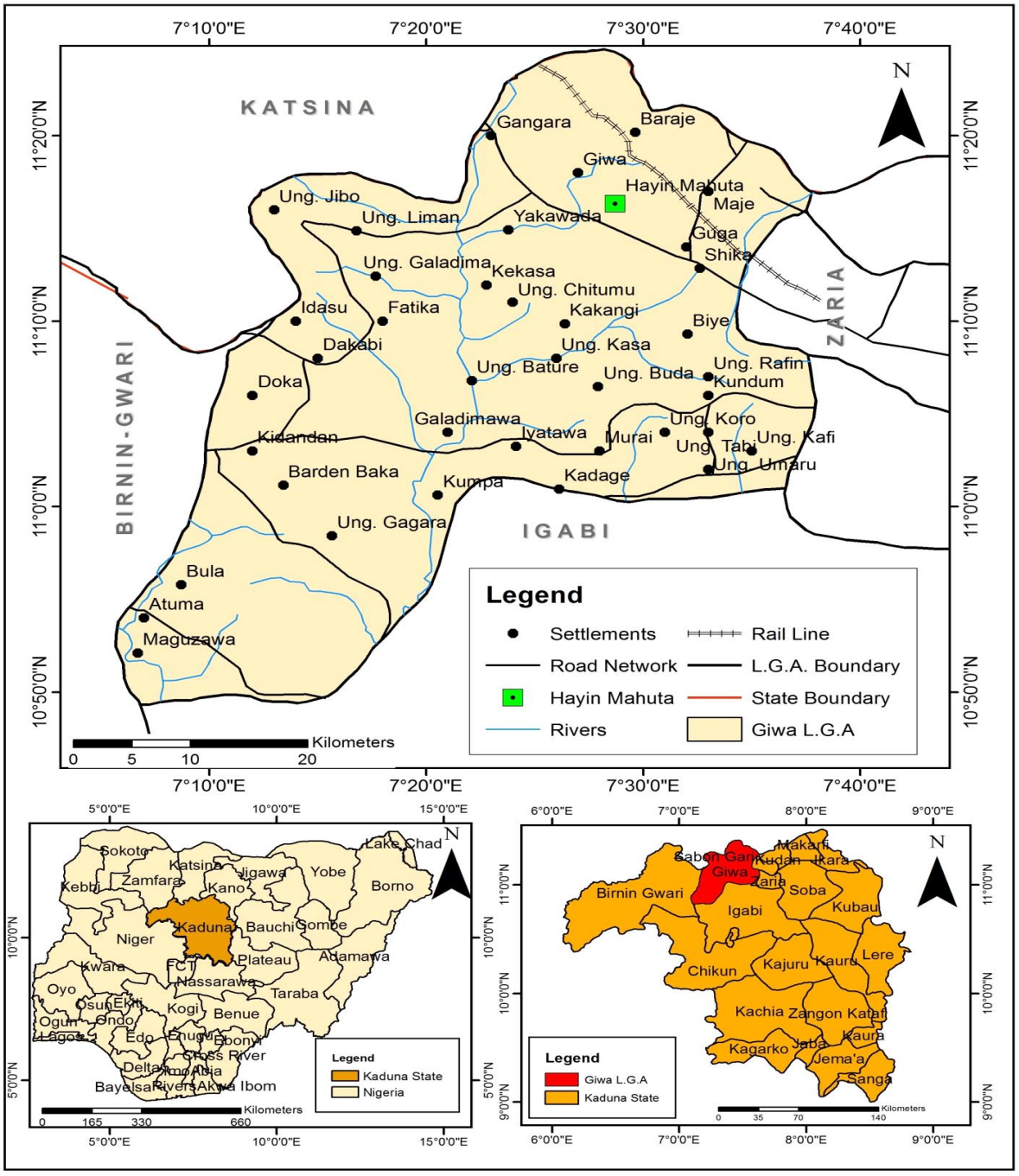

Figure 3.1: Map of Nigeria showing Kaduna State Giwa LGA and Hayin Mahauta community

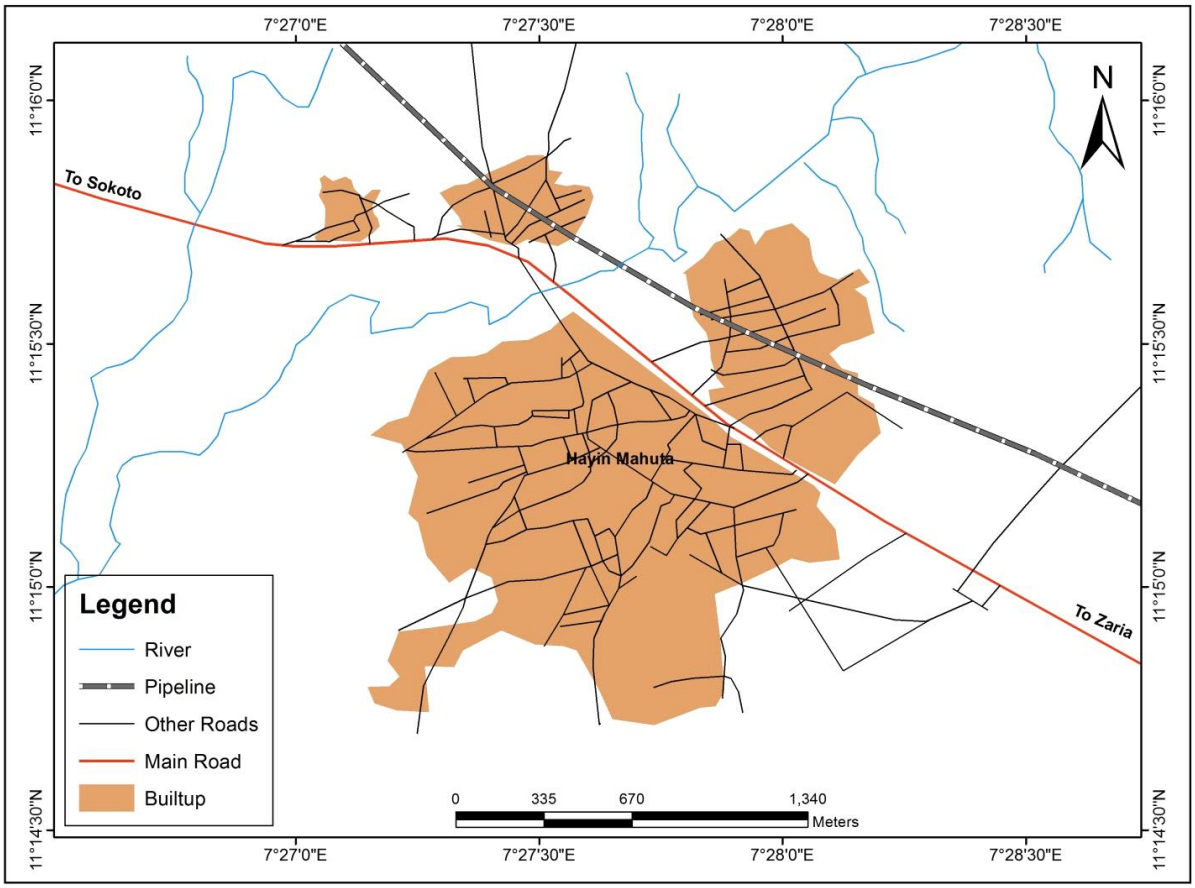

Fig3.2: Map of Hayin Mahauta Community showing oil pipeline route

Source: Adapted from Google Map of Giwa LGA

3.2.2 Population

Hayin Mahauta community has a total population of 1555. Out of this, 801 are male and 754 are female. Giwa Local Government Area is one of the 23 LGAS of Kaduna State, which was carved out of Igabi LGA on 23rd September, 1991 by General Ibrahim Babangida's administration. The people of the area are mainly Hausa, Fulani and few other tribes with Islam as their major religion. The local government has a total population of 292,384, 14 5,608 are males while the remaining of 146,776 are females (NBS, 2006).

3.2.3 Land used and Economic Activities

The indigenous people of Giwa LGA are mostly famers, animal rearers, small-scale business holders, traders and also civil servants. The educational institutions in the area include primary Schools across the administrative wards and secondary schools which include: Dr. Lawal Shehu Government Girl secondary school, Giwa. Government Day Secondary school, Giwa. Mallam Abdulkarim Islamic Secondary School, Government Secondary School, Shika. Zaria Academy, Shika. Higher institutions include Leventis Foundation, Dogon daw. National Animal Production Research institute, Ahmadu Bello University. Shika (NAPRI). Health institutions include primary health care centers across the administrative wards, General Hospital Giwa and Ahmadu Bello University teaching hospital Shika. Other institutional lands used are Local Government secretariat, Local Government Education Authority office, Market and social services structure (Abubakar, 2017).

3.2.4 Climate and Vegetation

Giwa Local Government Area experiences a tropical continental climate (Aw) with distinct seasonal regimes, oscillating between cold to hot and dry, humid and wet. These two seasons reflects the influences of tropical continental and equatorial maritime air masses which sweep over the entire country. However, in Giwa, the seasonality is pronounced with cold to hot dry season longer than the raining season. The soil of the area is sandy loam which is fertile for cultivation of crop varieties, while along the stream is flood plain which helps in rearing of animal. The type of rainfall in the area is conventional (Fadama office, Giwa LGA, 2013).

3.3 RESEARCH METHODOGY

The process of gathering data is vital to the entire research and is also very important for arriving at the research findings. In view of this, the various ways adopted in carrying out this research are presented below.

3.3.1 Reconnaissance Survey

A preliminary survey was conducted by the researcher in order to get more familiar with the study area. This aided the researcher in addressing the method of data collection used and in identifying the points chosen for taking the coordinates of the oil pipeline. During this phase of the research, a visit was paid to the Community leader of Hayin Mahauta community and the Local Government Council headquarters in Giwa, so that they were officially informed about the study which specifically focuses on Assessment of the consequences of oil pipeline rupture within Hayin Mahauta community and their support was solicited for, so as to ease the process of data collection.

3.3.2: Types and Sources of Data

Two main sources of data were used for this research work. These are the primary and secondary data sources. The primary sources of data include focus group discussion, in-depth interviews and field survey/ observation. The secondary sources of data for this study included report from the Oil spill monitor of National Oil Spill Detection and Response Agency (NOSDRA), records of oil pipeline spill (2016-2017) from Hayin Mahauta community head, National Bureau of Statistics (NBS) and Giwa LGA Headquarters respectively. Other data were obtained from journals, textbooks, newspapers, internet, published and unpublished thesis and dissertations.

3.3.3 Types of Instruments/Materials Used

The following Instruments were used for the conduct of this research.

i **Hardware used:** includes Hand-held GPS receiver (Garmin e-trex) printer, laptop and camera

ii. **Software used:** Microsoft Excel 2013 and Microsoft Word 2013 version

3.3.4 Research Design

Participatory Action Research (PAR) design approaches were used and data was collected through Focus Group Discussion, in-depth interviews and Field survey/ observation. The whole essence was to generate complete information from a group of subjects who are at the same time the beneficiaries of the research outcome.

3.3.5 Method/Techniques of Data Collection

The data collection for this research took place in three case study areas, and included a total of six (6) focus group discussions, 30 in-depth interviews and field observations. The method of data collection determines the reliability and validity of the result. The major approaches adopted for data collection in this study are group discussion with the local residents and in-depth interviews with key informants that have knowledge and information on oil pipeline spill hazard in Giwa LGA. In addition, field observation was also used to supplement the data.

i. Focus Group Discussions (FGD)

For this study work, the six groups were made up of 12 persons each who were representing the community leaders, opinion leaders, youth leaders, religious leaders, women leaders and heads of households. Six group discussions sessions were conducted, four at the beginning of the fieldwork and two at the end in order to provide useful background information on specific objectives of the research. This also helped to identify the policy actors to be enlisted for in-depth interviews.

ii. In-depth Interviews.

To balance the information on the issues of oil pipelines rupture under investigation and in addition to the focus group discussions, 30 in-depth interviews were conducted. For these interviews, five respondents were drawn from each of the following organizations: Local residents, Security Agencies, National oil spill detection and response agency officials, community health practitioners, environmental health workers and environmental activist groups.

iii Feedback Workshop

Two feedback workshops were organized towards the end of the fieldwork. The workshop made it possible to communicate preliminary results to the community in a way that would motivate them to act on and use the information, especially in local decision making. The question and answer session helped in gaining further information, for example, information on pipeline leakages and the compensation paid to the community.

3.4. DATA PRESENTATION AND ANALYSIS

Data gathered from the 30 in-depth interviews with key informants, and six (6) focus group discussions, field observation and feedback workshop on the four main objectives of the research work and other attributes data were recorded and analyzed with the aid of descriptive statistics to show the extent of dispersion within the variables of the study.

Objective one (i): To identify the root causes of oil pipeline rupture in the study area.

Data collected from the 30 In-depth interviews was subjected to qualitative analysis using frequencies and percentages. Some of the results were presented in tables while others were

presented in bar graphs using Microsoft Excel. Data obtained through (6) focus group discussion (FGD) and field observation.

Objective two (ii): To determine the effects of oil pipeline hazard within the study area.

The data collected through in-depth interviews was achieved with the aid of descriptive statistics to show the extent of dispersion within the variables of the study. Tables and bar graphs were used, using Microsoft Excel. Data obtained from (FGD) and field observation were also discussed.

Objective three (iii): To evaluate coping capacities of the people when the oil spill strikes the area.

The response from the 30 in-depth interviews was also subjected to qualitative analysis, using frequency and percentages. The results were presented in tables and graphs, applicable. Also, data obtained from (FGD) and field observation were discussed.

Objective four (iv): To introduce possible strategies measures to improve their capacities.

This was achieved through the findings of research work and recommendations by respondents.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 INTRODUCTION

This chapter deals with the data analysis and interpretation of the research findings through in-depth interviews responses and focus group discussion. The purpose of the presentation and analysis is to summarize the collected data in such a way as to provide answers to the research questions.

4.2 NATURE AND CHARACTERISTICS OF OIL SPILLS IN HAYIN MAHAUTA COMMUNITY

This objective described the frequency and magnitude of occurrence of the oil pipeline rupture/ oil spills and the number of property likely to be affected within Hayin Mahauta community.

Table 4.1: Frequency and occurrence of oil pipeline rupture in the study area

Frequency of occurrence	Magnitude (No. of property likely affected)	Number of respondents	Percentage
Occurs within every year	1-20 wells polluted, 20-50 meters of farmland and vegetation impacted.	14	46.7
Occurs within every two years	20-40 wells polluted, 50-100 meters of farmland and vegetation impacted.	15	
Occurs within every three years	40-60 wells polluted, 100-150 meters of farmland and vegetation impacted.	1	3.3
Occurs within every five years	60-70 wells polluted, 150-200 meters of farmland and vegetation impacted.	0	0
Total		**30**	**100**

Source: Field work, 2017- 2018

Table 4.1**:** above shows the Frequency and Magnitude of occurrences of the oil spill in Hayin Mahauta community. The research analysis indicates that frequency and magnitude of

occurrence of the oil spill in Hayin Mahauta community occurs within every two years with 20-40 wells polluted, 50-100 meters of farmland and vegetation impacted which has the highest number of 15 respondents, (50%), followed by occurrences within every year with 1-20 wells polluted, 20-50 meters of farmland and vegetation impacted with 14 respondents (46.7%), occurrences within every three years with 40-60 wells polluted, 100-150 meters of farmland and vegetation impacted and 1 respondent (3.3%), while occurrences within every five years has no respondent,(0%). Also, during focus group discussion session held within the community. I observed most of their building and houses is situated within (PPMC) Right of Way. Based on interviews result obtained, the community faced a lot of environmental challenges as a result of oil pipeline rupture. **(See Plate 3 for impacted land within the community)**.

Discussion

The frequency occurrence of oil spill in Hayin Mahauta community is also contrary to the frequency occurrence in FCT Abuja as identified by Shehu (2016). In his research analysis of the occurrence of oil spill along pipeline in the FCT using GIS and the map of the study area showing the location of oil spill occurrence between 2009 and 2014, it was gathered that a total of 16 oil spills occurred in the study area from 2009 to 2014. The analysis of the map revealed that 2010 has the highest number of oil spill occurrence of 8, followed by 2012 with oil spill occurrence of 4. In 2009, oil spill occurred twice while in 2013 and 2014, the frequency of oil spill was one each. 50 metre and 500 metre buffer zones were created around the pipeline and field survey of the study area revealed that built up and farming activities have encroached into 500m and 50m right of way of the pipeline. Also, the magnitude of oil spill in Hayin Mahauta also contradicted that of the Niger Delta as the toxic effect of oil pollution and spillage of

biological species, water contamination and habitat disturbance posed great biochemical and ecological impact (Akpomuvie, 2011).

Findings

The researcher obtained information from the community head, about the frequencies and extent of damages done by Oil spills incidents 2016-2017 in the study area, during survey phase. (See **Table 4.2. for more details)**

Table 4.2: Oil spill incidents 2016-2017 in Hayin Mahauta community Giwa LGA of Kaduna State.

DATE OF INCIDENT	CAUSE OF OIL SPILL	TYPE OF PRODUCT	EXTENT OF DAMAGE DONE	LOCATION
17/6/2016	Third-party interference	Refined product (PMS)	Surface water and farm land	At km 31.4
24/6/2016	Third-party interference	Refined product (PMS)	Surface water and farm land	At km 31.4
30/1/2017	Pipeline rupture	Refined product (PMS)	13 wells impacted with oil spill	At km 31.5
16/2/2017	Pipeline rupture	Refined product (PMS)	2 wells impacted with oil spill	At km 31.5

Source: Researcher field findings, 2017-2018

4.3. THE ROOT CAUSES OF OIL PIPELINE RUPTURE IN THE STUDY AREA

Table 4.3: Causes of oil pipeline rupture in the study area.

Root Causes	Number of respondents	Percentage
Third-party interference	8	26.7
Pipeline ageing	11	36.7
Corrosion	6	20
Inadequate design	2	6.6
Natural disaster	3	10
Total	**30**	**100**

Source: Field work, 2017-2018

Table 4.3**:** above shows the perception of respondents on the main root causes of oil pipeline rupture in the study area. The research analysis indicates that majority of the respondents 11 (36.7%) said pipeline ageing is the root cause of pipeline rupture. followed by Third-party interference with 8 (26.7%), Corrosion with 6 (20%). While natural disaster and inadequate design with 3 (10%) and 2 (6.6%) respectively. Therefore, the main root cause of pipeline rupture in Hayin Mahauta community is pipeline ageing based on in-depth interviews with key informants.

The question was also asked from participants during focus group discussion session held within the community, whether they are aware of the root causes of oil pipeline rupture in their community. Majority of the respondents said they don't have knowledge on the root causes of oil pipeline rupture, while other participants said it is the results of third- party interference (vandals), corrosion, and environmental factors and it was also observed during the field survey that most of the pipelines which passes through the community are visible as a result of soil erosion which led to interference by third-party **(See Plate 2 for unbury oil pipeline).**

Discussion of finding

The root causes of oil pipeline rupture in Hayin Mahauta contradicts the root causes oil pipeline rupture/spill in Niger Delta region of Nigeria as stated by Adejoh, (2014). In his research analysis of the petroleum Pipeline spillages in the region of the Niger Delta, he found out that oil pipeline spills are cause by oil well leakage 13%, pipeline related sources 67%, reservoir/tanker related sources 13%, facility failure/ ageing 17%. He used the similar method of generating data for the study as used in this study. It also contrary to the causes of oil spillage in Niger Delta region of Nigeria as state in the findings of the Oyebamiji and Adekola (2013). In their research on the Effects of oil Spillage on community Development in the Niger Delta region, they found out that sabotage takes up to 80 % and operational failure 20%. The instruments used for their data collection in their study were the questionnaire, focus group discussions and field observation.

4.4. THE EFFECTS OF OIL PIPELINE HAZARD IN THE STUDY AREA.

4.4.1 Effects of oil pipeline rupture within Hayin Mahauta Community

Figure 4.1**:** below indicates that Water pollution is the main effect of oil pipeline spill hazard the community faced. It has the highest number of the respondents12 (40%) followed by Soil contamination with 8 (26.6%) of respondents, Impacted vegetation has 5 (16.7%), while soil erosion and fire/explosion constituted 4 and 1 respondents each (13.3%) and (3.3 %) respectively. Based on in-depth interviews results, the community becomes vulnerable to water pollution as a result of persistence pipeline rupture. In addition, during focus discussion sessions held within the community, most of the households attested that they avoid drinking water from their wells as a result of its being polluted by oil spill. They have no alternative than to go to the

neighboring communities to source for water for consumption and other domestic activities especially during dry season. **(Refer Plate 1 for polluted well).**

Discussion

The effects of oil pipeline as a result of pipeline rupture in Hayin Mahauta community also contradicted the main effects of oil spill in Niger Delta region of Nigeria as discovered by Adejoh, (2014). In his research analyses of the Petroleum Pipelines Spillages on the Environment of the Niger Delta Region of Nigeria, the following were found to be the main effects of oil spill hazard on their environment:

i. Water pollution from leaking pipes
ii. Explosion of pipes resulting from vandalism/ and/ or sabotage
iii. Destruction of seabed by dredging for pipeline installation
iv. Occasional cause of erosion and flooding
v. Destruction of environmentally sensitive estuaries wet lands.

He used same method for acquiring data such as focus group discussion in-depth interviews and field observation, also same method of data analysis.

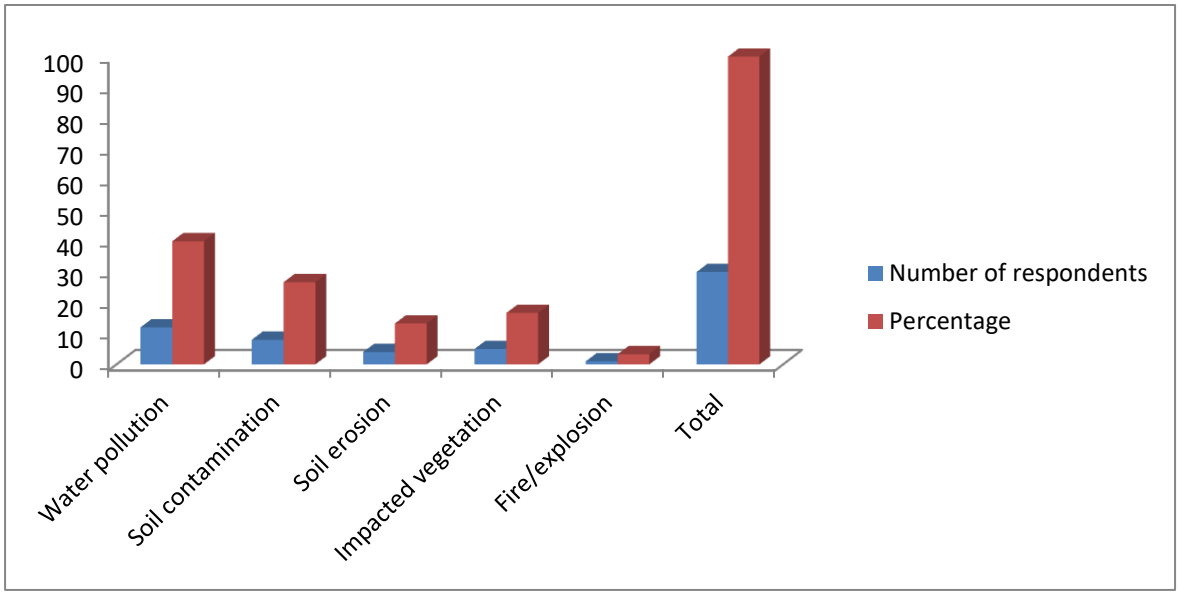

Figure 4.1: Effects of oil pipeline rupture within Hayin Mahauta Community.
Source: Field work, 2017-2018

4.4.2: Groups/People most vulnerable to the oil pipeline rupture in Hayin Mahauta Community

Figure 4.2**:** below shows the group/ people most affected by the oil spill hazard as a result of pipeline rupture within the community. The research analysis indicates that children below five years of age have the highest number of the respondents 12 (40%), followed by children six to seventeen years of age with 8 respondents (26.7%), child bearing mothers has 6 respondents, (20%) while eighteen years and above with 4 respondents (13.3%).Based on interviews result obtained, it shows that children within the age of five are more vulnerable to oil spill hazard as a result of pipeline rupture. Also, during focus group discussion session held in the community, most of the households attested that children below five years of age are more at risk of the danger because they always show signs and symptoms of water borne diseases.

Discussion

The group/ people affected by the oil spill hazard as a result of pipeline rupture within Hayin Mahauta Community contradicted to the people daily affected in developing countries as a result of oil pipeline rupture. Discovered tby Nwidu et al. (2008), over 50,000 people die daily due to water borne diseases as a result of oil pipeline spill and the mortality in children under five years from water related diseases annually is estimated to be about 4 million in developing countries. The health of the inhabitants of a community depends solely on the quality and quantity of water available Water pollution has direct relationships with civilization, industrialization and standard of living of the people (Goel, 2006). When all these are affected by pollution, the local economy of the people is seriously affected.

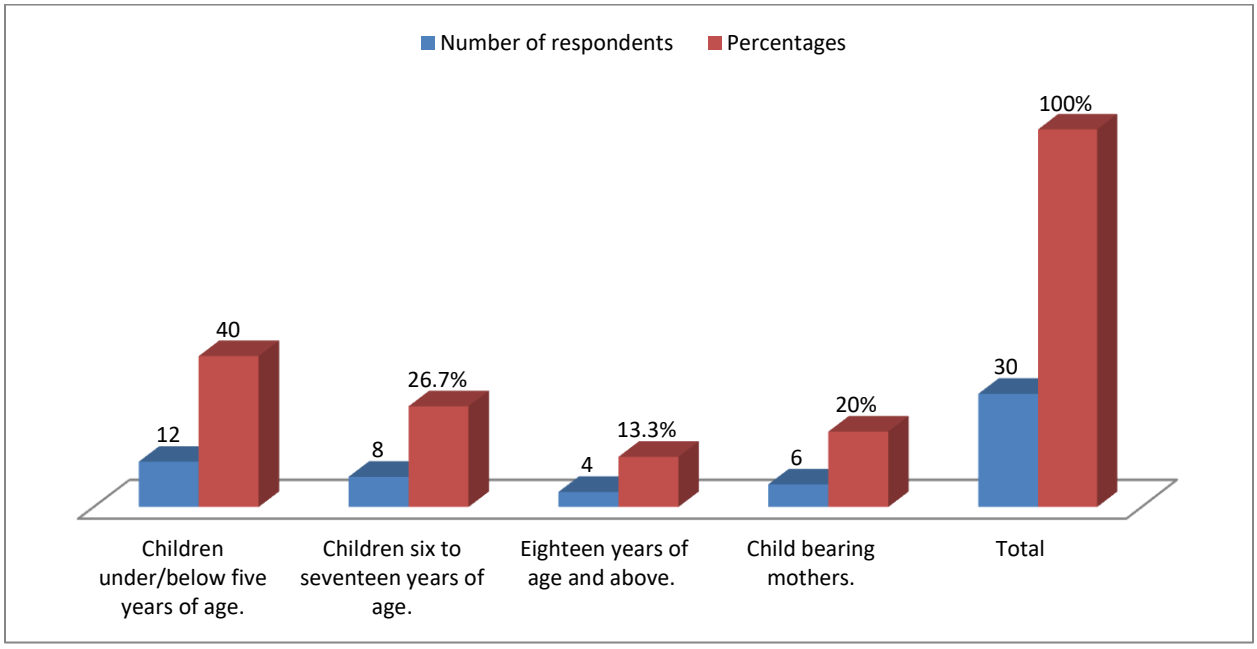

Figure 4. 2: Group/ people are most affected by the hazard of oil pipeline rupture in Hayin Mahauta Community.
Source: field work, 2017-2018

4.4.3: Effects of oil spills on source of water in Hayin Mahauta Community

Table 4.4: Effects of oil spills on source of water in Hayin Mahauta Community.

Effects on source of water	Number of Respondents	Percentages
Unfit for human consumption	14	46.7
Unfit for animal consumption	8	26.7
Unfit for bathing	6	20
Unfit for domestic activities	2	6.6
Total	**30**	**100**

Source: Fieldwork, 2017- 2018

Table 4.4: above shows the main effects of oil spill hazard on sources of water within Hayin Mahauta community. The research analysis indicates that "unfit for human consumption'' has the highest number of the respondents 14 (46.7%), followed by unfit for animal consumption with 8 respondents (26.7%), while unfit for bathing and unfit for domestic activities with 6 respondents (20%) and 2 (6.6%), respectively. Results of interviews obtained show water unfit for human consumption is the main effect of oil spill hazard in Hayin Mahauta community. **(See plate 1 for the main source of water)**.

Discussion

The effects of oil spill hazard on source of water as a result of pipeline rupture within Hayin Mahauta community are almost similar to the effects of oil spill on sources of water within villages in the Niger Delta region. According to Ereagha and Irughe (2009), the effects of oil spill and gas activities in the Niger Delta have posed great danger to the quality of the fresh water supplies in the region. The fresh surface water used by the local people has been significantly impacted by the oil spill and other chemicals used in oil and gas activities. Villages in the Niger Delta Region where oil spills and gas activities are ongoing rely on surface

freshwater for fishing, recreation, drinking and other domestic purposes. Poor people are vulnerable to environmental dynamics because social, political and economic exclusion indicates they are left with few choices where they live.

4.4.4: Effects of the oil spills on human health in Hayin Mahauta Community

Table 4. 5: Effects of the oil spills on human health in Hayin Mahauta Community.

Effects on Human Health	Number of Respondents	Percentages
Cholera	8	26.7
Diarrhea	11	36.7
stomach irritation	5	16.6
Skin ulcer	6	20
Total	**30**	**100**

Source: Field work, 2017-2018

Table 4.5: above shows the main effects of oil spill hazard on human health as a result of pipeline rupture within the community. The research analysis indicates that Diarrhea cases are the main effects of oil spill hazard on human health within Hayin Mahauta community. It has the highest number of respondents with 11 (36.7%), followed by Cholera cases with 8 respondents (26.7 %), while skin ulcer and Stomach irritation with 6 (20%) and (16.6%) respectively. Based on interviews result obtained shows the local residents are more vulnerable to diarrhea disease as a result of the main source of water was being polluted by oil spillage. Also based on observation during focus discussion session held in the community, most of their children show symptoms of malnourishment, while the adults show symptoms of rashes on their skin as a result of bathing and domestic activities with oil polluted water.

Discussion

The effects of oil spill hazard on human health as a result of pipeline rupture within Hayin Mahauta community also similar with the research carried out on the impact of oil spill hazard in developing countries which has direct relationship with the dwindling health status of the people in communities near oil reserves and are well documented Darkwah (2010). Oil spill and gas developments posed great risk to public health especially in developing countries as a result of the unsustainable manner used to harness the oil and the lack of information on health risks and petroleum hydrocarbon contamination to the local population. Petroleum hydrocarbons contaminate sources of water, food chains and are always present in the ambient air. Exposure to oil exploration and exploitation has caused cancer to population under 10 years in Ecuador (Darkwah, 2010). According to Kimerling (1994), significant amount of poly aromatic hydrocarbons and other harmful chemicals from oil spill and gas developments are found in water supply in Cofan community in Ecuadorian Amazon. These contaminants cause irreversible ailments ranging from cancer, skin rashes, and gastro-intestinal disorders, reproductive and neurological problems. Darkwah (2010) also reported birth defects among communities living close to oil reserves in Ecuadorian Amazon and deaths of people in Sudan who consumed contaminated water from oil fields. Women living close to oil fields have higher risk of spontaneous abortion and delivering of children with birth defects (Hurtig and Sebastian (2005).

4.4.5: Effects of the oil spills on the environment in Hayin Mahauta community

Figure 4.3**:** below shows the effects of oil spill on the environment within Hayin Mahauta community. The research finding indicate that soil contamination and impacted on vegetation have the highest number of the respondents 10 (33.4%), respectively, followed by Soil erosion and flood with 5 respondents each (16.6%) respectively. Based on interviews results obtained

shows soil contamination and impacted vegetation are the main effects Hayin Mahauta community faced on their environment as a result of oil pipeline rupture and this menace affect their main source of survival which is farming and rearing of animals. (See Plate 3 for land impacted).

Discussion

The effect of oil spills hazard on environment as a result of pipeline rupture within Hayin Mahauta community also similar to the effects of oil pipeline in the Niger Delta region of Nigeria. According to finding by Ogri (2001), the environmental effect of oil spill pollutions and exploitation activities on soils, farmlands, forests and water bodies have made the local community lose farmlands and fishing occupation which is their major source of livelihood. Large area of the mangrove ecosystem has been destroyed and this mangrove forest was in the past a major source of wood and income for the indigenous people. Land degradation is the major socio-economic impact as it affects crop yields, land productivity and income incessant oil spill in the past prompted resettlements of some local communities that are seriously affected. This alteration to the normalcy and state of the environment forced the locals to new ways of life

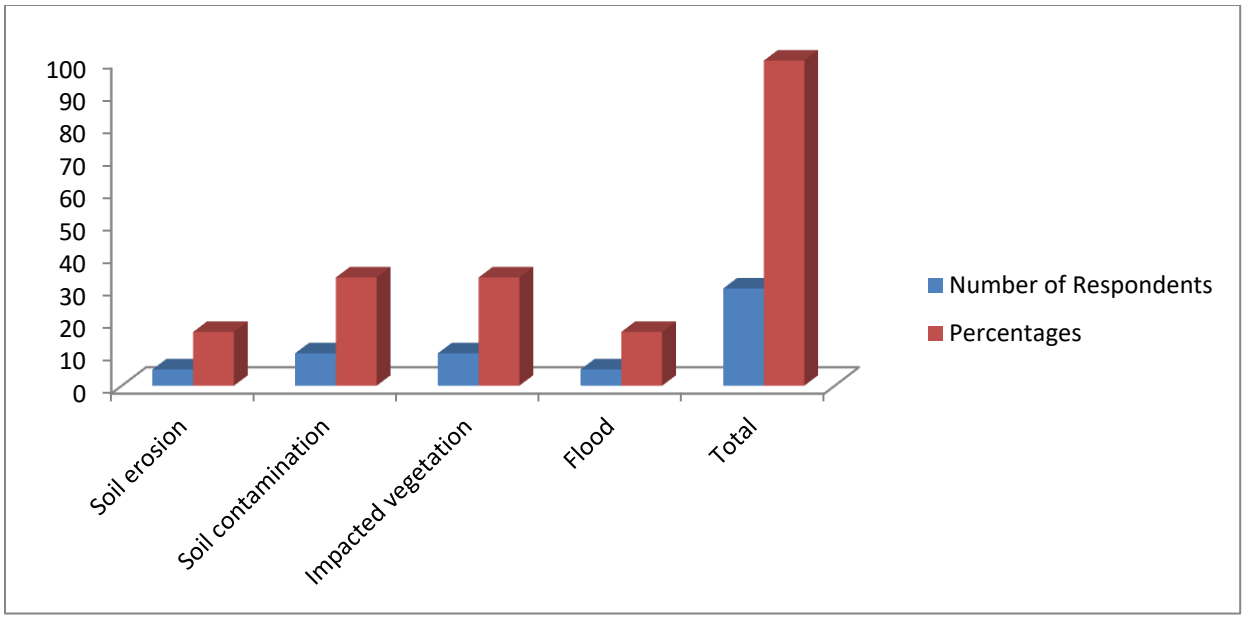

Figure 4.3: The effects of oil spill hazard on environment as a result of pipeline rupture within Hayin Mahauta community.

Source: Field work, 2017-2018

4.4.6: Effects of the oil spills on Agriculture in Hayin Mahauta community.

Figure 4.4 below shows the main effects of oil spill hazard on agriculture within the community. The research analysis indicates that reduced available land for agricultural activities has the highest number of the respondents with 12 (40%), followed by loss of Soil fertility/Nutrient with7 respondents (23.3%), unsuitable land for pastoral agriculture activities 6 respondents (20%), while destruction of soil quality/ shape, with 5 respondents (16.7%). Based on interviews results obtained, reduced available land for agricultural activities are the main effects Hayin Mahauta community faced as a result of pipeline rupture and it affects the outcome of agricultural produce negatively. Also, during focus group discussion session held with the local residents in the community, they all attested that food production output has declined annually within the community as a result of oil spill hazard effects.

Discussion

The effects of oil spill hazard on agriculture as a result of pipeline rupture within Hayin Mahauta community are almost similar to the effects of oil spill on agriculture in Niger Delta region of Nigeria. According to Okeagu et al. (2006), oil spill pollution from Royal Dutch Shell oil drilling, exploitation and transportation activities in Nigeria have destroyed thousands of acres of farmlands and some palm trees in the areas no longer bear fruits. Soil pollution in the areas affects the soil fertility and the physical degradation leads to reduced soil structure, aeration, water holding capacity and biological activities.

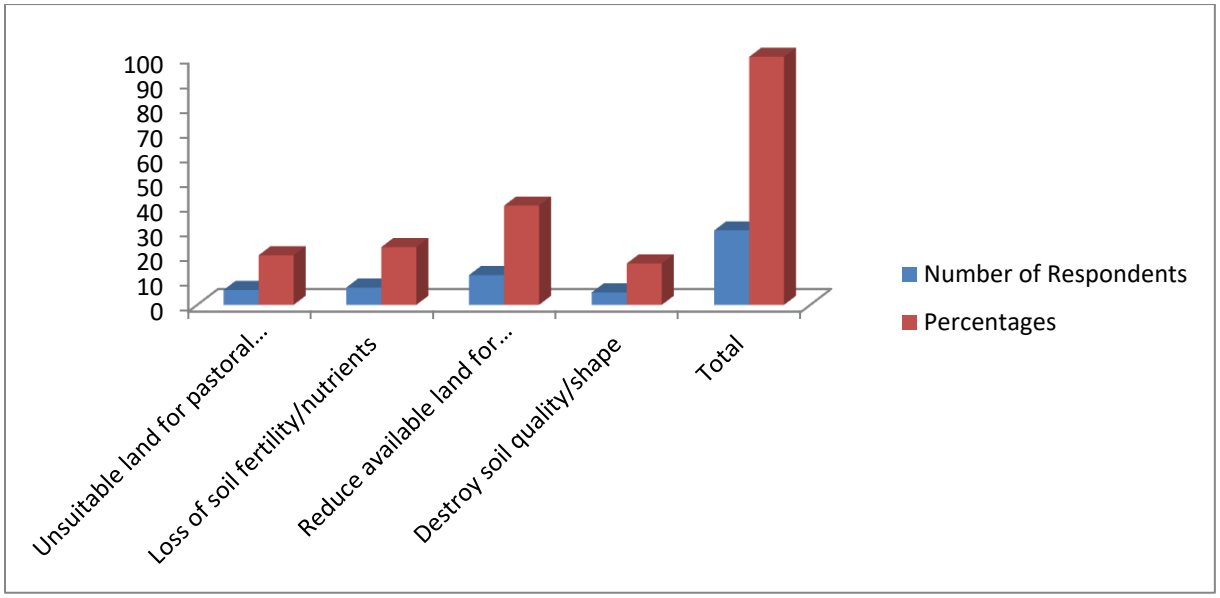

Figure 4.4: The effects of oil spill hazard on Agriculture as a result of pipeline rupture within Hayin Mahauta community.

Source: field work, 2017-2018

4. 4 .7: Effects of the oil spills on socio- economic activities in Hayin Mahauta Community.

Figure 4.5**:** below shows the main effects of oil spill hazard on socio-economic activities within the community. The research analysis indicates that decrease in food production has the highest number of the respondents with 10 (33.3%), followed by decrease in pastoral agriculture activities with 8 respondents (26.7%), while decrease in irrigation farming and decrease in fishing activities with 6 respondents (20%) respectively. Based on interviews result obtained, decrease in food production is the main effect of oil spill hazard on socio-economic activities in Hayin Mahauta community. During a focus group discussion session held in the community with the local residents, they lamented that usually they used to produce high quantity of vegetables during dry season, but of recent they are producing low quantity of vegetables as a result of oil spill effects on their source of water which they use for irrigation purpose.

Discussion

The effects of oil spill on socio- economic activities as a result of pipeline rupture within Hayin Mahauta community also contradict the finding of the effects of oil spill on socio-economic in Niger Delta region of Nigeria. According to Saliu et al. (2007), socio-economic disempowerment refers to the relative lack of access to the resources essential for self-production of livelihood. The socio- economic implication of oil spill pollution in the Niger Delta and the ensuing environmental degradation have made the people lose means of livelihood leading to many socio-cultural impacts that can be seen in increasing cost of living, poverty, poor social welfare performance, unemployment, increase in social vices (mainly prostitution and crimes), state violence and suppression, communal conflict and wars and, youth militancy and hostage takings which are of major social concern. The violence election experienced in the Niger Delta in 2015

and 2016 are also a social cost of oil spill and gas developments. The people jostle for political positions in order to control the oil wealth.

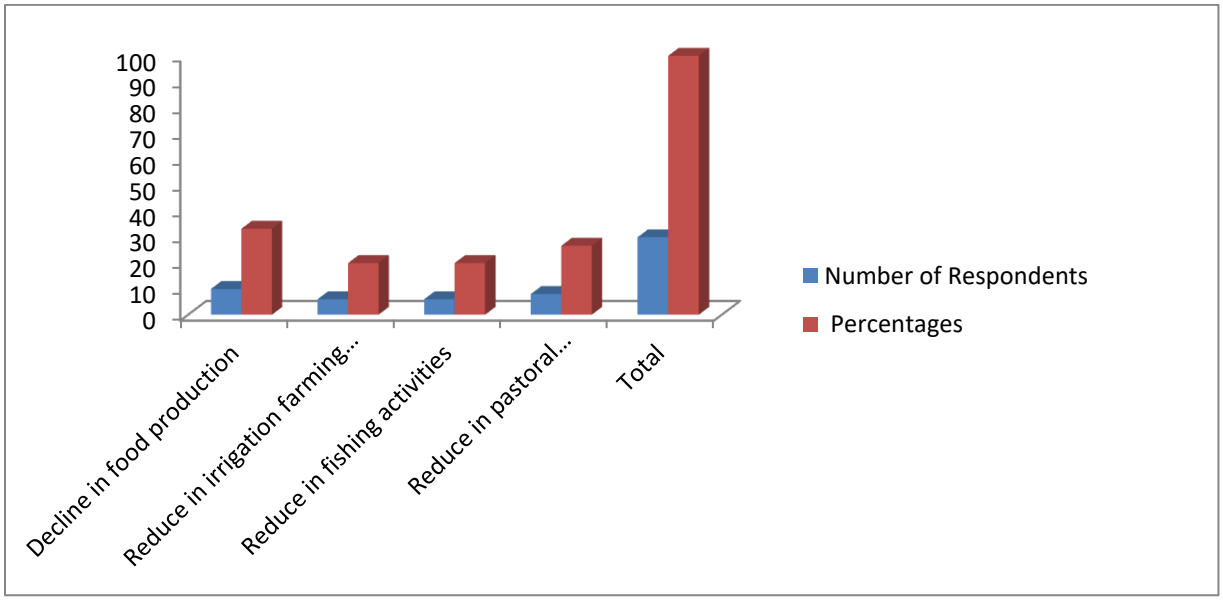

Figure 4.4: effects of oil spill hazard on socio- economic activities in the study area. Source: Field work, 2017-2018

4.5 COPING STRATEGIST ADOPTED BY THE PEOPLE IN HAYIN MAHAUTA COMMUNITY.

4.5.1: Distribution of sources of water within Hayin Mahauta community

Figure 4.6: below shows the sources of water within the community, The research analysis indicates that well has the highest number of the respondents with 22 (73.3%), followed by borehole with 5 respondents, (16.7%), while Stream and Tap (pipe borne) with 3 respondents (10%) and (0%) respectively. Results of the interviews obtained and field observation shows that well is the main source of water within Hayin Mauta community, which means the community does not have coping capacity to curb water borne related diseases.

Finding

Also, during focus group discussion session held within the community on issue of any benefits the community gained from oil pipeline rupture, they lamented no any benefits derived from oil pipeline rupture. Rather, they impose danger and constraints on interactions and when located close to houses, farmland and streams, they are potentially hazardous to the habitants. The local community attested that they are neglected by the relevant authorities despite for the negative impact on their sources of water, environment and health. The community see little in the form of compensation from the appropriate authorities. Residents further stated that PPMC dug two boreholes within the community and promised to dig additional one borehole and to pay compensation for the damages done by oil spillage which was polluted their wells, the main source of water. Unfortunately, the PPMC failed to fulfill their promises. Also, the borehole earlier provided was not in good working condition.

On the other hand, through in-depth interview with NOSDRA officials and environmental/community health officers on the issue of compensation as a result of damages by oil spilled on the environment. In responding, only properties impacted outside the PPMC Right Of Way are eligible for compensation, but those within the Right Of Way are not eligible. According to the NOSDRA officials said standard PPMC Right Of Way, the distance between oil pipeline and the community settlement should be 15 meters from the left and 10 meters from the right.

Discussion

The main source of water within Hayin Mahauta community which is wells, is contrary to the main source of water in Karatudu /Romi in Chukum local government area of Kaduna State.

According to Augustine finding (2005), the main source of water is river that passes through their community. The water sources have been contaminated by chemical waste released from the Kaduna Refinery and Petrochemical Company (KRPC). The water which stinks offensively has affects irrigation farm lands and killed aquatic life, particularly fish in the river. Also discovered that the community has no access to clean water for drinking. They cannot wash their clothes because they use water from the river which have being contaminated. Rather, they purchased water from vendors which cost about N4, 000 in a week for the family. Also, the bitter leaf and other vegetables they planted in their garden along the river site have being destroyed by chemical waste.

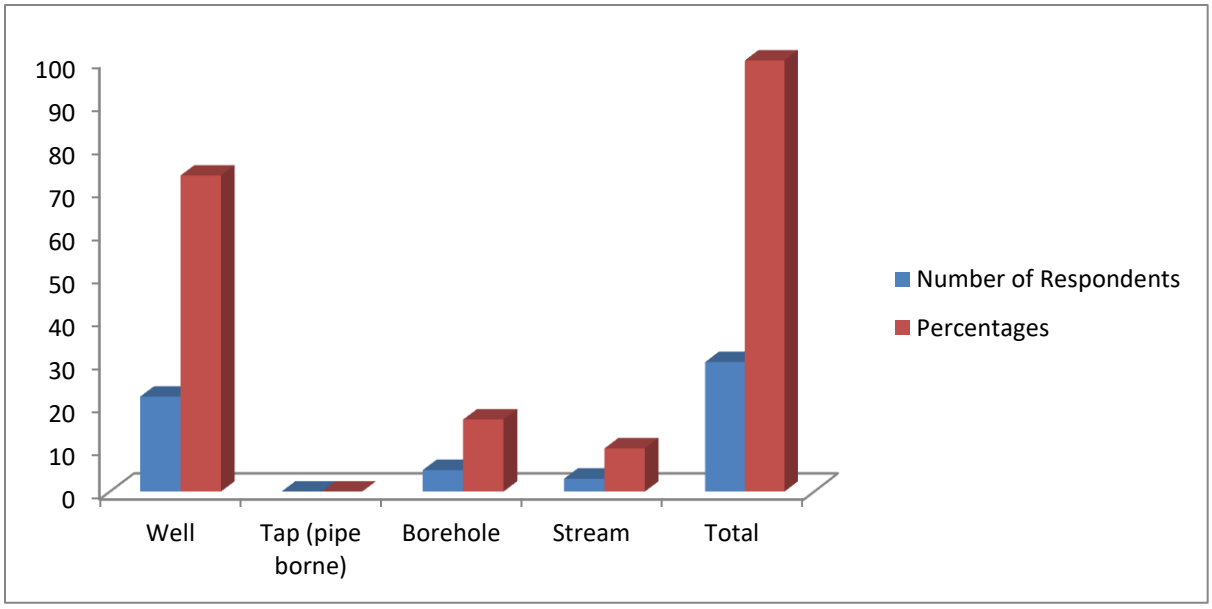

Figure 4.6: The distribution of sources of water in Mahauta community.

Source: Fieldwork, 2017- 2018

4.5.2: The main sources of livelihood in Hayin Mahauta community

Figure 4.7: below shows the main sources of livelihood within the community. The research analysis indicates that crop farming has the highest number of respondents 15 (50%), followed

by rearing of animals with 10 respondents (33.3%) while fishing and Trading with 3 respondents (10%) and 2 (6.7%) respectively. Results of interviews obtained show crop farming is the main source of livelihood within Hayin Mahuta community and the local resident does not have coping capacities to containment the oil spillage on their environment.

Discussion

The main sources of livelihood within Hayin Mahauta community are almost similar to the sources of livelihood in Niger Delta Region. According to Onwuka (2005), the Niger Delta Region is known for fertile agricultural lands, rivers, lakes, creeks and forests. The local communities depend solely on this environment which makes them farmers, fishermen, hunters and forest gatherers. Land supports farming while rivers are indispensable resource for fishing and recreation. However, environmental abuse, in the form of seismographic blasting from the oil companies, petroleum fires, oil spillages and gas flaring damages the fertility of the soil, destroys wildlife and the breeding grounds for marine fish because of the toxicity of oil and gas. Criss-crossing of surface oil pipelines makes the lands economically useless for farming and irrigation and then makes it impossible and dangerous for people to undertake economic activities on it.

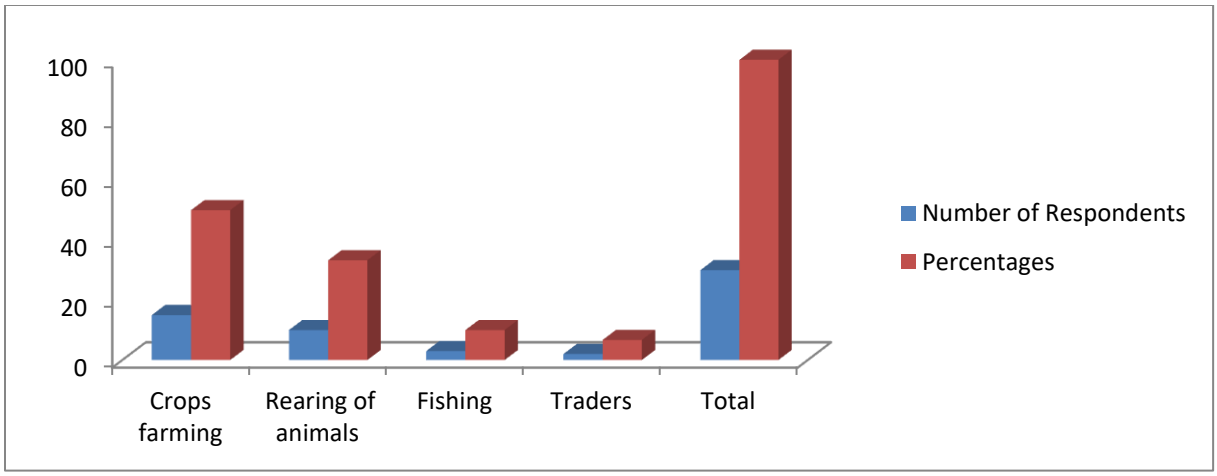

Figure 4.7: The main sources of livelihood within the Hayin Mahauta community
Source: field work2017-2018

4. 5. 3: Sources of Power/energy in Hayin Mahauta Community

Figure 4.8: below shows the sources of power/energy within the community. The research analysis indicates that Lantern has the highest number of the respondents 22 (73.3%). followed by touch light with 5 respondents (16.7%) while generator and solar with 3 respondents (10%) and none (0%) respectively. Results from in-depth interviews obtained shows that lantern is the main source of power/energy within Hayin Mahauta community other sources of power have low respondents, which means the community defend solely on lantern as source power/energy and does not have access to social amenity and services. Also during focus group discussion session held in the community, local residents attested that they have solicited assistance from appropriate authority to supply power in the community, in order to improve their coping capacity but there's no positive response yet.

Discussion

The findings sources of energy/power in Hayin Mahauta community contradict the finding on sources of energy/power in Niger-Delta community. According to Okoji (2002), Operating oil companies in the Niger Delta embarked on a rural electrification but this become unusable and

abandoned after some years owing to neglect, lack of maintenance and funding. Some host communities do not receive such projects at all as community service by the companies' two refineries and a petrochemical plant operates nearby but the communities have no public services available including electricity, telephones, the people live in shanties and slums with dilapidated infrastructures.

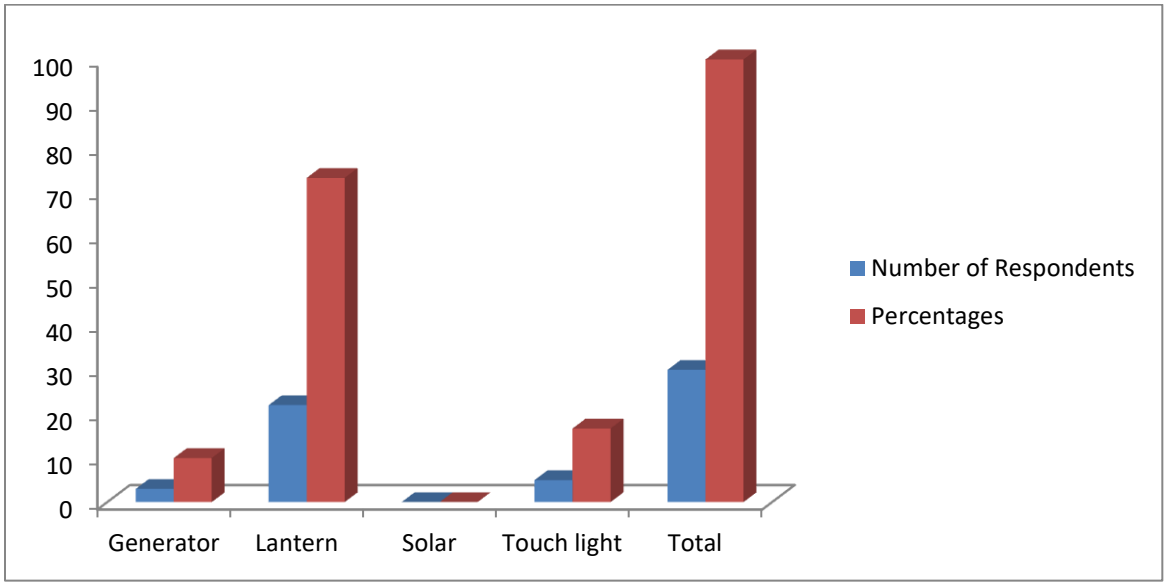

Figure 4.8: Distribution of the sources of power/energy in Hayin Mahauta community
Source: field work2017-2018

4.5.4: the distribution of health facilities in Hayin Mahauta community

Figure 4.9**:** below shows the available Health facilities within the community. The research analysis indicates that Patent chemist has the highest number of the respondents 22 (73.3%), followed by private clinics with 8 respondents (26.7%), while Primary Health care and Maternity clinic with respondents none (0%) respectively. Based on in-depth interview result obtained patent chemist and private clinics are the main available health facilities within the community, which are not sufficiency to attend to the community health need, and the community is prone to so many diseases as a result of effects of oil spill hazard.

Discussion

The findings on the sources of Basic and Social amenities such as health facilities in Hayin Mahauta community is in contradict on with sources in Niger-Delta Community, based on the findings by Okoji (2002). According to him Operating oil companies in the Niger Delta embark on a developmental projects for their host communities as their way of public participation. Unfortunately, such health clinics become unusable and are abandoned due to lack of maintenance and funding. This region has been blighted with inadequate social development indicators such as heath and health services delivery.

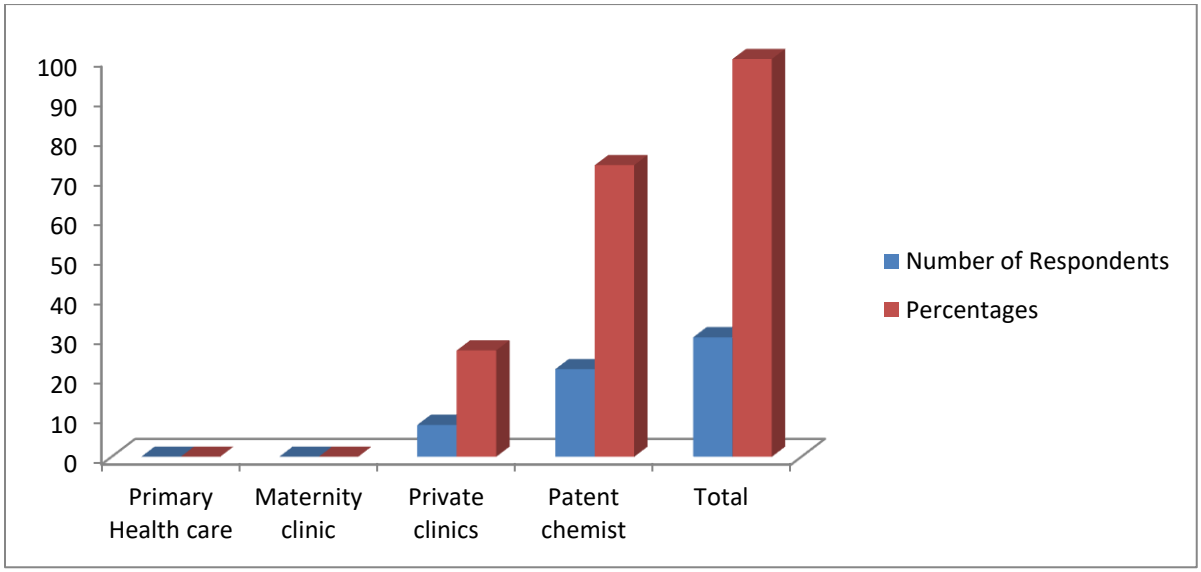

Figure 4.9: The Distribution of Health facilities in Hayin Mahauta community
Source: field work, 2017-2018

4.5.5: The distribution of schools in Hayin Mahauta community

Figure 4.10: below shows the available schools within the community. The research analysis indicates that Islamic school has the highest number of the respondents 17 (56.7%), followed by Primary 1-3 with 13 respondents (43.3%), while Nursery and Primary 4-6 respondents with (0%) respectively. Based on in-depth interviews results obtained shows Islamic schools and primary 1-

3 are the only available schools within Hayin Mahauta community. Therefore, the level of illiteracy is very high within the community and the local residents lack capacity to cope with conventional education challenges. Also at the focus group discussion session held within the community and the community leaders and households attested that they solicited assistance from the Local Government Education Authority through Local Government Council to upgrade their Primary school from class 3 to class 6 to enable their wards to complete their primary education within the community in order to enhance their coping capacity in education sector but there's no positive result yet.

Discussion

The sources of Basic services such as school condition within Hayin mahauta community are almost similar in Niger Delta communities According to Okoji (2002), Operating oil companies in the Niger Delta embark on a developmental project for their host community as their way of public participation. Unfortunately, these projects such as schools and rural electrification become unusable and abandoned after some years owing to neglect, lack of maintenance and funding. Some host communities do not receive such projects at all as community service by the companies. Two refineries and a petrochemical plant operates nearby but have no public services available including school services. Housing, infrastructural facilities and transportation have been inadequate. The people live in shanties and slums with dilapidated infrastructures.

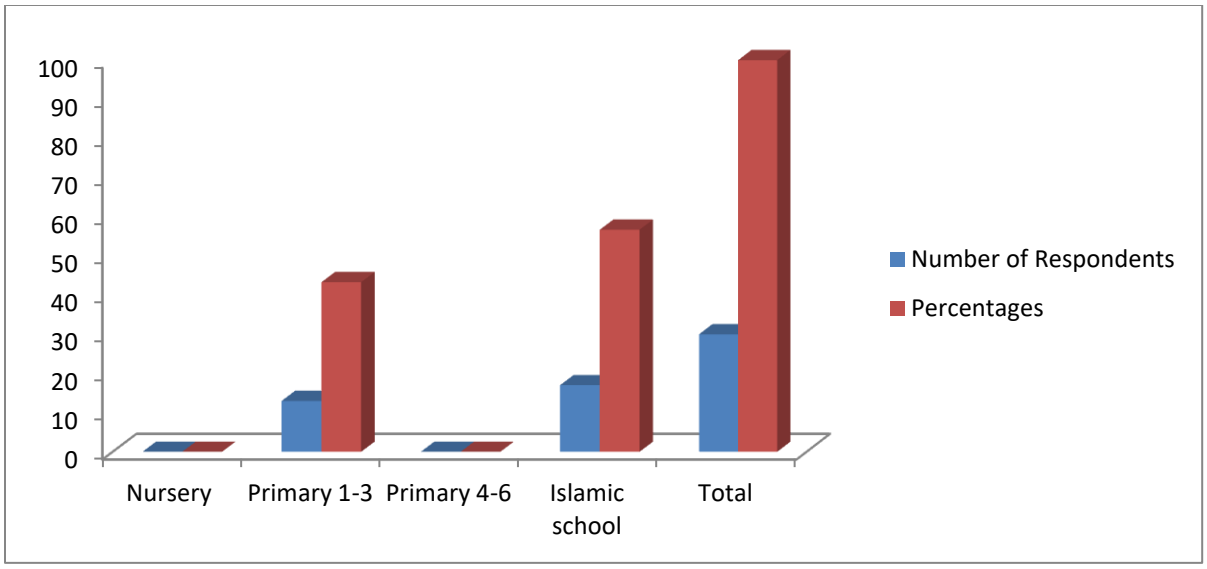

Figure 4. 10: The distribution of schools in Hayin Mahauta community.

Source: Field work, 2017-2018

4.6: MITIGATION MEASURES TOWARDS PIPELINE RUPTURE IN THE STUDY AREA.

This objective described the local residents' capacities put in place in the events of oil pipeline rupture/spill, during focus group discussion held within the community and the possible strategies/ measures to improve or enhance their coping capacity through recommendations by respondents during in-depth interviews in the community.

4.6.1: The mitigation measures the community put in place in the event of oil pipeline Rupture hazard.

Table 4.6: Response of the local residents on mitigation measures towards pipeline rupture

1.	The local residents used to avoid consumption of water from polluted wells, with 10 respondents (33.3%)
2.	They also avoid bathing and domestic activities with polluted water, With 8 (26.6%)
3	They avoid farming activities on contaminate soil, with also 8 (26.6%)
4.	"Avoid grazing animals from impacted vegetation, with 4 (13.3%)

Source: Field work, 2017-2018

The response of the local residents indicates that "avoid consumption of water from polluted Wells" has the highest number of respondents 10 (33.3%), followed by "Avoid bathing with polluted water" and "Avoid farming activities on contaminated soil" with 8 respondents each which have (26.7%) respectively, while "Avoid grazing animals from impacted vegetation with 4 respondents (13.3%). Based on the result obtained from the respondents avoiding consumption of water from polluted wells is the main mitigation the community put in place in events of oil spills hazard, these mitigation measures taken by local residents was considered inadequate because the community was already prone to water borne related diseases which has to be handled with care by appropriate authority, in order to secure human health and environment from negative consequences

Discussion

The possible mitigation measures the community put in place in the event of oil pipeline rupture within Hayin Mahauta community contradicts the mitigation measures in Niger Delta. According

to Omofonmwan and Odia (2009) to mitigate the impacts of the oil pipeline rupture and gas activities in the Niger Delta Region on the biophysical and social environments, measures to avoid impacts should be emphasized, as well as a description of how impacts that cannot be avoided will be minimized to the extent possible. The measures are Abnormal pressure monitoring scaring away of wildlife from affected area, exclusion zone established around the drillship, use of water-based mud, storage tank venting, water column turbidity should be minimized by maintaining the cutting shaker equipment, pipeline community awareness and use of underground pipelines. All hazard materials should be stored and disposed appropriately as well as minimization of pollutant releases and health survey of the residents.

4 .6 .2: The possible strategies / measures for improving local residents' capacities

Table 4.7: Response of the key informants in the study area.

1.	Periodic integrity test of oil pipeline to reduce rupture and spill with 10 respondents (33.3%)
2	Provide adequate security guard to curbs menace of vandalism with 6 (20%)
3	Regular sensitization training on oil spill response mechanism to the local residents. With 5 (16.7%)
4	Authority concerned should provide social service and social amenities to the community with 5 (16.7%)
5	Prompt continuous monitoring and evaluation of oil pipelines with 4 (13.3%)

Source: Field work, 2017-2018

The response to the in-depth interviews indicates that periodic integrity test of pipelines to reduce rupture has the highest number of the respondents with 10 (33.3%), followed by providing adequate security guard to curb vandalism with 6 (20%), regular sensitization training on oil spill response mechanism with 5 (16.7%), authority concern should provide social service and social amenities to the community with 5 (16.7%, while Prompt continuous monitoring and

evaluation with 4 (13.3%). Based on in-depth interviews result obtained, to the responses by the informants for improving local residents' capacities indicate that the people have to be given adequate priority attention by appropriate authority concern, in order to enhance their local capacities to curb the menace of oil spill hazard within their community. **(See Table 4.7 for more details)**.

Discussion

The possible strategic measures to improving local residents' capacities within Hayin Mahauta community are in contradiction with the possible strategic measures for improving local communities in Niger Delta Region. According to Omofonmwan and Odia (2009), providing a regular supply of potable/safe drinking water, health care facilities, accessible paved roads, educational facilities, (scholarships, vocational and skill acquisition centers), micro credit facilities, town hall and agricultural development and prompt sensitization training on oil and gas response mechanism.

4.6.3: Community participation in the training/ planning on oil spills hazard management measures with PPMC.

Table 4.8: Response of local residents towards training/planning on oil spills hazard management

1.Vulnerability capacity and Assessment training	The local residents attested that they have not participated in any training related to Vulnerability capacity and Assessment
2.Oil Spill Response Mechanism	They also said PPMC has not organized such training.to them
3.Public Health Education on Danger of Oil Spill	The local residents attested that authority concern has not been health educated them on danger of oil spill hazard
4.Hazard Risk Reduction Measures	The local residents does not aware of any information on hazard Risk Reduction measures

Source: Field work, 2017-2018

The participants attested that the community has never been involved in any of the following training/ planning of oil spill hazard management measures with PPMC such as oil spill response mechanisms, hazard risk reduction measures and public enlightens on danger of oil spill. That is the main reasons why Hayin Mahauta community became vulnerable to the danger of oil pipeline hazard. **(See Table: 4.8 for more details)**.

4.6.4: Community level of awareness towards locally formulated strategies for the management of oil spills hazards in the study area

Table 4.9: Response of the local residents towards level of awareness on formulated strategies

Water pollution	The local residents have not aware of local formulated strategies for the management of water pollution.
Soil contamination	They also attested that have been not aware of local formulated strategies for the management of soil contamination.
Cholera	The local residents have not aware of local formulated strategies for the management of cholera disease.
Diarrhea	They also attested that have been not aware of local formulated strategies for the management of Diarrhea.
Skin disease	The local residents attested that have not aware of local formulated strategies for the management of skin disease

Source: Field work, 2017-2018

Also, each of the participants attested during the focus group discussion session held in the community that they were never involved in any of the locally formulated strategies for the management of oil spill hazard/diseases that had becomes vulnerable in the study area such as water pollution, soil contamination, erosion, cholera, diarrhea and skin disease etc. and the community does not have access to Primary Health care facility for treatment in case of emergency health con6itions. **(See Table: 4.9 for more details)**.

The field observation findings show that the distance from Hayin Mahauta community to the Local Government Headquarters Giwa is 2 km and the mode of transportation to community is by road and in good condition even though the road is not tarred. During focus group discussion held within the community, it was confirmed from the community head that the community has been in existence for decade before PPMC installed their oil pipeline. Also based on in-depth interviews with National Oil Spill Detection and Response Agency officials, Community health practitioners, Environmental activists and Security officials reveals that weak enforcement of Rights Of Way (ROW), lack of regular enlightenment campaign on the danger posed by oil pipeline incidence, lack of constant surveillance and monitoring of oil pipeline by oil operators are the main factors that led to encroachment by farmers and human dwellings, thereby bringing people in close proximity to pipelines route. **(See Plate 6 for the group picture)**

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

This research was essentially conducted to assess the consequences of oil pipeline rupture within Hayin Mahauta community in Giwa Local Government Area of Kaduna State. The findings of the study revealed that Hayin Mahauta community has faced a lot of environmental challenges as a result of oil pipeline rupture/oil spillage. The result shows that pipeline ageing and third-party interference are the main root causes of pipeline rupture and the corresponding impact on the study area. Thus, impacting the main source of water in the study area such as wells and stream. Also, it was also discovered that their farmland and vegetation are impacted with oil spillage. It was also discovered that diseases such as cholera, diarrhea, and skin ulcer and stomach irritation were observed within the study population. The study revealed the absence of health care facility within the study area, makes it difficult to access medical care in the event of oil spills hazard. . Also, the study revealed that the community has no access to standard schools and good source of power, which lead to high level of illiteracy/ ignorance in the community. It was found that the community was never involved in any sort of sensitization or awareness that concerns oil spill hazard management measures. Generally, the findings of this study revealed that numerous factors contributed to cause of oil pipeline rupture/oil spillage within the community such as lack of periodic integrity test of pipelines to ensure that the integrity of the pipes is in accordance to set standards, lack of continuous monitoring and surveillance of pipelines and installations to guard against third-party interference. Inability of the oil operator to bury visible oil pipeline as a result of natural disaster or atmospheric condition leads to third-party interference with pipeline. It was also found out that the community currently

is vulnerable to oil pollution as a result of persistence pipeline rupture which usually occurs due to pipeline ageing and third-party interference. The local residents lack coping capacities on how to prevent or mitigate the effects of oil pipeline hazard. Thus, there is need for stakeholders to collaborate with the host community to ensure a safe environment. Therefore, the community is vulnerable to so many effects of oil pipeline hazard and corresponding impact on human health, plants and animals and they lack coping capacities to mitigate those hazards.

5.2 CONCLUSION

In conclusion based on this study findings, revealed that Hayin Mahauta community is vulnerable to oil pollution as a result of oil pipelines belonging to PPMC passes through the community, whenever pipeline rupture, oil spills in to the environment and affects both the surface and underground water. This is an important issue to be handled with great concern in order to protect and secure the environment and human health from all possible consequences of oil spillage as a result of pipeline rupture. There is need for the stakeholders to collaborate with the host community to ensure a safe environment. I therefore recommend community participation, simulation to increase community resilience and reduce vulnerability towards oil spillages in Hayin Mahauta community.

5.3 RECOMMENDATIONS

In view of the findings of this research, the following are recommended:

i. It is highly recommended that there should be periodic integrity test of pipelines to ensure that the integrity of the pipes is in accordance to set standards.

ii. There should be continuous monitoring and surveillance of pipelines and installations to guard against third-party interference, also to ensure that the Right Of Way (ROW) is not encroached

by the host community. This will minimize the high level of water pollution and farm land impacted within the community.

iii. It is also recommended that the relevant authorities should provide potable water to the community and all polluted wells should be flooded in order to avoid drinking polluted water, this is known to be the root cause of water borne diseases.

iv. There should be prompt remediation of impacted sites in the community to enhance plant recovery and the authority concerned should ensure that compensation is paid to those owners of farm land and wells which was impacted outside the Right Of Way (ROW) of PPMC as a result of oil pipeline rupture.

v. The authority concerned should provide basic and social amenities such as health facility, schools, good road and electricity with adequate equipment and personnel within Hayin Mahauta community in order to curb morbidity and mortality rate and also to improve their coping capacities.

vi. There is need for appropriate authority to sensitize the community on oil spill disaster response mechanisms. This will strengthen the local resident mitigation strategies and also improve coping capacities to curb the effects of oil spill hazards that may turn in to disaster.

vii. There is also need for PPMC to bury all the visible oil pipeline in the study area, which was occurred as a result of natural disaster. In order to curb the level of interference by vandals and atmospheric condition.

5.4 Contribution to knowledge

This work has contributed greatly in the aspect of knowledge to the entire Hayin Mahauta community and Giwa local government area. Prior to this, the local residents does not have knowledge on how to curb the incidents of oil spills with their local resources. This research work has enlightened the local residents and Giwa community on how to use their available local resources at hand to mitigate the consequences before seeking assistance from the appropriate authority. The researcher used participatory action research (PAR) the whole essence was to involve the community on how to collect the data and analyzed with them at same time the beneficiaries of the research outcome, and the result that are useful and meaningful to both the researcher and researched. The findings can serve as a reference document for subsequent research and studies, because it was first of its kind to be carried out within the community.

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APPENDIX

STRUCTURAL IN-DEPTH INTERVIEWS

Centre for Disaster Risk Management and Development Studies
Department of Geography and Environmental Management
Faculty of physical science
Ahmadu Bello University, Zaria

Dear Respondent,

I am a postgraduate student of the above name university, presently undertaking a research on *Assessment of the consequences of Oil Pipeline rupture within Hayin Mahauta community in Giwa L.G.A of Kaduna State*, in partial fulfillment for the requirement of the award of M.Sc. Degree in Disaster Management. Please your response to these questions is needed. The information you give will be used strictly for academic purpose.

Thank you for your cooperation.

SECTION A

CAUSES OF OIL PIPELINE RUPTURE IN THE STUDY AREA

- What do you think is the root cause of oil pipeline rupture within Hayin Mahauta community?
- What are the main effects of oil pipeline hazards that community faced as a result of pipeline rupture?
- What are the frequencies and magnitude of occurrences of the oil spill hazard within the community?
- Which group/ people are most affected by the oil spill hazard as a result of pipeline rupture?
- Was the community in existence before PPMC installed their oil pipeline?
- Are there any benefits the community gained from oil pipeline rupture?

SECTION B

EFFECTS OF OIL PIPELINE RUPTURE WITHIN HAYIN MAHAUTA COMMUNITY

What are the main effects of oil spills hazard on the following sectors as results of pipeline rupture within Hayin Mahauta community?

- Human health
- Environment
- Agriculture
- Socio-economic
- Source of water

SECTION C

COPING STRATEGIES ADOPTED BY THE PEOPLE IN HAYIN MAHAUTA COMMUNITY

- What is the access/mode of transportation to Hayin Mahauta community?
- What are the sources of water within the community?
- What are the sources of power/energy within the community?
- What are the main sources of livelihood within the community?
- What are the available Health facilities within the community?
- What are the available Schools within the community?

SECTION D

THE POSSIBLE MITIGATION MEASURES TOWARDS OIL PIPELINE RUPTURE IN THE STUDY AREA.

I. What is the possible mitigation measures the community put in place in event of oil pipeline spill hazard?

2. What are the possible strategies measures for improving local residents' capacities?

Thanks you for taking your time and putting your efforts to response to my interview questions.

Plate1**:** one of the polluted wells within Hayin Mahauta community as a result of oil pipeline rupture

Plate 2**:** unbury oil pipeline interference by third- party within Hayin Mahauta community

Plate 3**:** land impacted by oil spill as a result of pipeline rupture within Hayin Mahauta

Plate 4**:** showing opinion leader, security official, community head, researcher and youth leader

Plate 5**:** some of the local resident after focus group discussion within the community

Plate 6**:** Join investigation team comprises of NOSDRA official, PPMC official, KEPA official, Securities personnel during join investigation visit.