



**UNIVERSITI PUTRA MALAYSIA**

***ECONOMIC AND ENVIRONMENTAL IMPACT OF PIPELINE  
VANDALISM IN THE NIGER DELTA REGION***

**AHMED UMAR TUKUR**

**FEP 2017 18**



**ECONOMIC AND ENVIRONMENTAL IMPACT OF PIPELINE  
VANDALISM IN THE NIGER DELTA REGION**

By

**AHMED UMAR TUKUR**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra  
Malaysia, in Fulfillment of the Requirements for the Degree of  
Doctor of Philosophy**

**August 2017**

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## DEDICATION

*This work is dedicated to my Late father Umar Ahmed (Muqaddas Ndabala), my Late Mother Maryam Umar also my spouse Jamila and Children; Maryam, Ahmad, Hauwa'u, Fatima, and Faruq.*



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

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VANDALISM IN THE NIGER DELTA REGION**

By

**AHMED UMAR TUKUR**

**August 2017**

**Chairman : Professor Mohammad Shawahid Hajj Othman, PhD**  
**Faculty : Economics and Management**

The study investigates the factors that causes and influences crude oil pipeline vandalism in the Niger Delta region of Nigeria. It assess the impact of crude oil spill on the socioeconomic life of the people in the region, it's economic and environmental impacts. The study was able to achieve its three important specific objectives; to assess the factors that encourage oil pipeline vandalism in the Niger delta region; to design a compensation package most desirable for the Niger Militants and to aggregate the cost of oil pipeline vandalism in the Niger delta region. Both the EFA and CFA were employed in the analysis. The study also developed a compensation model for the militants using choice modeling. Finally the total cost of oil spill losses due to pipeline vandalism were also aggregated. To carry out the study, 269 respondents were selected comprising both militants and some stakeholders in the affected communities from the region for SEM analysis. Also, 300 respondents were selected for the choice models analysis. Both purposive and simple random sampling techniques were used in the selection process. For the first objective of the study, SEM was used and the results from the analysis indicates a significant relationship between poor governance, environmental degradation, poor management, weak legal factors having a significant relationship with crude oil pipeline vandalism and a significant but negative relationship with marginalization. For the second objective, CE was used, the results show the willingness to accept of the militants for a new improved compensation plan with less training allowance. For the third objective, it's revealed that, there is a high cost associated with oil pipeline vandalism, however, the cost can be reduced if the new package is adopted by the government. There is a significant relationship between reduction in land & water pollution intensity, improvement in infrastructural facilities provision and willingness to accept for lower training allowance by militants. There is significant cost associated with oil pipeline vandalism in the region. The following recommendations were offered: Structural improvement in the institutions of governance will be accompanied by a reduction in militancy in the Niger Delta

region; a better compensation package accompanied by will to effective implementation can significantly reduce the activities of militancy, hence reduction in pipeline vandalism and oil spill and environmental degradation; The high cost associated with vandalism can be reduced to its minimum level if accompanied by effective public policy implementation.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

**KESANNYA EKONOMI DAN ALAM SEKITAR VANDALISME TALIAN  
PAIP DI RANTAU DELTA NIGER**

Oleh

**AHMED UMAR TUKUR**

Ogos 2017

**Pengerusi : Profesor Mohammad Shawahid Hajj Othman, PhD**  
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Kajian ini memeriksa faktor-faktor yang mempengaruhi dan menyebabkan vandalisme terhadap paip minyak mentah paip di rantau Niger Delta, Nigeria. Ia menilai kesan tumpahan minyak mentah kepada sosioekonomi rakyat, kesan ekonomi dan alam sekitar di rantau ini. Kajian ini telah berjaya mencapai tiga objektif khusus yang penting; Untuk menilai faktor-faktor yang menggalakkan vandalisme terhadap paip minyak mentah paip di rantau delta Niger dan Untuk merangka pakej pampasan yang paling wajar untuk Militan Niger. Untuk mengagregat kos terhadap vandalisme paip minyak mentah di rantau delta Niger. Analisis ini menggunakan kedua-dua EFA dan CFA. Kajian ini juga membangunkan model pampasan bagi militan menggunakan model pilihan. Kesimpulannya, jumlah kos kerugian tumpahan minyak mentah kerana vandalisme terhadap saluran paip juga dikumpulkan. Untuk menjalankan kajian ini, 269 responden telah dipilih yang terdiri daripada kedua-dua kumpulan militan dan beberapa pihak berkepentingan dalam masyarakat yang terjejas dari rantau ini untuk analisis SEM. Juga, 300 responden telah dipilih untuk analisis model pilihan. Kedua-dua teknik persampelan rawak bertujuan dan mudah telah digunakan dalam proses pemilihan. Bagi objektif pertama kajian, SEM telah digunakan dan hasil daripada analisis menunjukkan hubungan yang signifikan antara tadbir urus yang lemah, kemerosotan alam sekitar, pengurusan yang lemah, faktor undang-undang yang lemah mempunyai hubungan yang signifikan dengan vandalisme terhadap paip minyak mentah dan hubungan yang signifikan tetapi negatif dengan peminggiran. Bagi objektif kedua, CE telah digunakan, keputusan menunjukkan kesediaan untuk menerima kumpulan militan untuk pelan pampasan yang lebih baik baru dengan elaun latihan kurang. Bagi objektif ketiga, ia mendedahkan bahawa, terdapat kos yang tinggi yang berkaitan dengan vandalisme terhadap paip minyak mentah, bagaimanapun, kos boleh dikurangkan jika pakej baru itu yang diguna pakai oleh kerajaan; Terdapat hubungan yang signifikan di antara pengurangan tanah & pencemaran air, kekuatan, peningkatan dalam peruntukan kemudahan infrastruktur dan kesediaan untuk

menerima elaun latihan yang lebih rendah oleh militan; terdapat kos yang berkaitan dengan saluran paip minyak vandalisme di rantau ini. Cadangan-cadangan berikut telah ditawarkan: peningkatan struktur dalam institusi tadbir urus akan diiringi oleh pengurangan militan di rantau Niger Delta; Satu pakej pampasan yang lebih baik disertai dengan kehendak untuk pelaksanaan yang berkesan boleh mengurangkan aktiviti militan, oleh itu pengurangan dalam perancangan vandalisme, tumpahan minyak dan pencemaran alam sekitar; Kos yang tinggi berkaitan dengan vandalisme boleh dikurangkan ke tahap minimum jika disertai dengan pelaksanaan dasar awam yang berkesan.





## ACKNOWLEDGEMENTS

All thanks and praises are due to Allah (swt) for granting me the privilege to acquire this prestigious degree from a prestigious university, UPM. First and foremost, I would like to extend my profound gratitude and appreciation to the Chairman, thesis supervisory committee, Professor Dr. Mohammad Shahwahid Hajj Othman, for his wonderful contribution to the success of this thesis. This research work wouldn't have been a reality without his continued guidance, patience, and valuable suggestions. I am highly indebted to his benevolence and support.

I would also like to appreciate the contributions made by members of my supervisory committee; Professor Dr. Khalid Abdul Rahim and Associate Prof, Dr. Abdul Rahim Abdul Samad. Their professional comments and advices have contributed immensely to the success of this work. My sincerest gratitude goes to the staff of faculty of economics and management UPM, for their valuable contribution to my scope of knowledge. I would also like to thank Associate Professor Dr. Alias Radam for his valuable contribution. His willingness to share his knowledge is really appreciated.

My gratitude also goes to the management of MAUTECH for giving me the opportunity to further my studies. My appreciations goes to Prof A.Y Ribadu, Prof B.H. Usman, Prof M. Kyari, Prof B. Aliyu, Assoc. Prof H. Lawan and MAUTECH Registrar Mallam I.A. Ribadu. My profound gratitude goes to TETFund for financing this research study. Also my gratitude goes to NNPC, NOSDRA and Amnesty stakeholders and various support extended to me from Niger delta region during my study. Especially my gratitude goes Mr Samson Graham Dobbey, Mr Philip, Mr Royal Miss Ini, Presidor, Mr Smart and Mrs Gift.

The sacrifices, supports, patience and endurance exhibited by my family, relatives and friends throughout the duration of this study cannot be forgotten. Specifically my sincerely appreciations goes to Dr S.U. Jen, Dr A.S. Yahya, Dir U.Y. Abba, Dr I.B. Hassan, Dr M. Donga, Dr S.H. Zummo, Alh S.A. Lawan and H.A.Y Balami, M.A. Ardo, Alh. A. Gurin (Allah cenido yafumo, ameen) for their sincere and valuable support throughout my study period.

My deepest appreciation also goes to Professor William Greene of New York University for his response to my emails.

I certify that a Thesis Examination Committee has met on 1 August 2017 to conduct the final examination of Ahmed Umar Tukur on his thesis entitled "Economic and Environmental Impact of Pipeline Vandalism in the Niger Delta Region" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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## LIST OF ABBREVIATIONS

NNPC	Nigeria National Petroleum Corporation
MND	Ministry for Niger Delta
OMPADEC	Oil Mineral Producing Area Development Commission
NOSDRA	National Oil Spill Detection and Response Agency
EIA	Energy Information Administration
NDDC	Niger Delta Development Commission
CM	Choice Modelling
CE	Choice Experiment
SEM	Structural Equation Modelling
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
BPD	Barrel Per Day
MBPD	Million Barrels Per Day
OPEC	Organization of Petroleum Exporting Countries
PIB	Petroleum Industry Bill
NDA	Niger Delta Avengers
ATM	Automated Teller Machine

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the Study

Nigeria is a rich oil producing country with an estimated 33 billion barrels of oil reserves, 163 trillion cubic feet of gas, abundant biodiversity and wildlife (Omotola, 2009). While EIA (2012) estimates puts the figure higher to 37 billion barrels in oil and 180 billion cubic feet of gas reserves respectively. The country generates well over \$36 billion from oil exports to the international market. However, recent figures indicates that Nigeria produces far less than its organisation of petroleum exporting countries (OPEC) quarter of 3 million barrels per day (mbpd), mainly due to oil pipeline vandalism mostly carried out by the militants (Raji & Abejide, 2013; EIA, 2012 and Omotola, 2009). The militants resorted to vandalism, oil bunkering, and kidnapping of oil workers to capture world attention on their struggle to achieving the objective of emancipating their region from environmental degradation and neglect by the multinational oil companies and the government.

NNPC (2012) observed that, despite having an OPEC quota of 3million bpd, frequent attacks on oil facilities have forced oil production to fall by 25% for years. Particularly oil production dropped to its lowest level of 1.75million bpd in 2009. This has resulted to the then government to propose an amnesty programme for the militants which was eventually signed in 2009. The amnesty deal has reduced oil pipeline vandalism to its minimum levels from 2009 – 2010, (EIA, 2012). In addition, it provides room for the establishment of the Ministry for Niger delta and the amnesty training programme for the ex-militant. However, by 2011 attacks on oil facilities by the militants have resumed and became more severe which many attributed to the failure of the amnesty programme.

#### 1.1.1 Militancy in the Niger delta region

Militancy in the Niger delta region can be traced to agitation by the oil producing communities for better environmental conditions, improved economic wellbeing of the oil producing communities, more financial resource allocation and control to the region. The inability to achieve the above, let to the formation of the re-known militias in the region which includes: The Niger Delta People's Volunteer Force 2007 (NDPVF) 2007; Movement for the Emancipation of the Niger Delta (MEND) 2005; and Niger Delta Vigilante (NDV). Given the financial strength of the militants groups, community, international support and recognition accorded to them as agitators for a better Niger delta, they continued to attack oil pipelines without much difficulty. However, they employ various means that are outside acceptable norms in an attempt to achieve their presumed stated political, economic and environmental demands. These include vandalism, kidnapping of oil workers, killing of military &

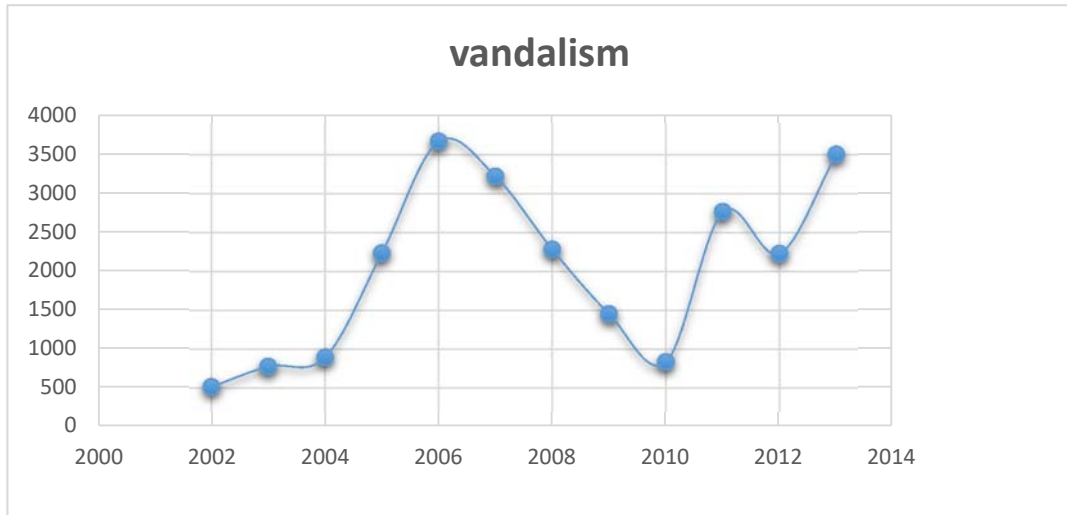
other security personnel sent to the region to protect oil pipelines and fight pipeline vandals (Omotola, 2009; Orogun, 2009).

Furthermore, the militants significantly reduced oil production from the region to 700,000bpd from 2.2mbpd until amnesty was granted in 2009. Under the amnesty programme the militants have reached an agreement with President Umaru Musa Yar'adua to lay down their arms struggle and embrace dialogue with a promise of better environmental management and economic development of the region. However, the death of President Yar'adua resulted to a dramatic change in the amnesty programme implementation despite the fact that, the vice president, Goodluck Johnathan (an Ijaw from Niger delta) who became the next president is from Niger delta region failed to keep to the terms of the amnesty programme. Corruption and lack of delivery of promises signed under the amnesty programme led to increased attacks on oil pipelines by the militants with increased economic losses of up to 300,000 bpd from 2012 to 2015.

Youth militancy is considered a responsibility and cut across ages, educational qualification and status among the youth in the region. Meetings involved all Ijaw youths in the communities where a number of decisions, including shutting down of oil wells and areas to be vandalized are usually discussed. Most of them believe that violence is the only language, both the government and oil companies understand (Oluwaniyi, 2010).

### **1.1.2 Economic and Environmental Impacts of Oil Spill in the Niger delta region**

There are number of oil spill sources in the Niger delta region however, spill from pipeline vandalism is (mostly carried out by militants) considered most severe and worrisome. It involves a deliberate attacks on oil pipelines for the purpose of achieving some presumed economic and political objectives. Attacks on oil pipeline a times causes significant amount of losses running into thousands of metric tonnes of oil, polluting farmlands, forcing companies to halt production and sending price shocks to the international oil markets (Anifowose, Lawler, van der Horst, & Chapman, 2012 and NNPC, 2013) see figure 1.1. In addition, statistics have shown that Nigeria have experience 18,968 cases of vandalism related incidences of pipeline, out of that 18,665 (ie 98.40%) are as a result of pipeline vandalism, while 303 (i.e. 1.60%) due to pipeline rupture (NNPC, 2011). These problems continued to rise despite concerted efforts from the government and oil companies to bring the situation under control.



**Figure 1.1 : Pipeline Incidences of vandalism 2002-2013** (Source: NNPC, 2013)

Figure 1.2 also shows that Nigeria loses up to 3,462.81 metric tonnes of oil valued at ₦ 177.975m. This figure continued to rise over the years especially, with the renewed attacks on oil pipelines by the militants from 2012 to (See figure 1.1) due to renewed hostilities between the government and the militants despite the amnesty programme (NNPC, 2012).

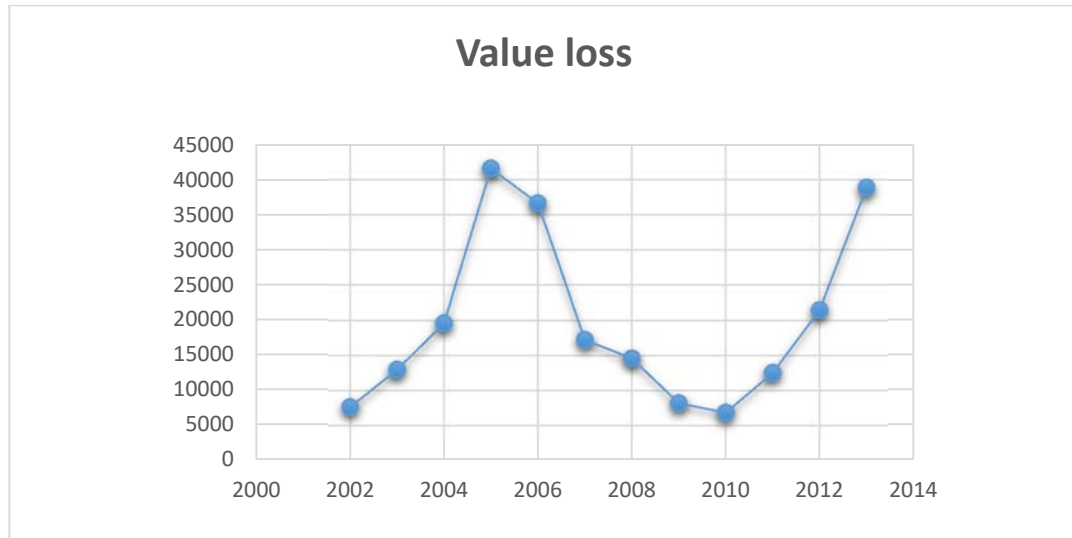


**Figure 1.2 : Pipeline Incidences of product loss (PL) in 000 metric tonnes** (Source: NNPC, 2013)

Daily independence (2014) also reported that, major challenges facing the Nigeria's oil industry in recent years, is pipeline vandalism and sabotage. Major export pipelines that were severely vandalized in 2013, includes the Trans-Forcadose line, the Obangwere, Temidaba-Brass line, the Nembe creek and Trans-Niger pipeline including that of Bonny-Escravos. This has resulted to significant losses to the oil

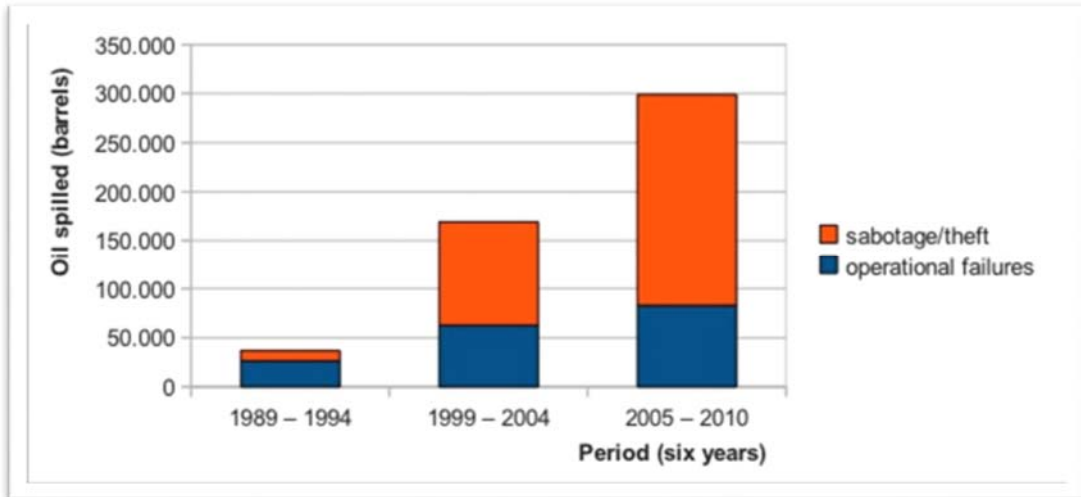


industry, the economy and the environment. It was estimated that, Nigeria loses about \$10.95b in 2013 with losses rising as high as 300,000 bpd (Daily independence, 2014) see figure 1.3 as reported by (NNPC, 2013).



**Figure 1.3 : Pipeline Incidences of value loss (VL) in millions of Naira**  
(Source: NNPC, (2013))

Equally, the Shell annual report on oil spill indicates, that the National oil spill detection and prevention (NOSDRA) recorded 2,054 cases of oil spill from June 2006 - June 2010. While Shell itself has recorded 150-200 cases of oil spill each year in different parts of the Niger delta region. In addition, from 1989-1994, Shell has recorded 37,000 barrels of oil spill with, 72% due to poor facilities, while 28% as a result of vandalism, see figure 1.4. However, from 1994 to 2006 the company recorded 169,000 barrels of oil spill with 63% due to sabotage and 27% due to operational failure. Furthermore, from 2005-2010 oil spill increased to 299,000 barrels with 72% due to sabotage (WSJ, 2014).



**Figure 1.4 : Volumes of oil spill from shell Development Company**

Considering that 60% of the people in the Niger Delta region earns their livelihood through subsistence farming, the Polluted environment has significantly impacted their sources of livelihood negatively (AI, 2009). Although, other sources of pollution were also identified in the region to include; gas flaring, industrial waste, but oil spill and gas flaring are among major polluters in the region for decades (also see Raji & Abejide, 2013).

Oil pipelines passing through communities and farm lands are commonly seen in the region, therefore, any damage of pipeline may have effects on crops, and soil fertility significantly. It can also contaminate fisheries and sources of drinking water with considerable human health effects, see below Figure1.5.



**Figure 1.5 : Pipelines crossing through Village.** (Source: AI (2009))

Oil spillage in some areas of the Niger delta region has been there for over 40 years without a clean-up. Areas affected includes Eburu, Kiratai in Ogoniland, Rikpokwu in Rivers. However, due to inadequate comprehensive data, it's difficult to quantify the level of damage oil spilled have on agriculture. Pipelines a times are damaged to aid oil bunkering in the Niger delta region, UNEP (2011). It is common to see small boats transporting stolen oil in broad day light to illegal local refining in the forest or transferred to larger boats for onward shipment to international markets (see figure 1.6).



**Figure 1.6 : Showing Stolen Crude Oil after Pipeline Vandalism**  
(Source: UNEP (2011))

Such practices can only be possible with the support of the local communities, significant intelligence, and high levels of unemployment could also be a driving force for the people to engage in to such an act (UNEP, 2011).

### **1.1.3 Institutional, Socioeconomic and Political factors of Oil Pipeline Vandalism**

It might be argued that, institutional factors which are predominantly found to be weak or less effective in many developing countries may be responsible for the militancy in the Niger delta region. This can be found in many empirical studies (Aroh, Albion, Eze, Harry, Umo-Otong, 2010; Anifowose, 2012) who observed that, most developing countries that experience institutional weakness in governance and poor management of resources can experience some sort of deviant behaviour which includes vandalism and deliberate attacks on infrastructure facilities. Equally, poor environmental management may lead to losses in agricultural productivity, health problems and polluted sources of water supplies may encourage vandalism (Klassen, & McLaughlin, 1996; Uyigue & Ubong, 2007). Furthermore, there are evidences that pointed to institutional shortcomings in the Niger delta region which encouraged and sustained the insurgency in the region (Oshwofasa, et al., 2012 and Onuoha, 2007).

Institutions are defined to include both formal and informal institutions Schmid (2004) that deals with issues regarding constitutions, regulations, statute & the common law rules and norms of conduct respectively. Both need to be understood, legislated and sanctioned by the state. In addition, an increase in investment and property right and effective economic development policies will give state powers to enforce laws, protect property right and promotes stability (Tool, 1993). However, it is argued that, good governance can reduce property crime, but not violent crime (Habibullah, Din & Abdul Hamid, 2016). Despite that, good governance is the most effective instrument in fighting corruption and crime (Asongu, & Kodila-Tedika, 2016).

Weak institutional factors are attributed to vandalism and crime in the Niger delta region (Imosemi, & Abangwu 2013; Onuoha, 2007). Also, inadequate or lack of compensation to victims whose properties were damaged are considered to be encouraging factors sustained militancy and crime in the Niger delta region. Evidence has shown that, despite the presence of security agencies, such as the special joint task force (JTF), vandals still carry out their activities without much challenges and the legal system is not effective enough in prosecuting offenders.

On the other hand, there exist a long dispute between two major tribes of Itsekiri and ijaw over economic and political marginalization in the Niger delta. It is presumed that, employment opportunities after oil discovery in the region tend to favour the Itsekiri through their monarch as the paramount ruler of Warri. It was also claimed that successive colonial government has favoured Itsekiri for political appointments

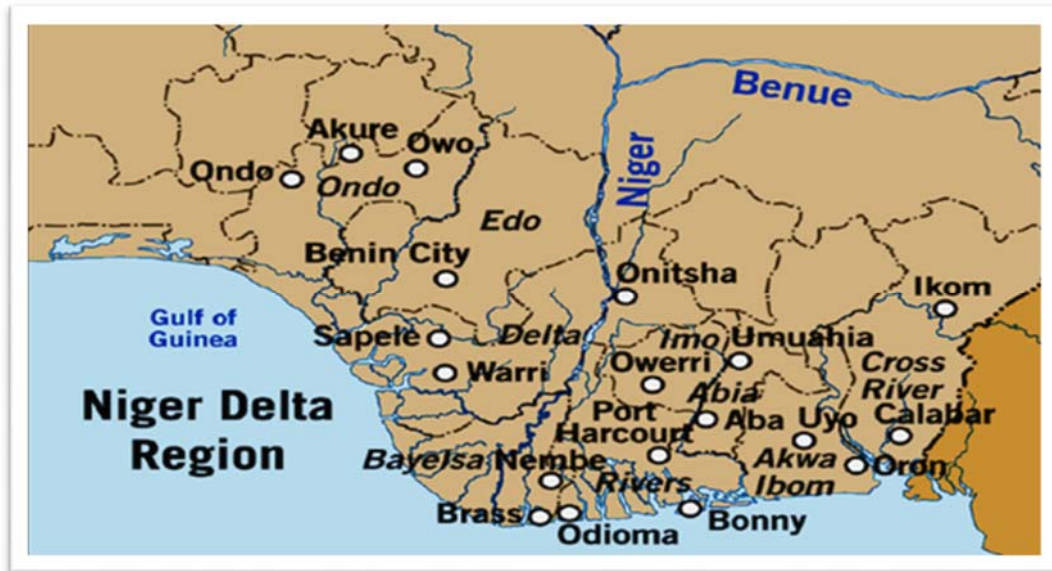
at the national levels which subsequently encouraged insurgency in the region (Raji & Abejide, 2013). To achieve maximum support from the international community, a propaganda machinery was established through the international media, which propagates marginalization of the region by successive governments in terms of share of oil revenues and employment. What really makes matters worse, is the involvement of some politicians, traditional rulers, community elders, etc. in the insurgency through indirect participation (Oriola, 2012).

While significant number of research studies have identified, poor implementation of environmental regulations as the root cause of contamination of the sources of water, rivers, farmlands, fish ponds, etc. that gave rise to militancy in the region (Raji & Abejide, 2013). There are compelling evidences from different studies that, from 1970-1990 the Niger delta region recorded a total of 4,647 oil spills with leaked oil totalling 2,369,470 barrels with vandalism, corrosion, equipment failure as major contributors. With an estimated 31,000 square kilometre, 6,000km of oil pipelines and flow lines, 87 flow stations, 8 plants and over 1,000 producing wells in the region, oil spill is eminent except if, proper monitoring and evaluation is carried out regularly. Underdevelopment and low life expectancy (high maternal and child mortality), depletion of biodiversity and other problems which are mainly associated with oil activities are also observed by ECCR (2010) as sources of conflict in the Niger delta region.

#### **1.1.4 Background of the Nigeria's Oil Industry and Sources of Conflict in the Niger delta region**

The Niger delta is a geopolitical region with the highest oil reserves in Nigeria. It is said to be the world's third and the Africa's largest oil reserves in an estimated geographical area of about 70,000 sq kilometre. An ecological zone of great rivers, coastal areas, mangroves, and sweet and salt water swamp forest (Omotola, 2009). The region has a population of approximately 31million people, 40 ethnic groups speaking 250 dialects with an area of 27,000 square miles (Oregon, 2009; Kuenzer, Claudia van Beijma, Sybrand Gessner, Ursula Dech, Stefan, 2014). Although there are areas in the Northern and Western parts of Nigeria with deposits of oil, Niger delta remains the main oil producing region in Nigeria at present. The people are predominantly subsistence farmers who earn their livelihood on farming and fishing. Akpomera (2013) highlighted that the region has 5,700 oil well, 112 flow stations, 16 gas plants, 126 production platforms, 6 floating production, and storage offloading (FPSO) platforms, 13 oil terminals, and 6,000 km of oil pipelines.

Despite its strategic economic contribution to Nigeria's external earnings, the region remains among the least developed regions of the country (Kuenzer, van Beijma, Gessner, et al., 2014). Oil revenues have enriched only a few people in the region and misery for the majority of the population due to corruption within the ruling and political class in the region (figure 2.1). The resource curse has not only widened income inequality between the opportunistic class and the majority poor, it has also resulted to significant environmental degradations.



**Figure 2.1 : Niger delta Region**

Nigeria's oil was discovered in Oloibiri, present Bayelsa state in the Niger delta region in commercial quantities in 1956 by the Shell D' Arcy and started commercial production in 1958 at the rate of 5,100bpd (Odeyemi & Ogunseitan, 1985). Thereafter, more oil was discovered in other parts of the region such as; Isoko & Warri in Delta and Eket in Akwa Ibom states (Okpo & Eze, 2012). Shell petroleum Development Company continued to dominate the Nigerian oil industry until Nigeria join OPEC in 1971. Thereafter, Nigeria established the NNPC in 1977 and began to exercise control over its oil and gas resources in line with the practice of OPEC member countries. The NNPC became the major partner in the country's upstream ventures with the major multinational petroleum exploration and production companies (NNPC, 2006). The petroleum industry in Nigeria is regulated by the Department of Petroleum Resources (DPR), a subsidiary of NNPC which ensures compliance with industry regulations, establishes & enforces environmental regulations (Smallwood, 2012). Nigeria is generating well over 90% of its foreign exchange earnings from oil export despite agriculture being the mainstay of the economy. The region has seen the presence of many foreign multinational oil companies like Shell, Chevron, ExxonMobil, Agip, Chevron, ELF, Texaco and a host of indigenous oil companies after the deregulation of the oil industry. To further strengthen and improve ways of doing business in the oil sector, a petroleum industry bill (PIB) is before the national assembly for approval. It is an act to establish the legal and regulatory framework for the Nigerian petroleum industry. In addition, the bill will establish guidelines for the operation of the upstream and downstream sectors, and other issues relating to the oil industry. This includes; sovereign Property ownership of petroleum to Nigeria government, allocation and management of petroleum resources strictly in accordance with the principles of good governance, sustainable development and transparency in accordance to development of Nigeria etc (NNPC, 2016; BBC, 2016).

Over the years Nigeria built network of refineries, oil depots through pipelines distribution network. Major refineries constructed were Kaduna Refinery and Petrochemicals built in 1988 with a processing capacity of 110 000 barrels per day; The Port-Harcourt Refineries I & II constructed in 1964 by Shell Petroleum Development Company with a processing capacity of 60 000 bpd and the new refinery built in 1978 with a processing capacity of 210 000 bpd; and the Warri Refinery and Petrochemicals built in 1978, with a processing capacity of 125 000 bpd (Peel, 2011 and Smallwood, 2012). With over 7,000 kilometres of pipelines, 159 oil fields and 275 flow stations operated in the region (UNDP, 2006). One of the sources of pollution is the expansion of oil exploitation, production and oil spill (Eregha & Irughe, 2009).

However, in recent years the country's oil production capacity have fallen significantly from 2.6 mbpd in 2006 to 1.6 mbpd by March 2009 due to pipeline vandalism. This have resulted to the loss of approximately \$61.6 billion to oil theft and sabotage between 2006 and 2008. The reduction in the country's oil production capacity has significantly resulted in revenue losses from foreign exchange earnings. While approximately, 300 people (including foreign expatriates) were kidnapped or taken as hostages and in some cases ransomed were paid before their released (Oladele, 2009). Basedau, & Pierskalla, (2014) observed that, poor environmental regulations associated with oil exploitation and underdevelopment are among major sources of conflict in the Niger delta region.it was further observed that, assumed State repression, unemployment, marginalization of the major tribes in the region (e.g. Ijaw) and neglect of the oil producing communities significantly contributed to the societal unrest in the Niger delta region. This has led to agitations' for the emancipation of the region from domination and resource control from 1960's to date (Basedau, & Pierskalla, 2014; Oriola, 2012; and Ukiwo, 2007).

Shell's oil platform in Bonga fields leaked over 40,000 barrels of crude oil in 2011 due to convulsed failure with significant damaged to neighbouring beaches and impacted fisheries. Similar problems are experienced in the region over the years, which makes water unsuitable for fishing and render many hectares of land degraded (ERA & Oilwatch Africa, 2012; Raji & Abejide, 2013). In addition, Oil spill is blamed for low agricultural production and poor economic activities in the Niger delta region. Also ignorance/or deliberate and greed by some inhabitants of the oil producing communities let to sabotage through pipeline vandalism (Okpo & Eze, 2012 and Imosemi1 & Abangwu, 2013).

On the other hand, displeasure of the 1978 land use Decree which transferred ownership of all lands and its resources to the central government, is also considered as one of the genesis of the Niger delta militancy. In addition, they accused the government of scrapping the revenue sharing derivation formula, approving just a paltry one-percent to oil mineral producing states. However, successive governments increased the percentage from 1 % by Obasanjo 1978, Shagari increased the share of the oil revenue to 1.5 % 1979, Babangida increased it to 3 % in 1987, and in addition established the oil mineral Producing Areas Development Commission (OMPADEC). Equally in 1999, Obasanjo reviewed the allocation percentage to 13

% by 2000 in addition to establishing of the Niger Delta Development Commission (NDDC) in July 1999. Yet, the region is demanding between 25 %, 50 % and 75 % respectively to become truly self-reliant and competitive (Okpo & Eze, 2012).

Environmental degradation is not only limited to spillage from pipeline vandalism, other sources of pollution in the region also includes: spill from oil companies, industrial activities, acid rain, gas flaring (Uyigue & Agho, 2007; Eregha & Irughe, 2009; Emoyan, 2010; Bright & David, 2012). However, pipeline vandalism is considered the most severe due to its frequency and its negative environmental impact on land, forest and agricultural production (Alawode, & Ogunleye, 2011).

### **1.1.5 World view on Oil Spill and Pipelines as a means Transportation**

Oil spill can be an accidental discharged of oil on the land or in the sea, which comes from drilling, pipeline, tanker accidents, etc. It is usually associated with negative impacts on marine life and the environment. Therefore, limiting the amount of oil spilled is beneficial to the environment and human activities (Schmidt-Etkin, 2011). It is considered a global phenomenon which deserves adequate attention due to its negative impact on the environment and the socioeconomic life of the people. World-wide spill rates has shown a drastic fall since 1960's and 1970's from 635,000 tons to 300,000 tonnes annually, excluding the Gulf of Mexico spillage in 1991 with over 82 million tonnes on land and in the sea. It has been observed that, in the last two decades the largest sources of oil spills is attributed to oil shipment through oil tankers or pipelines (Schmidt-Etkin, 2011).

Although oil spills are relatively small worldwide, it still causes serious environmental and economic damage despite significant technological improvement and industry best practices. Historical records have shown that, in 1967 Torrey Canyon spilled 130,000 tonnes of oil which resulted to killing of 15,000 seabirds and oiling nearly 300 kilometres of English and French coastline. Equally, during the second world war (first six months of 1942) a total of 484,200 tonnes were released from tankers in the United States of America, this led to the establishment of environmental protection agency (EPA). Other spillage that influence greater world attention includes the tanker Metula (Chile in 1974), Spain 1977, France 1978, and Atlantic Express (Trinidad and Tobago/Barbados in 1979), also in 1989 Exxon Valdez that spilled an estimated 37,000 tons in Alaska USA. This events resulted in the passage of significant spill prevention and liability legislation in the UAS - The oil pollution act of 1990 (OPA 1990) as well as, international conventions on spill prevention that included measures that requires double-hulls on tankers by 2015 (Schmidt-Etkin, 2011). However, May (1992) observes that, oil spill has insignificantly reduced during production trends in Australia. May further observed that, during Australia's drilling of over 1000 offshore oil wells no significant amount of spill is recorded. With the production of 2.6bb only one percent spillage was recorded and pointed out that large spill are mostly associated with transportation and ship related accidents which are very rare events and occur once in 27 years to 30 years.



Oil spill as a result of vandalism at the global level is relatively small, however, large accidental spill usually attracts world attention due to its environmental and economic effects. Spill regional or national are largely related to handling of petroleum products and the degree of preventive measures enforced by the company or government of the region or country (ITOPF, 2014). Despite increase in global trade and oil shipment since the mid of 1980's to date, the level of oil spill is decreasing. Statistics have shown that bulk spillage from 1970 - 2014 around the world are found to be the result of tanker accident. ITOPF, (2014) statistical report has shown that, in the 1990's there were 358 spillage amounting to 7 tonnes of oil, resulting in 1,133,000 tonnes of oil spilled and lost with 73% of this amount was spilt in only ten (10) incidents. While In the 2000's there were 179 spills of 7 tonnes were recorded which resulted in 208,000 tonnes of oil spilled and lost, with 55% of this amount spilt in four (4) incidents. However, from 2010-2014 (five years) 35 spills of 7 tonnes were recorded, resulting in 26,000 tonnes of oil spilt and lost with 90% of this amount spilt in just nine (9) incidents. This is a clear indication of drastic fall in the volume of oil spills.

Despite spills, oil pipelines are commonly used as a means of transporting petroleum products due to its convenient, safety and lower cost. However, oil pipelines that passes through communities and urban areas and in environmentally friendly regions is considered to be dangerous when exposed. Therefore, oil pipelines are expected to be buried at a depth of 1.3 to 1.6 metres below the earth's surface (Bauer, Heck, Dones, Mayer-Spohn, & Blesl, 2009). The flow of oil in the pipelines is usually at the speed of about 1 to 6 m/s which is influenced by cold or hot temperature. Usually the pipelines are multipurpose i.e. they can accommodate and transport two or more petroleum products in a sequential order. See table1.1 (Bauer et al., 2009).

**Table 1.1 : The main technical characteristics of oil pipelines**

Oil Pipeline	Material	Inner diameter	Building depth	Thicknes s	Oil speed	Oil transported	Pressure
	Steel or plastic*	30+* to 50+ to 120* cm (12 to 47 inches)*	Onthe surface or 1 metre*, Butalso 3- 15 metres *****	6-30++ mm (pipeline around 30 cm diameter) 1/3 of an inch***	1 to 6 m/s*	50000- 60000 barrels/day+ (pipeline 30 cmdiameter)	50 atmosphere *****

Source: Bauer, et al. (2009)

There are four basic sources of impact/effects from the oil pipeline when a leakage occurred as outlined by Bauer, et al. (2009): (i) can cause air pollution; (ii) pipelines can cause fire and explosion due to rupture or accident; (iii) It can also cause air pollution from the pumping stations.

Due to above problems, important considerations were usually taken when constructing oil pipelines as outline: (i) Conflict with existing land users; (ii) Soil conservation of agricultural land; (iii) Preservation of wildlife and fish habitat; and (iv) avoidance of sensitive areas and seasons for fish and wildlife species; (v) Protection of rare or unique plants communities, rare and endangered wildlife and associated habitat and Socioeconomic considerations (Bauer, et al., 2009). Environmental effects of oil pipeline construction can be minimized through careful selection of route to avoid sensitive areas of human activities, wildlife, plants, farmlands etc., also effective and regular inspection monitoring can reduce the adverse effects of pipeline.

## **1.2 Statement of the Problem**

The nature and frequency of oil pipeline vandalism in the Niger delta region have become a source of concern as it's negatively affects not only sources of revenue from oil resources, but also destructive to the environment and the socioeconomic lives of the oil producing communities. Despite having the largest deposits of well over 37 billion barrels of oil reserves, generating well over 90% of foreign exchange earnings, and a major contributor to economic development of Nigeria, the region could not receive the desired attention for years in terms of physical development especially in the areas of roads network, electricity, pipe born water, health facilities and adequate environmental protection from degradation. In line with above, it was argued that it let to the rise of militancy and attacks on oil pipelines in the Niger delta region.

Attacks on oil pipeline in the form of vandalism although has been there for decades but, has become severe from 2002 to 2013 with rising records of 516 incidences, to 3,674 incidences. However, the incidences of vandalism falls to 1,453 in 2009 and 836 in 2010 respectively when the amnesty programme was signed between the Niger delta militants groups and the federal government in 2009. However, shortly after in 2011 the incidences of vandalism increased to 2,768 and continued to increase to date. Sadly, the inability of the government to improve the economic and environmental situation in the region only encouraged militants to vandalize more oil pipelines in an effort to deny government any revenue from oil and also attract public and international community over economic and environmental neglect of the region.

On the other hand over the years, pipeline vandalism becomes the order of the day with the government losing billions of naira in oil revenue. In 2002, ₦7,661.06 billion was lost to vandalism and the figure continued to rise until the signing of the amnesty

in 2009, when the value lost dropped to ₦8,195 billion and ₦6,848.11 billion respectively. However, from 2011 the figure continued to increase from ₦12,526 billion to ₦38,881.33 billion in 2013 and continued to increase up to 2015. As pipeline vandalism intensified, pollution levels in the oil producing communities' become so severe, polluting rivers, farms lands, the rich wetlands and mangrove forest. This has resulted to massive environmental degradation with serious effects on the soil fertility, water sources and the general socioeconomic life of the people in the region.

Indeed, government has made concerted efforts over the years to promote the socioeconomic wellbeing of the region and bring an end to pipeline vandalism through the establishment of various developmental programmes, among which are: the oil mineral producing areas development commission (OMPADEC), Niger delta development commission (NDDC), ministry for Niger delta (MND) and Amnesty program for the Niger delta militants. These programmes were designed to promote infrastructural development and promote the socioeconomic wellbeing of the oil producing communities and the region as a whole. Besides, the Federal Government of Nigeria also established the National Oil Spill Detection and Response Agency (NOSDRA) as an institutional framework to implement the National Oil Spill Contingency Plan in 2006. The agency is responsible for checking oil spill through, containment, recovery, and remediation/restoration. It is a strategy for preventing loss of lives, assets and natural resources.

However, the little achievements recorded over the years may not be unconnected to poor implementation of the programmes and corruption among some government officials and some stakeholders in the Niger delta region. Furthermore, some argued that, lack of decisive efforts to protect the environment from degradation due oil exploitation and spillage, might have significantly contributed to the increased incidences of militancy in the region. Hence, oil pipeline vandalism continued with devastating economic and environmental effects in the Niger delta region which makes it to be one of the most volatile oil producing region in the world.

Furthermore, it was also argued that, the failure in the effort of the government to improve the situation in the Niger delta region may not be unconnected to weak institutions. Most programmes that were designed to promote development in the region couldn't achieve much due to perceived corruption and poor accountability. While the amnesty stood a better opportunity for building peace in the region, it was highlighted that the programme lacks holistic approach to solving the Niger delta problems. Also it was pointed out that, oil pipeline vandalism couldn't have been sustained without the support of the oil producing communities and long years of environmental neglect. Besides, militant groups enjoy the support of the political class, elites and the some community leaders in the Niger delta region for their personal gains against the state. In addition, it was presumed that some Niger delta stakeholders are against the land act, decree of 1976 which transferred ownership of land and resources to the federal government might also be a factor that encouraged militancy in the region. Therefore, the militants has the moral support of some

stakeholders in the struggle to emancipate the region from the federal government domination of their resources. All these makes it difficult to deal with pipeline vandalism in the region. Despite the above, it is generally viewed that, both the militants and stakeholders are in supported the amnesty programme which they believe will bring an end to their suffering as a result of decades of environmental neglect and underdevelopment.

It is against this background that researcher carried out this study to identify the factors that encourages pipeline vandalism and its economic and environmental impacts on the Niger delta region. In addition, to look into the feasibility of designing of a better compensating plan for the Niger Delta militants involved in oil pipeline vandalism.

### **1.3 Objectives of the Study**

The general objective of the study is to “assess the economic and environmental impact of crude oil spill through pipeline vandalism in the Niger delta region of Nigeria”. To achieve this, the specific objectives outlined in this study are:

- (I) To identify the dimension of the factors that encourage oil pipeline vandalism in the Niger delta region.
- (II) To design a compensation package most desirable for the Niger delta Militants.
- (III) To aggregate the cost of oil pipeline vandalism in the Niger delta region.

### **1.4 Research Hypotheses**

The study is guided by the following research hypotheses:

- (i) There are important economic, social and political factors influencing the frequencies of the occurrences of oil vandalism in the Niger delta region.
- (ii) There are specific economic incentives that can be used to internalize the external cost of oil spill caused by militants in the Niger delta region.
- (iii) There are high costs associated with oil pipelines vandalism in the Niger delta region.

### **1.5 Justification for the Study**

The study identified the factors that influence crude oil pipeline vandalism which are usually associated with economic costs and environmental degradation. This would be very useful to the government and oil companies’ especially in tackling the problem of oil pipeline vandalism. The study estimated an improved compensation package for the militants which show a far less cost compared to the existing. This new plan not only allow increased in the number of militants to undergo training at a time, but also allows government to executive more developmental programs that

will significantly impact positively on the socioeconomic life of the Niger delta communities.

The study also provided an estimate of economic and environmental loses as a result of the vandalism related activities in the Niger delta region. This will assist the government in policy formulation against vandalizing of oil pipelines in the Niger delta region. The study will help in achieving improvements in the socioeconomic life of the people and enhance revenue generation for the government. The study will enrich existing literature and contribute significantly to students and researchers in the feel of environmental economics as a source of literature.



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