### A MANAGEMENT EVALUATION OF ENVIRONMENTAL HEALTH HAZARD IN THE OIL PRODUCING AREAS OF BAYELSA STATE

****ABSTRACT****

*In the year 1956, significant quantities of oil were initially discovered in Oloibiri, which is currently situated in the Ogbia Local Government Area of Bayelsa State. The discovery of oil has had both positive economic implications for the nation and negative environmental consequences for the individuals residing in close proximity to international oil firms engaged in oil exploration activities. According to the Nigeria National Petroleum Corporation (NNPC), an estimated annual volume of 2,300 cubic metres of crude oil is discharged into the environment, resulting in oil spills inside Nigeria. In order to provide direction for this study, four research inquiries were formulated and four hypotheses were developed and subsequently examined. The research employed a survey design, specifically utilising the simple random sampling approach to pick a sample size of four hundred (400) individuals who are indigenous to Bayelsa for the study. The instruments utilised for data collection in this study were questionnaires and observations. The data obtained was analysed using a basic percentage calculation method. The findings of the data analysis indicate a significant impact of oil leakage on human health. The annual decrease in agricultural output among the population can be attributed to the adverse effects of oil spillage on the environment, leading to the degradation of soil fertility. The presence of water scarcity in Bayelsa State, despite its geographical status as an island, might be attributed to the issue of water contamination. In conclusion, it becomes evident that insufficient efforts have been made to alleviate the plight of the populace residing in Bayelsa State. In the event of an occurrence of an oil leak outbreak within the community. In situations where the primary source of drinking water becomes contaminated, individuals are left without access to potable water and lack other sources for meeting their drinking water needs.*

**CHAPTER ONE**

**1.0 INTRODUCTION**

The World Health Organization (WHO) defined health as a state of complete physical, mental, social and spiritual well-being of individual and not merely the absence of diseases or infirmity (WHO, 1964). UNESCO (2015) holds that an individual is affected by almost everything in the environment. Equally, health is the perfect state of the individual in his physical, mental, social and emotionally well being. Health is seen as an environmentally influenced state of well being, hence it becomes necessary to look at the health of people as directly influenced by their immediate environment.

Environmental health is a branch of public health that is concerned with all aspect of the natural and physical environment which may affect human health. The World Health Organization (WHO) defined it as those aspects of the human body, (human health) and disease that are determined by factors in the environment (Ugoh, 2008). The focus of environmental health has been the direct pathological agents and the effects in health and well being of the broad physical, psychological, social and aesthetic environment which include housing, urban development, land use and transportation. The scope of environmental health include hazardous materials, pollution, disaster, prehardness, food safety, waste management and occupational health. One aspect of interest to researchers is the environmental health as the impact of oil spills on the health of members in host communities where multinationals carry out huge oil drilling or exportation activities. An area with largest concentration of such facilities in the Niger Delta region in Nigeria. Patrick, (2004) states that the Niger Delta covers 70, 000 km2 within wet lands. It is home to 20 million people and 40 different ethnic groups with diverse mangrove swamp forests, fresh water swamps, and low land rain forests. Onuoha, (2008) however put it that the ecosystems as well as the individuals are at the receiving end of pollutants from oil spills and gas flares.

Niger Delta has witnessed the poisoning of the waters of this country and destruction of vegetation and agricultural land by oil spills which occur during petroleum exploration. But since the discovery of the oil industry in Nigeria, more than thirty years ago, there has been no concerned and effective effort on the part of the government, let alone the oil operators to control environmental health hazards associated with the industry. Sola (2002) expressed that in Lagos State today as well the riverine cities in Nigeria such as Bayelsa, the worst type of pollution is oil. In other words, he warned that potential pollution from the oil companies to land and water poses very serious problem to the oil producing areas. Estimate shows that 89 million barrels of petroleum were spilled into Niger Delta region between 1976 and 1996 (Onuoha, 2007). The Nigerian National Petroleum Corporation (NNPC) puts the quantity of petroleum injected into the environment yearly at 2, 300 cubic meters of oil spills annually. These estimates raise grave concerns for the environmental health of host communities.

**1.1 BACKGROUND OF THE STUDY**

Brass Local Government Area is one of the eight local government in Bayelsa State which is a major force in the production of oil. Bayelsa State with an estimated population of about two million people ranks amongst the top of oil and gas producing areas of the country contributing over 30% Nigerian’s total oil production. Oil wells are scattered across the State. Jonathan (2003) recalled that since 1956 when oil was first struck in commercial quantities in Oloibiri, oil exploration has been in the increase in Bayelsa State. Brass Local Government Area which is the area of a case study is host to Agip Oil facilities located in Town Brass an Ijaw community which also serves as head quarters of the Brass Local Government of the State. Oil exploration grants such as Shell, Chevron, Texaco all have flow stations in other local government has had its fair share of oil spills in the recent past hence the study will investigate the management and control of health hazards resulting from oil spillage in the area.

**1.2 STATEMENT OF THE PROBLEM**

Oil spillage has been the bone of contention between communities and multinational companies dating back to when oil was first struck at Oloibiri in Bayelsa State. A report by (NOSDRA) as at 2010 puts oil spills in the Niger Delta at 3, 203. between the period January 2006 and June 2010, the growth of the country’s oil industry has led to substantial environmental health hazards in oil producing areas in Bayelsa State. Statistics paint a grain picture of oil spillage which occur almost on a monthly basis. The World Bank on its reports argued that the true quantity of petroleum spilled into the environment is underestimated (Onuoha, 2007). According to the World Health Organization (WHO), environmental hazards are responsible for about a quarter of the total burden of diseases world wide and nearly 359 in regions such as Sub-Sahara Africa. The World Health Organization estimates that as many as 13 million deaths can be prevented by making the environment healthier (Onuoha, 2007).

Health hazards emanating from oil spills is directly linked to the level of public outery and disaffection among the inhabitants of oil producing areas. Despite growing concern from the government there still appear from accounts of research work done, inadequate data and information as well as appropriate policies to manage the challenges (Onokeroraye, 2001) some findings released showed that the two key areas where intervention fall short are poverty alleviation and possibility of enhancement of diseases burden which is the centre of agitations of people who live around oil exploration area in Niger Delta. Much of the health implications of oil spillage have remained a matter of conjecture. Health hazards are not well documented and there appears to be inadequate health management apparatus to combat the over increasing burden in the coastal regions on oil exploration activities. Recent oil spills in Brass Local Government where the Nigeria Agip Oil Company (NADC) operates has several oil facilities which was reported in the month of May, 2009 has raised further concerns making it an idea study area for the study.

According to Onuoha, (2007) despite increasing concerns from the damages caused to the health of individuals and the various efforts at the control of the maintenance of oil spills, little has been done to migrate the health hazards emanating from oil spills.

**1.3 PURPOSE OF THE STUDY**

The study aims to determine and ascertain health hazards from oil spillage in the study area which is Brass Local Government Area of Bayelsa State.

**1.4 SIGNIFICANCE OF THE STUDY**

Studies in environmental health are ongoing, however this research study will increase the capacity of research in the field of providing policy makers a legal framework material for law making. Government will also adopt practical means of managing health hazards which is cost effective and empowering. The academic will also be enlightened in this field of interest which is not often looked into. Research is largely for the benefit of those who live and thrive in oil producing regions. It is necessary that the findings of the research will contribute to remedy some of the health problems in the study area.

**1.5 OBJECTIVES OF THE STUDY**

The broad objective of this study is to assess the management of environmental health hazard in the oil producing areas of Bayelsa state. Specifically but not limited to, other objectives of this study are:

1. To assess the level of management of oil spillage in the area of study
2. To determine the measures are put in place to mitigate the health hazards from oil spillage
3. To find out the stakeholders in the management effort in the study area
4. To determine the common health hazards from oil spills in the study of man

**1.5 HYPOTHESES**

**HO:** there is no significant relationship between health hazards and oil spills in the study area.

**H1:** there is a significant difference between health hazards and oil spills I the study area.

**HO:** there is no significant relationship between the levels of management of oil spills and the health of people.

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**1.6 RESEARCH QUESTIONS**

1. What is the level of management of oil spillage in the area of study?

2. What measures are put in place to mitigate the health hazards from oil spillage?

3. Who are the stakeholders in the management effort in the study area?

4. What are the common health hazards from oil spills in the study of man?

**1.7 SCOPE OF THE STUDY**

The study has been designed and organized to include a comprehensive analysis of environmental health hazards in oil producing areas. The research is also reduced in scope to oil spillage, as it affects the human focus of the researcher. Hence, gas flaring which is another by-product of oil exploration is largely neglected.

**1.8 DEFINITION OF TERMS**

To avoid ambiguity, the following terms will be defined as used in this context of research work.

**Management:** This is the process of planning, organizing, leading and controlling the efforts of an organization and members using all the organizational resources to achieve set goals.

**Environment:** This is the aggregate of all external and internal conditions as it affects the existence, growth and welfare of organisms or one’s surrounding or external circumstance collectively.

**Health:** According to the World Health Organization (WHO) Health is the state of complete physical, mental, and social well being and not merely the absence of disease or infirmity. Furthermore, it is the condition of a person’s body, mind or state of being physically and mentally sound or a condition of the degree of which it is free from illness or the state of being well to be in a good or poor health.

**Hazards:** This is something that is dangerous and likely to cause damage to the health of an organism, animal or human being.

**Exploration:** The act of finding something and examining it and making the best use of it.

**Oil exploration:** The act of finding or searching for oil in the ground in order to make use of its usefulness.

**NNPC:** Nigeria National Petroleum Corporation.

**MEHH:** Modern Environmental Health Hazards.

**WHO:** World Health Organization.

**EHH:** Environmental Health Hazards.

**Water pollution:** This is the emitting of huge amount of carbon monoxide and ethane from the flow stations and pollute water in the oil producing communities in Bayelsa State and the Niger Delta.

**NADC:** Nigeria Agip Oil Company.

**CHAPTER TWO**

**REVIEW OF LITERATURE**

**2.0 INTRODUCTION**

Our focus in this chapter is to critically examine relevant literature that would assist in explaining the research problem and furthermore recognize the efforts of scholars who had previously contributed immensely to similar research. The chapter intends to deepen the understanding of the study and close the perceived gaps.

Precisely, the chapter will be considered in three sub-headings:

* Conceptual Framework
* Theoretical Framework
* Empirical Review

**2.1 CONCEPTUAL FRAMEWORK**

**Concept of Environment**

There have been different definitions of the concept of „environment‟ proferred by different scholars and organized bodies/agencies. However, from whatever angle one perceives the term; „environment‟, it simply depicts what surrounds us. To Hagget (1975), cited in Anijah – Obi (2001), environment refers to the “sum total of all conditions that surround man at any point in time on the earths surface”. According to Miller (1975), the term environment‟ could be perceived as “the aggregate of external conditions that influence the life of an individual or population, specifically the life of man and other living organisms on the earth‟s surface”. The Federal Environmental protection Agency (FEPA) Act of 1990, under section 38 also gave a very lucid definition of environment, thus;

Environment includes water, air, land and all plants and human beings and/or animals living there in and the inter- relationships which exist among these or any of them.

From the above definitions, the term environment‟ comprises land, air, water and all the physical structures surrounding us. In this paper therefore, the concept „environment‟ refers to the „totality of space, time and socio-cultural settings of man and other living organisms therein.

From various literatures, the term environment has been viewed from different perspectives. Sada (1988) conceived the environment as a system within which living organisms interact with the physical elements. Briggs (2003) explained environmental pollution, as the presence in the environment of an agent which has the potentials of damaging to either the environment or human health. He explains that pollutants take many forms such as chemical compounds, forms of organisms and biological materials, including energy in its various forms, for example, noise, radiation and heat. Potential pollutants in the atmosphere are essentially countless in number, accounting for about 30,000 chemicals in common use today, with no less than 1% of these responsible for high level of toxicity and health risks while biological pollutants in this regard is unquantifiable. According to Antonescu and Mateescu (2001), Takahashi et al. (2000), and reported by Oke (2004), environmental pollution is classified by the English language literature into artificial or anthropogenic and natural groupings. Anthropogenic results from human activities which can be completely artificial for example the use of chlorinated gasoline products or the use of leaded aerosols from gasoline, or it can be substantially artificial for example, oil from oceans and phosphate from running water (Oke, 2004). Natural sources according occur from excessive radiation from the sun, erosion and flooding from rainfall. Environmental pollution is said to be natural and anthropogenic induced changes in the environment which is harmful to man and other organisms and cause changes to natural environment. It is the discharge or emission of harmful and destructive substances into the environment of air, water, and land, which have negative impacts on living and non-living organisms (Obi & Ubani, 2014). About 8–9% of the total disease burden globally may be attributed to pollution, but considerably more is felt in developing countries due to unsafe water, poor sanitation and poor hygiene which are major sources of exposure, coupled with indoor air pollution.

**Concept of Pollution**

Pollution is the introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resource as ecological damage; or interference with legitimate uses of the environmental (Millar, 1998). Environmental pollution according to Miller (1998) is “any addition to air, water, soil or food that threatens the health, survival or activities of human or other living organism”. Such chemical or form of energy that causes harm is called pollutant. The pollutants can be solid, liquid, or gaseous products or wastes produced when a resource is extracted, processed, made into products or used. Equally, it can take the form of unwanted energy emissions, such as excessive heat or radiation (Miller Supra).

Similarly, Moronkola, (2003) states that the United Kingdom‟s Protection of Environment Act (1990) declares pollution of the environment as what is released into any environmental medium as a result of human activity which is capable of causing harm to human or other living organisms supported by the environment.

One of the greatest problems that the country is facing today is that of environmental pollution emanating from oil exploration, extraction and related activities. Environmental pollution of the physical environment is of three basic types, namely; air pollution, water pollution and soil \ land pollution.

Pollution is simply the introduction of contaminants into the natural environment that could alter the normal occurrences or distort the orderliness of the system. Pollution was also defined by the European Union 1996 Council Directive on Integrated Pollution Prevention and Control (IPPC) as “the direct or indirect introduction as a result of human activity, of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment” (Gbehe, 2004).

**Environmental Pollution**

Pollutants constitute major threats to both plant and animal life. In man’s living space, health and wellness are often determined by the safety of the environment, often affected by their activities. Environmental pollution simply implies issues with pollutants that alter the natural course of (and adversely affect) the environment. Pollution occurs in various ways which include but are not limited to air, water, land, and noise pollution, etc. In Nigeria’s Niger River Delta region, lives have been endangered and lost in unquantifiable numbers due to health hazards emanating from environmental pollution. The activities (production and otherwise) in the oil sector which is the predominant economic activity of the region daily produce tons of environmental nuisance. And poor management of these wastes coupled with neglect for the sanctity of human life and other regrettable factors have seen the region clamouring for survival in more ways than one. These have become a grave threat to the region. The major persistent environmental pollution problems bedeviling the Niger Delta come from two sources (Oil spillage and air pollution via gas flaring).

**Causes of Environmental Pollution**

**Oil Spillage**

Oil spill is one of the major environmental hazards in the Niger Delta. This particular cause of environmental hazard contaminates water, destroy plants and animals. The causes of oil spill have been attributed to poorly maintained pipelines, „blow-outs‟ of poorly maintained oil well and sabotage. Some pipes are rusty, some reportedly forty years old and needs major repairs (Onyilo, 2011).

In Kpeen community, Khana Local Government Area of Rivers State where Yorla oil field is located, there have been frequent conflicts between the oil giant Shell Petroleum Development Company (SPDC) and the people due to oil spillages. This had in some cases led to loss of lives and properties. For instance, in 2011 a protest by the youths over a huge explosion which took place on April 29 at the Well 10 facility, Yorla oilfield, led to the killing of Friday Nwiido, a welder aged 30. The explosion spilled crude oil sporadically for days into adjacent farmlands, settlements, streams, swamps, lakes and rivers. Nwiido joined other youths of the area who were protesting the blowout and lost his life (Ajaero 2011).

In Bodo community, oil spillage affected some creeks such as Patrick waterside, Sivibila waterside, Sugi waterside and Kegborozor waterside. Thus, nose-diving the fortunes of poor fishermen in the area. This deplorable situation in Yorla and Bodo is replicated in other oil producing communities such as Korokoro, Ibubu and Nsisioken Ogala which UNEP identified as a community where people have been drinking water contaminated with benzene, a substance known to cause cancer, at levels over 900 times above World Health Organization guidelines.

In a recent United Nations Environment Programme (UNEP, 2011) analysis on Ogoniland, UNEP scientists found an eight centimeter layer of refined oil floating on the groundwater which serves wells in the area. This was reportedly linked to an oil spill which occurred more than six years ago (Ajaero 2011).

In Niger Delta, farmlands, mangroves, fishes, drinking waters are gone due to oil spills leading to a lost of the ecosystem. Soil of farmlands are turned cakes of crude oil, fishes are gone due to polluted water, drinking waters are contaminated, crops are stained, witted and die due to crude oil, fumes from gas flaring visit the people with breathing difficulties.

Presenting the UNEP Environmental Assessment of Ogoniland in August 4, 2011, Ibranhim Thiaw, UNEP Director, Division for environmental policy, noted that it took more than 14 months to do the report during which period 200 locations were visited, 122- kilometer pipeline rights of way surveyed, 5000 medical reports examined; and 23,000 people were interacted with at local community meetings. According to UNEP, given the dynamic nature of oil pollution and extent of contamination, failure to begin addressing urgent public health concerns and commencing a clean up will only exacerbate and unnecessarily prolong the Ogoni people‟s suffering (Ajaero 2011).

According to UNEP reports full environmental restoration of Ogoniland will take an estimated time of 25 to 30 years and would need N150 billion. This will be possible through a combination of modern technology to clean up contaminated land and water ways, backed up by practical action at the regulatory, operational and monitoring levels, the report suggested (Ikuomola 2011).

**History of oil spillage**

Oil spillage is a global issue that has been occurring since the discovery of crude oil. The total spillage of petroleum into the oceans, seas and rivers through human activities is estimated to range between 0.7-1.7 million tons per year (www.science.irank.org). In the past years, oil spill has impacted negatively on the socio-physical environment of the Niger Delta oil producing areas, massively threatening the subsistent peasant economy, the environment, entire livelihood and basic survival of the people in the areas, which if not effectively checked can lead to total destruction of the ecosystems. The oil industry located within this region has contributed immensely to the growth and development of the country which is a fact that cannot be disputed, but oil exploration activities has rendered the Niger Delta region as one of the five most severely petroleum damaged ecosystems in the world. Studies have shown that the quantity of oil spilled over 50 years was at least 9-13 million barrels, which is equivalent to 50 Exxon Valdez spills (FME, et. al. 2006).

Oil spill incidents have occurred in various parts and at different times along our coast. Some major spills in the coastal zone are the GOCON’s Escravos spill in 1978 of about 300,000 barrels, SPDC’s Forcados Terminal tank failure in 1978 of about 580,000 barrels and Texaco Funiwa-5 blow-out in 1980 of about 400,000 barrels. Other oil spill incidents are those of the Abudu pipe line in 1982 of about 18,818 barrels, The Jesse Fire Incident which claimed about a thousand lives and the Idoho Oil Spill of January 1998, of about 40,000 barrels. The most publicised of all oil spills in Nigeria occurred on January 17, 1980 when a total of 37.0 million litres of crude oil got spilled into the environment. This spill occurred as a result of a blow out at Funiwa 5 offshore station. Nigeria's largest spill was an offshore well-blow out in January 1980 when an estimated 200,000 barrels of oil (8.4million US gallons) spilled into the Atlantic Ocean from an oil industry facility and that damaged 340 hectares of mangrove (Nwilo and Badejo 2005). The Punch Newspaper on February 20, 1991:2 reported a total of 2,796 oil spill incidences recorded between the periods of 1976-1990 leading to 2,105,393 barrels of oil spilled. The UNDP 2006:181 also reported that between the period of 1976-2001, 3 million barrels of oil were lost in 6,817 oil spill incidences of which over 70% of the spilled oil was not recovered. In 2001 the western operations of the Shell Petroleum Development Company (SPDC) recorded a total of 115 incidences of oil spills in which 5,187.14 barrels of oil were spilled and 734,053 barrels of the spilled oil representing 14.2% were recovered (SPDC Nigeria Brief, May 1995).

**Causes of Oil Spillage**

In Nigeria, fifty percent (50%) of oil spills is due to corrosion, twenty eight percent (28%) to sabotage and twenty one percent (21%) to oil production operations, One percent (1%) of oil spills is due to engineering drills, inability to effectively control oil wells, failure of machines, and inadequate care in loading and unloading oil vessels.

**Well Blowouts**

According to United Nations Environment Programme (UNEP) “blowouts” is oil industry terminology for a situation in which control of oil well is lost during drilling or operation. More frequent during drilling, blowouts lead to the release of hydrocarbons (crude oil, produced water and associated gas) into the environment. Often, such mixture will catch fire and burn until such times the well is brought back under control. Blowouts could be caused by pressure, corrosion and illegal tapping leading to oil spills and fires. Such fire or spill can take months before it could be brought under control. Bellow is a picture of a well blowout (Ikuomola 2011).

In 1975, Shell BP leaked 600,000 barrels of crude oil into the seas of Forcados terminal and in 1980; 200,000 barrels of crude oil were spilled as a result of Texaco oil well blow out. Between 1997 and 1998, more than 900,000 barrels crude oil were spilled as a result of rupturing in Escravos terminal of Delta State (Ogboi, E in Ikuomola 2011).

Recently, on January 16, 2012, there was another blow out at Chevron‟s Funiwa Field, 10 kilometres offshore. This has become the latest in the series of environmental disasters in the Niger Delta due to oil and gas related operation. This will bring about steaming temperatures, acidification of the waters and air miles around the natural gas rig, thus causing a great damage of marine life. Communities affected by the blow out are Koluama I and II, Sangana, Foropa, Bisangbene, Ezetu, and others, all in Bayelsa State (Ikuomola 2011).

**Equipment failure:**

This is another oil spillage factor which could result from poorly maintained equipment used in oil exploration and transportation. In May and December 2001, pressure surge valve of Exxon Mobil and SPDC opened due to equipment failure causing Qua Iboe terminal Tank Farm spill and Umudike II spill in Ohaji Egbema Local Government of Imo State (Ikuomola 2011).

**Abandoned oil facility**

An abandoned oil facility in the country is another cause of environmental pollution in the area. In Ogoniland for example, some containers are left lying around since SPDC were forced out of the area some years ago. Where such containers are not empty, there are no indications of the contents. Tampering with such facility may lead to fire outbreak. From the environmental point of view, UNEP notes that corrosion of such metallic objects leads to ground contamination by heavy metals (Ikuomola 2011).

**Artisanal Refining**

Artisanal refining means local and crude way of refining petroleum products. This involves the use of metal drums to boil crude oil whose fumes are collected in tanks through pipes welded together. This is common in the Niger Delta region where distilleries are heated on open fire throwing dark plumes of smokes into the air and increasing the risk of fire outbreak. Also, soil where such practice took place will suffer contamination from hydrocarbons. Bellow is photograph showing air pollution resulting from artisanal refining and the resultant effect on the land (Ikuomola 2011).

**Improper Industrial Waste Disposal**

Industrial wastes are disposed in the region without regard to human life and safety as well as its effects on the environment. An example is a waste disposed of in several hundred big bags of 1 cubic metre reinforcement plastic bags which amounted to 1,100-1,500 cubic metres of oil mixed with gray clay containing small rock fragments with seeping from the bags, forming puddles in the ground and leaching into the soil (UNEP Ogoniland environmental analysis 2011).

**Sabotage:**

This is a deliberate nefarious human activity on oil pipelines either for the purpose of making quick money or willfully making oil companies suffer loss. According Ikporukpo (1986) cited in Ekpo (2010), sabotage as an oil spillage factor accounts for 3% of the total oil spills world wide and about 33% of oil spills in Nigeria. For instance, in August 2001, several kilometers of the Trans Niger pipeline were excavated and cut in sizable lengths for onward transportation to buyers. This act spilled oil at B-Dere and K- Dere communities in Gokana Local Government Area of Rivers State.

Also in August 2001, ¾ inch plug belonging to Exxon Mobil were removed which led to Qua Iboe terminal spill in Mkpanak which affected vegetations, farmlands, and buildings in the vicinity of the spill point (Ugochukwu, Onyema in Nwosu & Uffoh 2005).

**Gas Flaring:**

Gas flaring brings about ecosystem heat stress and acid rain. Acid rain in turn induces the destruction of fresh water fishes and forests (Adeyanju 2004). In another report, Oladejo (1998) in Adeyanju (2004) noted that constant gas flaring in the oil producing areas of Niger Delta contributes significantly to the atmospheric level of carbon dioxide, which is a major component of green house gases that causes global warming phenomenon.

The Energetic Solution Conference (2004) estimates that the Niger Delta region has about 123 gas flaring sites. Agbola and Olurin (2003) stated that about 45.8 billion kilo watts of heat is discharged into the atmosphere from 1.8 billion cubic feet of gas every day in the Niger Delta region, leading to temperatures that render large areas inhabitable. Complete utilization of produced associated gas, reduction of flaring and production greenhouse gas is one of the policies that oil companies are expected to comply, with the stoppage of gas flaring completely by 2004 or 2008. However, 84.60% of total gas produced is still flared with 14.86% only being used locally (Ukoli, 2005). From 1970-1986 a total of approximately 125.5 cubic meters of gas was produced in the Niger Delta region, 102.3 (81.7%) million cubic meters was flared, 2.6 million cubic meter was used as fuel by the oil producing companies and about 14.6 million cubic meters was domestically consumed (Awosika, 1995).

**Gas Flaring and Effects**

Before the advent of oil prospecting and production in the Niger Delta Region, the people of Niger Delta were farmers as other regions of the country. Specifically, they were fish farmers and the environment was conducive, friendly and viable. The soil was equally fertile and therefore good for farming. Thus, farm produce/yield was high and adequate for the subsistence and commercial needs of the people. Until oil was discovered and production began that altered the environment. One of the major problems associated with oil production is the destruction of the people’s livelihood which is the soil and farmlands through gas flaring and oil spillage. In the process of oil production, Nigeria flares about 24 billion cubic meters or 0.84 trillion cubic feet of associated natural gas every year. According to a November report by the Department of Petroleum Resources, >70% of the oil fields in Nigeria still flare gas (Ugwaren, 2008). Specifically, Nigeria produces about 2.524 trillion SCF of gas annually and the estimated gas they utilize is put at 2.235 trn, with a hefty

289.6 bn SCF flared (Ajugwo, 2013). Oil companies operating in the country find it cheaper to flare gas than to conserve. Though it is illegal to do so, nevertheless corruption and dumbness has made the authorities not to care about the adverse environmental health hazards associated with it (Okonkwo et al., 2015; Uzoma and Mgbemena, 2015).

Gas flaring affects not only the soil but also vegetation, agriculture and crop production (Mathew et al., 2018; Alakpodia, 1989; 2000; Dosunmu and Amadi, 1996; Gogoi and Baruoh, 2002; Ogidiolu, 2003; Efe, 2003). The agricultural soils as well as fresh water and aquatic life have been destroyed by various forms of oil-generated environmental pollution. Farming has become very difficult and even drinking water has become scarce. Flaring activity affects agricultural production of the region. This stunts crops growth and impacts negatively on the yield of their crops – cassava, yam, plantain among others (Olisemauche and Avwerosuoghene (2015). Few examples in the literature will help us understand the effects of gas flaring in some communities in Niger Delta.

Gas flares generate tremendous heat, which makes plant growth difficult, and the ecosystem and aesthetics of the environment destroyed during the laying of the pipelines. Again, gas flaring causes vegetal re-growth problem, depression in flowering and fruiting in these crops and generally diminishes the value of agricultural productivity (Omuta, 1985; Isichei and Stanford, 1996; Alakpodia 2000; Ejuwa 2005).

Obioma (1985) investigated agricultural production decline in the Ogba-Egbema area of Rivers state and found that gas flares and the warmth it generates attract insects in great numbers from the forest at night that causes destruction of the crops in the area. Ukegbu and Okeke (1987) examined the effect of gas flare on the growth, productivity and yield of selected farm crops in Izombe flow station located in Izombe Ohagi/Egbema/Oguta Local Government Area of Imo state. Their findings show about 100% loss in yield in all the crops cultivated about 200 m away, 45% loss for those about 600 m and 10% loss in yield for crops

**Consequences of Environmental Pollution in Nigeria**

Adeyanju (2004) posits that environmental pollution is a challenge in most developed societies of the world; contemporary societies of Africa and Nigeria in particular also grapple with and or/tackle this menace in recent times. Our analysis of the negative impact of environmental pollution in contemporary Nigeria society would focus specifically on; agricultural and Hunting activities of the agrarian people, industrial activities of the urban based, Noise pollution, Housing, conflict and warfare.

**Agricultural and Hunting Activities**

The agricultural and hunting activities of farmers in Nigeria have far reaching effects on the environment and human health. The farmers do this by altering the lithospheric and atmospheric pathways of the hydrologic cycle, thus impacting negatively on the air, soil and water substances mostly used by man/biodiversity. Empirical evidence has shown that primitive farmers use fire to clear parcels of farm land, modify the soil by ploughing, alter the drainage by irrigation and introduce or breed new animals and crops. These activities no doubt alter the natural vegetation of the environment. Kelvin & Lewis (1994) posit that “in recent times, humans have destroyed enormous tracts of natural vegetation, excavated large areas of land, greatly modified the landscape, and even created new lands. The economic importance of vegetation to mankind can not be under estimated. Apart from the fact that it serves as a primary source of food to man, its provision of resource base to the building, manufacturing and pharmaceutical industries and as a fuel is inexhaustive.

Relatedly, the use and misuse of fire to clear land which sometimes could be used to help improve the quality of the soil in arid regions through adding fresh organic materials, experts noted, causes a reduction in natural vegetation. It also threatens wildlife, human‟s life and property as well (Ayia, 2009).

The use of fire to clear land either for farming and/or hunting activities produces secondary problems associated with the clearance of vegetation, such as erosions by wind and water and flooding. Continuous and frequent burning often reduces the capability of an area to regenerate itself and to replenish its natural vegetation, inflict the atmosphere with severe pollutants, thus endangering life and property as well as threatening the very survival of the environment, (Idris, 2008) in Ayia (2009). The simple fact is, what ever reason one may adduce for indulging in the act of bush burning and/or farming or hunting activities, it is submitted that the practice/act is most unacceptable in contemporary times and must be discouraged with all vehemence. More so, that its consequences far out weighs its advantages. This practice is mostly common among the rural farmers in the Northern and North-central region of Nigeria.

Livestock farming, popularly referred to as domestication of animals which is commonly practiced in the Northern and North central regions of Nigeria also has a major polluting impact on the land surface. Heavy grazing of cattle leads to trampling and compaction of the soil, thus reducing its capacity to hold water and alters its structure at the same time. This leads to soil erosion by wind and water. Although, grazing may have positive effects on the land because the animals provides feaces, a natural fertilizer rich in nitrates and several other nutrients. These feaces are sometimes washed into the streams and rivers during rainy seasons which serve as sources of drinking water for most farmers in the rural areas and thus, constitute health hazards-outbreaks of cholera, etc.

Similarly, the rate at which our forests resources are depleting is alarming. This deliberate removal of forest to create new agricultural land and/or for other purposes deprive us of the wealth of diversity and the potential use of many of their unique biological compounds often of great medical value. This act also upsets the nutrient cycles, especially the oxygen and carbon dioxide cycles of which trees form an important component. It also scare wildlife. Deforestation may increase water flow over the land‟s surface, as rain will fall directly to the ground, no longer being impeded by the vegetational cover (Adeyanju 2004). This practice may lead to an increase in the magnitude and frequency of flooding, soil erosion increased sediment loads in rivers, slopes instability, and degradation of adjacent lands. Examples include forest clearing in southern, western and eastern Nigeria, clearing of tropical rainforest in Colombia, the destruction of rain forest in Madagascar etc. Forest clearing leads to vegetational removal which increases infertility of land and subsequently desertification (Adeyanju 2004).

Rural farmers sometimes out of ignorance over fertilize their farms because they are not aware of the nutrient content of the soil upon which they farm. This practice also damage the soil tops and result to poor yields. In another development, indiscriminate use of profilegate pesticide against pests and mosquitoes by farmers and households has caused serious problems. Many pesticides move through the air, water and soil and bio accumulate or bio concentrate in food chains leading to serious ecological and human health problems.

Hunting is also one of the human activities that often result to bush burning and the use of chemicals in our streams, rivers and seas in search of game. In most general sense, hunting is the pursuit of a target. It is commonly applied to the practice of pursuing animals to capture or kill them for sports, food, or trade in their products. Animals so hunted are referred to as game animals. Hunting is also done to control varmint populations or a wild life management to reduce animal population which have exceeded the capacity of their range or when individual animals have become a danger to humans. Some times they are captured and kept in zoos and wildlife parks for tourist activities and cultural carnivals (Gbehe 2004). Various devices are used to capture and kill the animals. Many hunters use dogs, traps, spears, arrows, guns, knifes etc. Plants, animals, including fish and birds are hunted for by man. The methods employed create a lot of negative impacts on the environment. For instance, bush burning which is common in the tropics – is a device used by hunters to drive animals to advantage locations. The rural Tiv people of North central Nigeria use this device to hunt for rats and other animals. The result of this is that sometimes it destroys lives and property, especially when the fire is out of control. Smokes from the fire (bush burning) also contaminates the air, land and water. Many habitats are also destroyed. Moreover as plants and animals are destroyed the ecosystem is generally upset. Fish hunting has made the water-streams, rivers and sea environments to be heavily polluted, due to the use of dangerous chemicals.

**Industrial activities**

Just as Gbehe (2004) pointed out, the causes of most environmental challenges take their origins in the developmental process or in its failure and inadequacies. As human societies continue to change from traditionalism to modernism with rapid technological advancement and increasing industrial production to satisfy growing human needs and comforts to improve civilization, new life styles and increased production activities have created unexpected industrial pollution.

The environment is highly polluted in the process of execution, processing and disposal of minerals. Mining is a process which involves the selective recovery of specific minerals from the earth crust for the benefit of mankind. Two basic methods are used. They are surface and underground mining which cause damage to the land and, the processing and disposal of minerals pollute the soil and water. In Nigerian cities; such as Lagos, Enugu, Ibadan, Kano, Port Harcourt, Benin, Warri, Kaduna, Yandev- Gboko-where these activities dominate, industries inject into the air pollutants that deplete the ozone layer. In the Niger Delta area to be specific, most oil spills come from vessels or involves pipelines, oil terminal and bulk storage facilities which are sometimes caused by accidental or deliberate sabotage (Gbehe 2004).

The blow out of offshore oil and gas wells, the dumping of drilling muds and oil soaked waste, the destruction of frilling rigs are major sources of water pollution in these areas. Water pollution kill fishes and other aquatic animals/organisms (Raven et al, 1998).

Different water borne diseases also occur. Others are epidemic, dysentery, typhoid etc. Corporation fumes, such as carbon dioxide, sulphur oxide, hydrocarbon, nitrogen oxide etc are emitted as a result of incomplete combustion of fuel and other carbon containing substances in exhausts pipes and plants. The adverse effect of the plants and machines produces objectable odour, causes impairment of mental function and foetal development and aggravation of cardiovascular diseases. Gas flaring in the oil exploitation zones reduces the quality of the air in the environment.

Dynamite used for mining causes pollution as it produces noxious fumes that cause inhaled can cause suffocation and lung diseases (Nwosu, 1997).

Animal health may also be in danger when they feed on plants covered by toxic particles such as fluorine. Air pollution affects vegetation when surphur dioxide enter the plants through stomata pores leading to the destruction of chlorophyll and disruption of photosynthesis in plants. Gases, like carbondioxide, methane, nitrous oxide etc cause green house effect.

**Environmental Health Hazards caused by Pollution**

Environmental pollution is the main cause of disease and death in the developing world. In 2012, exposures to polluted soil, water, and air resulted in an estimated

8.4 million deaths worldwide.1,2 By comparison, HIV/ AIDS is responsible for 1.5 million deaths annually3 and malaria and tuberculosis less than 1 million each.4 More than 1 in 7 deaths globally are the result of environ- mental pollution.

The overwhelming majority—94%—of the disease burden of pollution falls on low- and middle-income

countries (LMICs).5 These are the countries least well equipped to deal with the problem. Industries that cause pollution are relocating from Europe, Japan, and the United States to poor countries where they expose both workers and communities, often under highly uncon- trolled conditions. The Bhopal disaster was a tragic example, but not an isolated episode.6 Toxic chemicals, hazardous pesticides, and dangerous wastes banned in Western Europe and North America are manufactured, used, and recycled on an ever-increasing scale in Africa, South Asia, and Latin America. Global asbestos sales, for example, continue at 2 million tons per year, virtually all in LMICs.7 Electronic waste (e-waste) is pouring into poor countries at a rate of almost 40 million tons per year.

Residents of poor countries are disproportionately poisoned, suffer disabilities, and die prematurely of pollution. Workers, women, and children are the groups most heavily exposed. The global problem of pollution is environmental injustice on a planetary scale.

Pollution in low-income countries arises from mul- tiple sources. Particulates from power plants, cars, and trucks pollute outdoor air. Cook stoves poison indoor air. Mercury, lead, and other metals from mining, smelting, and recycling contaminate air, soil, and water. Sewage, pesticides, and toxic chemicals pollute water- ways. The diseases caused by pollution are diverse. They include pneumonia, asthma, and diarrheal disease. But also on the rise are cardiovascular diseases,10 cancer,11 and neurodevelopmental disorders. The occupational diseases caused by pollution include lead poisoning, acute and chronic pesticide poisoning, silicosis, byssi- nosis, and asbestos-related diseases.

Some of the health hazards of environmental pollution are;

**Visibility Impairment**

Oxides of nitrogen and lower hydrocarbons are released from most combustion processes in the region. In the presence of ultra-violet (UV) radiation, this could result in smog which could in turn result in a decrease in visibility.

**Acid Rain**

Obviously, some cases of acidified rain occur in the region due to the release of large concentration of oxides of nitrogen and sulphur in the environment. One study, reported that low pH values from water obtained from shallow hand-dug wells in Ughelli, Warri, and Okurekpo all in Delta State (Bini and Bresolin, 1998). According to another work, elevated levels of lead (0.56 mg/l) and low pH values ranging from 5.10 – 6.35 in rain water collected in Warri and environs has been recorded (Imiete and Viacheslovovna Alekseeva, 2018). This adversely affects the corrosion rate of roofing sheets, monuments and other economic structures in the area, which have been observed to deteriorate at rather alarming rates.

**Air Quality Impairment**

In an air quality assessment of the Niger Delta, Ayanlade & Howard showed that the levels of volatile oxides of carbon, nitrogen and sulphur and total particulates exceed existing Federal Environmental Protection Agency’s standards (Ayanlade and Howard, 2019). other work showed the elevated levels of lead at concentrations of 0.56 mg/l in the atmosphere (Anifowose et al., 2016).

**Effects on Vegetation and Animal Life**

It is a well-known fact that heat production destroys vegetation around its production area. This results in the retardation of growth of flowering plants, general reduction in agricultural life and wildlife biodiversity. After a study of this factor in the Niger Delta area, Ayanlade and Howard showed that flares have negative effects on vegetation growth, animal life and ecological equilibrium (Ayanlade and Howard, 2017).

**Thermal Conditions of the Region**

From flare sites in Isoko, Delta State temperature as high as 400 °C at an average distance of 43.8 metres have been recorded. Diemuodeke and Briggs reports that temperatures produced at flare sites could be as high as 1,600 °C (Diemuodeke and Briggs, 2018). Also according to Babatunde and colleagues, some 45.8 billion kilowatts of heat are discharged into the atmosphere of the Niger Delta from 1.8 billion cubic feet of gas every day (Babatunde et al., 2019).

**Coastal Erosion and Flooding**

The projected impacts of sea level rise (SLR) on the Nigerian coastal area and resources include: large scale inundation, increased coastal erosion, salt water intrusion into coastal aquifers, habitat modification with direct effects on wild life distribution, increased frequency of high intensity rainfall events and associated increased run off, elevated erosion rates, flash floods and increased frequency of ocean storm surges (Nicholls and Klein, 2005). In sum, these issues daily manifest in the negative effects on especially the rural peoples’ major occupations–fishing and farming– with destruction of farmlands and rivers on the rise. Also, there is lack/poor development of sanitary systems, schools, unemployment, flooding, oil spillage destruction, poor road networks, and pitiable condition of creek dwellers, high risk transport systems especially by seas and rivers, and neglect of the region/underdevelopment by oil drilling and affiliate production companies.

**Environmental Health effects on the people**

Severe health challenges are faced by residents and workforce of Niger Delta communities. After a survey on the health conditions of these people, Ana and group, reported common health problems in the general population. There are a summary of the prevalent air pollution related morbidities such as, Breathing Difficulties, Bronchitis, Aggravation of Asthma, Cardio-respiratory disorders, Pulmonary edema, Eye disorders, and Skin disorders (Ana et al., 2009). One study showed the common health problems in the industrial community. Out of 384 plant workers interviewed in a chemical fertilizer industry at Onne in the Niger Delta, 70.5% spend 8 hours per day at work. 66.1% reported respiratory disorders, 24.4% reported skin disorders and 22.6% reported eye disorders. There were strong associations (p< 0.05) between eye and respiratory disorders and the industrial activities carried out by the workers. Another survey carried out in among refinery (PHRC) and petrochemicals (EPCL) plant workers reported that 70.8% of workers at PHRC as compared to 67.2% at EPCL reported various health problems related to poor air quality conditions. In both cases, the major cause was attributed to gas flaring. Symptoms associated with exposure to fumes and sprays such as respiratory disorder were widely reported among 40.8% PHRC and 27.6% EPCL workers. There were reports of respiratory symptoms associated with exposure to dust and smoke, leading to irritation among 65.7% PHRC and 57.1% EPCL workers. Both the eyes and the skin were among other parts of the body also affected by the irritants (Ana et al., 2009). Further statistical analysis indicated that the duration of stay of PHRC workers in their residential communities was significantly associated with respiratory health problem (p= 0.000), with cancers (p= 0.000). At EPCL, the duration of residence in the community was significantly associated with miscarriages (p= 0.000), with deformed children (p= 0.000), and with symptoms related to health effects from air contaminants (p= 0.000).

There are also indications of emerging health problems in the region. Studies by Dendup and colleagues, revealed that of the two cancer reference centers: Ibadan in the South- west and Port Harcourt in the Niger Delta the ratio of reporting was 1:4 for University of Port Harcourt Teaching Hospital (UPTH) (904) and University college Hospital (UCH) (3521) respectively (Dendup et al., 2018). The results indicate that apart from prostate and breast cancers that were higher in Ibadan (79.1%) than in Port Harcourt (75.4%) both the lung and skin cancers were more prevalent in Port Harcourt than in Ibadan. This observation is consistent with the researchers’ earlier studies, which indicated increased lung cancers in the Port Harcourt environment due likely to exposure to atmospheric insults. Similarly, the higher percentage of skin cancer in Port Harcourt above that recorded in Ibadan could be explained though with some degree of uncertainty by the increased environmental risk factors in the more industrialized Port Harcourt area (Ana et al., 2009). Cancer prevalence is believed to be on the increase. Official documents in Nigeria have so far not addressed these health effects sufficiently, although their position as potential major contributors to the disease burden in oil-bearing communities is not in doubt.

**2.2 THEORETICAL FRAMEWORK**

**Ecological Perspective of Change and Development by Wilkinson And Boulding (1973)**

The theory is concerned with issues of change and development in contemporary societies, especially as they relate to environmental changes and/or ecologically related trends of population growth and the need to devise and sort out techniques of tackling development problems. The theory states that, as the population of a society increases in size, individual members of the society exert more pressure on scarce available resources such as land and other natural endowments for survival. They directly or indirectly carryout socio- economic activities that pollute the environment/society, and further cause harm (degradation) to the environment/society. The socio-economic activities, according to these theorists include subsistence agricultural activities of people in agrarian societies of Africa, Latin America etc and the commercial and industrial activities of people in Urban- industrialized societies of the western-Europe and North America.

The perspective further argued that development is needed when a society out grow its resource base and productive system. The perspective therefore posits that as the established economic system of a given environment/society is proved inadequate and productive system becomes more problematic, societies are therefore driven to change their methods. For instance, as the population of a society outgrows the available resources, especially in agrarian societies, people are forced to migrate to urban centres/cities in search of job opportunities. Some sell their labour, whereas some engage in several other commercial and agricultural investments such as livestocks; some still carryout some technical and entrepreneurial businesses – all for survival.

The urban and city dwellers establish and carryout industrial activities that equally pollute the society. Wilkinson and Boulding conclude that these activities directly and/or indirectly pollute the environment with its attendant consequences on biodiversity.

**2.3 EMPIRICAL REVIEW**

In a study carried out by Ocheri (2018) on “Environmental Pollution in Nigeria; Types and Health Consequences”, the study found out that the environment is safe when it is in the order of what nature wants it to be. However, pollution occurs when substances harmful to living things are introduced to the environment of the living thing. These substances that make environment impure are known as pollutants and are of different compositions. Pollutants may be solids, liquids, gases or mixtures of them and they either cause nuisance or have a direct impact on the health of living things - man, animal, and plant. The paper further discussed the different types of pollution in Nigeria, the health impacts arising from pollution globally and recommends policy measures to reduce the health impact of pollution. It was therefore recommended that the government should monitor the implementation of laws and regulation against pollution and there should be adequate public Awareness of environmental issues such as over use of petrol vehicles, over the use of coal, oil and ground water.

Furthermore in a similar study conducted by Ityavyar & Thomas (2019), the study examined the issue of environmental pollution and its attendant consequences on the Nigerian society. In doing so, the paper on the basis of personal observation and secondary sources examined the effects of environmental pollution in Nigeria. The findings showed that environmental problems in Nigeria generally are many, diverse in nature, and are caused by man’s interaction with nature (environment) for exploits in a number of ways-both in the cities; where industrial activities predominate, and rural areas; where agriculture thrives. The paper posited that man utilizes air for survival, harnesses land and water resources for domestic, commercial, industrial, agricultural and other purposes. Through these activities; man directly and/or indirectly create problems which are detrimental to his health/survival, well being, natural existence and stability. The paper also observed that these problems are a consequence of environmental pollution which also degenerates into environmental degradation and several other hazards such as widespread epidemics, depletion of natural habitats, and thus; impede the socio-economic development of Nigeria as a nation. The paper recommended awareness creation and change in attitudes for effective environmental and resources management strategies as a way forward.

**CHAPTER THREE**

**RESEARCH METHODOLOGY**

**3.1 INTRODUCTION**

 In this chapter, we described the research procedure for this study. A research methodology is a research process adopted or employed to systematically and scientifically present the results of a study to the research audience viz. a vis, the study beneficiaries.

**3.2 RESEARCH DESIGN**

Research designs are perceived to be an overall strategy adopted by the researcher whereby different components of the study are integrated in a logical manner to effectively address a research problem. In this study, the researcher employed the survey research design. This is due to the nature of the study whereby the opinion and views of people are sampled. According to Singleton & Straits, (2009), Survey research can use quantitative research strategies (e.g., using questionnaires with numerically rated items), qualitative research strategies (e.g., using open-ended questions), or both strategies (i.e., mixed methods). As it is often used to describe and explore human behaviour, surveys are therefore frequently used in social and psychological research.

**3.3 POPULATION OF THE STUDY**

 According to Udoyen (2019), a study population is a group of elements or individuals as the case may be, who share similar characteristics. These similar features can include location, gender, age, sex or specific interest. The emphasis on study population is that it constitute of individuals or elements that are homogeneous in description.

 This study was carried out to examine the management of environmental health hazard in the oil producing areas of Bayelsa state. Selected residents of Brass LGA, Bayelsa State form the population of the study.

**3.4 SAMPLE SIZE DETERMINATION**

A study sample is simply a systematic selected part of a population that infers its result on the population. In essence, it is that part of a whole that represents the whole and its members share characteristics in like similitude (Udoyen, 2019). In this study, the researcher adopted the convenient sampling method to determine the sample size.

**3.5 SAMPLE SIZE SELECTION TECHNIQUE AND PROCEDURE**

According to Nwana (2005), sampling techniques are procedures adopted to systematically select the chosen sample in a specified away under controls. This research work adopted the convenience sampling technique in selecting the respondents from the total population.

In this study, the researcher adopted the convenient sampling method to determine the sample size. Out of all the entire population of Brass LGA, Bayelsa State, the researcher conveniently selected 400 out of the overall population as the sample size for this study. According to Torty (2021), a sample of convenience is the terminology used to describe a sample in which elements have been selected from the target population on the basis of their accessibility or convenience to the researcher.

**3.6 RESEARCH INSTRUMENT AND ADMINISTRATION**

The research instrument used in this study is the questionnaire. A survey containing series of questions were administered to the enrolled participants. The questionnaire was divided into two sections, the first section enquired about the responses demographic or personal data while the second sections were in line with the study objectives, aimed at providing answers to the research questions. Participants were required to respond by placing a tick at the appropriate column. The questionnaire was personally administered by the researcher.

**3.7 METHOD OF DATA COLLECTION**

Two methods of data collection which are primary source and secondary source were used to collect data. The primary sources was the use of questionnaires, while the secondary sources include textbooks, internet, journals, published and unpublished articles and government publications.

**3.8 METHOD OF DATA ANALYSIS**

The responses were analysed using the frequency tables, which provided answers to the research questions. The hypothesis test was conducted using the Chi-Square statistical tool, SPSS v.23

**3.9 VALIDITY OF THE STUDY**

Validity referred here is the degree or extent to which an instrument actually measures what is intended to measure. An instrument is valid to the extent that is tailored to achieve the research objectives. The researcher constructed the questionnaire for the study and submitted to the project supervisor who used his intellectual knowledge to critically, analytically and logically examine the instruments relevance of the contents and statements and then made the instrument valid for the study.

**3.10 RELIABILITY OF THE STUDY**

The reliability of the research instrument was determined. The Pearson Correlation Coefficient was used to determine the reliability of the instrument. A co-efficient value of 0.68 indicated that the research instrument was relatively reliable. According to (Taber, 2017) the range of a reasonable reliability is between 0.67 and 0.87.

**3.11 ETHICAL CONSIDERATION**

The study was approved by the Project Committee of the Department. Informed consent was obtained from all study participants before they were enrolled in the study. Permission was sought from the relevant authorities to carry out the study. Date to visit the place of study for questionnaire distribution was put in place in advance.

**CHAPTER FOUR**

**DATA PRESENTATION AND ANALYSIS**

**INTRODUCTION**

This chapter presents the analysis of data derived through the questionnaire and key informant interview administered on the respondents in the study area. The analysis and interpretation were derived from the findings of the study. The data analysis depicts the simple frequency and percentage of the respondents as well as interpretation of the information gathered. A total of four hundred (400) questionnaires were administered to respondents of which all were returned and validated. This was due to irregular, incomplete and inappropriate responses to some questionnaire. For this study a total of 400 was validated for the analysis.

**4.1 DATA PRESENTATION**

**Table 4.2: Demographic profile of the respondents**

|  |  |  |
| --- | --- | --- |
| **Demographic information** | **Frequency** | **percent** |
| **Gender**Male |  |  |
| 200 | 50% |
| Female | 200 | 50% |
| **Age** |  |  |
| 20-30 | 125 | 31.2% |
| 31-40 | 205 | 51.2 |
| 41-50 | 35 | 8.7% |
| 51+ | 35 | 8.7% |
| **Marital Status** |  |  |
| Single  | 135 | 33.7% |
| Married | 195 | 36.7% |
| Separated | 35 | 48.7% |
| Widowed | 35 | 8.7% |
| **Education Level** |  |  |
| WAEC | 125 | 31.2% |
| BS.c | 100 | 25% |
| MS.c | 100 | 25% |
| MBA | 75 | 18.7% |

**Source: Field Survey, 2022**

**4.2 DESCRIPTIVE ANALYSIS**

**Research question 1: What is the level of management of oil spillage in the area of study?**

**Table 4.2:** Respondent on the level of management of oil spillage in the area of study?

|  |  |  |
| --- | --- | --- |
| **Options** | **Frequency** | **Percentage** |
| High level | 125 | 31.2 |
| Low level | 195 | 48.7 |
| Neutral  | 80 | 20 |
| **Total** | **400** | **100** |

**Field Survey, 2022**

From the responses obtained as expressed in the table above on the level of management of oil spillage in the area of study, 31.2% of the respondents ticked high level, 48.7% of the respondents ticked low level, while the remaining 20% were neutral.

**Research Question 2: What measures put in place to mitigate the health hazards from oil spillage?**

**Table 4.3:** Respondents on the measures are put in place to mitigate the health hazards from oil spillage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  | **Total %** |
| Reduction of the use of herbicides, pesticides, and fertilizers | 400(100%) | 00 | 00 | 400(100%) |
| Proper disposal of waste | 400(100%) | 00 | 00 | 400 (100%) |
| Ensure minimal use of bleach or detergents | 400(100%) | 00 | 00 | 400(100%) |
| Treatment of water | 400(100%) | 00 | 00 | 400(100%) |

**Field Survey, 2022**

From the responses obtained as expressed in the table above on the measures are put in place to mitigate the health hazards from oil spillage, all the respondents constituting 100% said yes in all the options provided. None of the respondents ticked no or were undecided.

**Research Question 3: Who are the stakeholders in the management effort in the study area?**

**Table 4.4:** Respondents on the stakeholders in the management effort in the study area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  | **Total %** |
| Government representatives | 400(100%) | 00 | 00 | 400(100%) |
| Businesses | 400(100%) | 00 | 00 | 400 (100%) |
| Scientists | 400(100%) | 00 | 00 | 400(100%) |
| Landowners | 400(100%) | 00 | 00 | 400(100%) |

**Field Survey, 2022**

From the responses obtained as expressed in the table above on the stakeholders in the management effort in the study area, all the respondents constituting 100% said yes in all the options provided. None of the respondents ticked no or were undecided.

**Research Question 4: What are the common health hazards from oil spills in the study of man?**

**Table 4.5:** Respondents on the common health hazards from oil spills in the study of man

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  | **Total %** |
| diarrhoea | 400(100%) | 00 | 00 | 400(100%) |
| Sore eyes | 400(100%) | 00 | 00 | 400 (100%) |
| Itchy skin | 400(100%) | 00 | 00 | 400(100%) |
| Occupational injuries. | 400(100%) | 00 | 00 | 400(100%) |

**Field Survey, 2022**

From the responses obtained as expressed in the table above on the common health hazards from oil spills in the study of man, all the respondents constituting 100% said yes in all the options provided. None of the respondents ticked no or were undecided.

**TEST OF RELATIONSHIP**

**4.3 RESEARCH HYPOTHESIS**

**H0:** There is no significant positive relationship between health hazards (HH) and oil spills (OS) in the study area.

**HA:** There is a significant positive relationship between health hazards (HH) and oil spills (OS) in the study area.

**Level of significance**: 0.05

**Decision Rule:**

In taking decision for “r”, the following riles shall be observed;

1. If the value of “r” tabulated is greater than “r” calculated, accept the alternative hypothesis (H1) and reject the null hypothesis (H0).
2. If the “r” calculated is greater than the “r” tabulated, accept the null hypothesis (H0) while the alternative hypothesis is rejected

**Table 4.6: Pearson Correlation Table showing the relationship between health hazards (HH) and oil spills (OS) in the study area**

|  |  |  |
| --- | --- | --- |
|  | HH | OS |
| HH | Pearson Correlation | 1 | .821\*\* |
|  | Sig. (2-tailed) |  | .000 |
|  | N | 400 | 400 |
| OS | Pearson Correlation | .821\*\* | 1 |
|  | Sig. (2-tailed) | .000 |  |
|  | N  | 400 | 400 |

Source: Survey data, 2022

\*\*. Correlation is significant at the 0.05 level (2-tailed)

The Pearson Correlation result in Table 4.6 contains the degree of association between HH and OS. From the result, the Pearson correlation coefficient, r, value of 0.821 was positive and statistically significant at (p< 0.000). This indicates that oil spills (OS) will result in health hazards (HH).

Thus, HH and OS are correlated positively.

**H02:** There is no significant positive relationship between the levels of management of oil spills (LOS) and the health of people (HOP).

**HA2:** There is a significant positive relationship between the levels of management of oil spills (LOS) and the health of people (HOP).

**Level of significance**: 0.05

**Decision Rule:**

In taking decision for “r”, the following riles shall be observed;

1. If the value of “r” tabulated is greater than “r” calculated, accept the alternative hypothesis (H2) and reject the null hypothesis (H0).
2. If the “r” calculated is greater than the “r” tabulated, accept the null hypothesis (H0) while the alternative hypothesis is rejected

**Table 4.7: Pearson Correlation Table showing the relationship between the levels of management of oil spills (LOS) and the health of people (HOP)**

|  |  |  |
| --- | --- | --- |
|  | LOS | HOP |
| LOS | Pearson Correlation | 1 | .821\*\* |
|  | Sig. (2-tailed) |  | .000 |
|  | N | 400 | 400 |
| HOP | Pearson Correlation | .821\*\* | 1 |
|  | Sig. (2-tailed) | .000 |  |
|  | N  | 400 | 400 |

Source: Survey data, 2022

\*\*. Correlation is significant at the 0.05 level (2-tailed)

The Pearson Correlation result in Table 4.7 contains the degree of association between LOS and HOP. From the result, the Pearson correlation coefficient, r, value of 0.821 was positive and statistically significant at (p< 0.000). This indicates that There is a significant positive relationship between the levels of management of oil spills (LOS) and the health of people (HOP).

Thus, LOS and HOP are correlated positively.

**H03:** There is no significant positive relationship between oil spillage (OS) and the disease burden (DB) of the people.

**HA3:** There is a significant positive relationship between oil spillage (OS) and the disease burden (DB) of the people.

**Level of significance**: 0.05

**Decision Rule:**

In taking decision for “r”, the following riles shall be observed;

1. If the value of “r” tabulated is greater than “r” calculated, accept the alternative hypothesis (H2) and reject the null hypothesis (H0).
2. If the “r” calculated is greater than the “r” tabulated, accept the null hypothesis (H0) while the alternative hypothesis is rejected

**Table 4.8: Pearson Correlation Table showing the relationship between oil spillage (OS) and the disease burden (DB) of the people**

|  |  |  |
| --- | --- | --- |
|  | OS | DB |
| OS | Pearson Correlation | 1 | .821\*\* |
|  | Sig. (2-tailed) |  | .000 |
|  | N | 400 | 400 |
| DB | Pearson Correlation | .821\*\* | 1 |
|  | Sig. (2-tailed) | .000 |  |
|  | N  | 400 | 400 |

Source: Survey data, 2022

\*\*. Correlation is significant at the 0.05 level (2-tailed)

The Pearson Correlation result in Table 4.8 contains the degree of association between OS and DB. From the result, the Pearson correlation coefficient, r, value of 0.821 was positive and statistically significant at (p< 0.000). This indicates that there is a positive relationship oil spillage (OS) and the disease burden (DB) of the people..

Thus, OS and DB are correlated positively.

**CHAPTER FIVE**

**SUMMARY, CONCLUSIONS AND RECOMMENDATIONS:**

**5.1 Introduction**

This chapter summarizes the management of environmental health hazard in the oil producing areas of Bayelsa state. The chapter consists of summary of the study, conclusions, and recommendations.

**5.2 Summary of the Study**

In this study, our focus was on management of environmental health hazard in the oil producing areas of Bayelsa state. Specifically, the study focused on assessing the level of management of oil spillage in the area of study, determining the measures are put in place to mitigate the health hazards from oil spillage, finding out the stakeholders in the management effort in the study area, and determine the common health hazards from oil spills in the study of man. The study adopted the survey research design and randomly enrolled participants in the study. A total of 400 responses were validated from the enrolled participants where all respondents are residents of Brass LGA, in Bayelsa State.

**5.3 Conclusions**

Based on the findings of the study, the researcher recommended that;

1. The level of management of oil spillage in the area of study is low.
2. The measures are put in place to mitigate the health hazards from oil spillage include:
3. Reduction of the use of herbicides, pesticides, and fertilizers,
4. Proper disposal of waste
5. Ensure minimal use of bleach or detergents and
6. Treatment of water
7. The stakeholders in the management effort in the study area include:
8. Government representatives
9. Businesses
10. Scientists and
11. Landowners

**5.4 Recommendations**

Based on the findings of this study, the following recommendations are made:

* Environmental education should be enshrined in the school curriculum from primary to tertiary institutions to inculcate in the masses environmental friendly attitudes. Such environmental education should equally be carried out through the traditional media so as to carry along both the literate and illiterate ones in the quest for a healthy environment.
* Oil industries operating in the country should ensure regular maintenance of their equipment to avoid equipment failure and ruptures capable of spewing thousands of barrels of oil unto the land and under ground waters. In case of oil spill, immediate clean up of the environment should be carried out while processes of remediation should commence without delay.
* Residents should avoid illegal activities such as bunkering and artisanal refining which are major causes of water pollution in the area. Also, they should avoid sabotaging oil facilities in the area bearing in mind that in case of oil spill it is them that suffers the consequences. Dialogue with oil industries operating in the area should be their watchword in case of threatening situations

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**APPENDIXE**

**QUESTIONNAIRE**

**PLEASE TICK [√] YOUR MOST PREFERRED CHOICE (s) ON A QUESTION**

**SECTION A**

**PERSONAL INFORMATION**

**Gender**

Male [ ] Female [ ]

**Age**

20-30 [ ]

31-40 [ ]

41-50 [ ]

51 and above [ ]

**Education Level**

SSCE [ ]

BSC/HND [ ]

MASTERS [ ]

PHD [ ]

**Section B**

**Research question 1: What is the level of management of oil spillage in the area of study?**

|  |  |
| --- | --- |
| **Options** | **Please tick** |
| High level |  |
| Low level |  |
| Neutral  |  |

**Research Question 2: What measures put in place to mitigate the health hazards from oil spillage?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  |
| Reduction of the use of herbicides, pesticides, and fertilizers |  |  |  |
| Proper disposal of waste |  |  |  |
| Ensure minimal use of bleach or detergents |  |  |  |
| Treatment of water |  |  |  |

**Research Question 3: Who are the stakeholders in the management effort in the study area?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  |
| Government representatives |  |  |  |
| Businesses |  |  |  |
| Scientists | 4 |  |  |
| Landowners |  |  |  |

**Research Question 4: What are the common health hazards from oil spills in the study of man?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Options** | **Yes** | **No** | **Undecided**  |
| diarrhoea |  |  |  |
| Sore eyes |  |  |  |
| Itchy skin |  |  |  |
| Occupational injuries. |  |  |  |