

**OIL AND COASTAL WATER POLLUTION: A CASE STUDY OF
CHANGAMWE DIVISION MOMBASA COUNTY COASTAL
PROVINCE-KENYA**

PRESENTED BY:

SAMWEL JOHN OLELA

REG NO: BEM/40430/91/DF

**A RESEARCH DISSERTATION SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A
DEGREE IN BACHELOR OF SCIENCE IN ENVIRONMENTAL
MANAGEMENT OF KAMPALA INTERNATIONAL UNIVERSITY**

OCTOBER 2012

Declaration

I Samwel John Olela, declare that the content of this document is my original work and has never been presented or submitted to any university college or any institution of learning for any award

Signed 

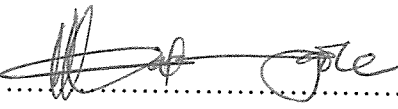
Samwel John Olela

Student

Date. 25/oct/2012

Approval

This research dissertation has been submitted by Samwel John Olela for approval

Signature  25th OCT - 2012

Madam Hadijja Katongoleh

Supervisor

DEDICATION

This study paper is heartily dedicated to my father Mr. Paul Olela, Mum Mrs. Esther Olela for their prayers, and instilling in me a sense of purpose throughout the course.

ACKNOWLEDGEMENT

I wish to acknowledge my heartfelt gratitude to my supervisor Madam. Hadijja Katongole despite her tight schedule took her precious time to read through my work and make necessary corrections. I also acknowledge her professional guidance which made it possible to tackle the work with fewer problems.

My sincere gratitude goes to my parents who have been of great help financially throughout my study.

I also acknowledge the following my fiancée Jane Atieno, my brothers; Fredrick, Kevin, Dennis and Joseph (Doctor), my sisters; Saline, Maureen, Beatrice and Mercyline. Friends Shem, Michael, Okanda, William, Eveline, and the entire environmental class of 2012 and lectures especially Madam Ann, for their support during my study.

To all the above and many others who may have not been mentioned, appreciation and acknowledgement is hereby expressed for all the assistance rendered.

May God the Almighty bless you.

TABLE OF CONTENT

Declaration.....	i
Approval.....	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ACRONYMS	viii
LIST OF PLATES	ix
LIST OF TABLES	x
ABSTRACT	xi
1.0 Introduction.....	1
1.1 Background	1
1.2 Statement of the problem.....	3
1.3 General objective.....	3
1.4 Specific objectives.....	4
1.5 Research question.....	4
1.6 Scope of the study	4
1.7 Significance of the study.....	4
1.8 Limitation of the study.....	5
CHAPTER TWO	6
LITERATURE REVIEW	6
2.0 Introduction.....	6
2.1 Conceptual Framework.....	8

2.2 Sources of oil pollution.....	8
2.3 Effects of oil pollution on Water ecosystem	11
2.4 Water oil pollution and livelihood and people of the coastal region	15
2.5. Measures of oil pollution	18
 CHAPTER THREE.....	 21
METHODOLOGY.....	21
3.0 Introduction.....	21
3.1 Research design.....	21
3.2 Sample scope.....	21
3.3 Why Changamwe area in Mombasa county.....	21
3.4 survey population	22
3.5 Sampling Techniques.....	22
3.5.1 Sampling Procedure.....	22
3.6 Sources of data	23
3.6.1 Secondary sources	23
3.7 Data Collection methods.....	23
3.7.1 Oral interviews	23
3.7.2 Questionnaire	23
3.7.3 Group discussion	24
3.7.4 Personal observation.....	24
3.8 Review of relevant documentation	24
3.9 Data collection procedures.....	24
3.10 Testing of the research instrument.....	25
3.11 Data Analysis	25
3.11.1 Quantitative data analysis	25
3.11.2 Qualitative dada analysis.....	26

2 Anticipated problems26

AFTER FOUR 27

PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION 27

Demographic characteristics of respondents 27

1 Age of respondents..... 27

le1: showing age of respondents 27

2 Sex of respondents 28

3 Educational background of parent as per the responses by students 28

4 Occupation of respondents 29

5 Number of people in a house hold 30

Sources of oil pollution..... 30

le 6: Response on the sources of oil pollution..... 30

Effects of oil pollution on Water ecosystem 32

Oil pollution effects on the live hood/people 33

Areas for Further Research 37

ERENCE..... 38

APPENDICES40

Appendidice A. questioner for environmental officer40

Appendidice B. Questioner for workers43

ACRONYMS

CBD	Convention on Biological Diversity
IMO	International Maritime Organization
KPA	Kenya Port Authority
NGO	Non Governmental Organization
NOSRCP	National Oil Spill Response Contingency Plan
UN	United Nations
UNCED	United Nation Conference on Environment and Development
UNDP	United Nations Development Programme
WWF	World Wildlife Fund

LIST OF PLATES

Plate 1	13
A picture showing part of the ocean polluted by oil spill and paper waste	13
Plate 2	15
A picture showing the effect of oil spill on the ocean.....	15

LIST OF TABLES

Table 1: Age of respondents	30
Table 2: Sex of respondents	30
Table 3: Educational background	31
Table 4: Occupation of respondents	32
Table 5: Number of in a household.....	32
Table 6: Response on the sources of oil pollution	32
Table 7: Response on the effects of oil pollution on Water ecosystem.....	34
Table 8: showing the effects of Oil pollution on the live hood/people.....	36

ABSTRACT

Oil wastes that enter the ocean come from many sources, some being accidental spills or leaks, and some being the results of chronic and careless habits in the use of oil and oil products. Most waste oil in the ocean consists of oily storm water drainage from cities and farms, untreated waste disposal from factories and industrial facilities, and unregulated recreational boating. It is estimated that approximately 706 million gallons of waste oil enter the ocean every year, with over half coming from land drainage and waste disposal; for example, from the improper disposal of used motor oil. Offshore drilling and production operations and spills or leaks from ships or tankers typically contribute less than 8 percent of the total. The remainder comes from routine maintenance of ships (nearly 20 percent), hydrocarbon particles from onshore air pollution (about 13 percent), and natural seepage from the seafloor (over 8 percent). The methods used for data collection were questionnaires and interviews to the community members. The study revealed that most of the local residents of Changamwe engage in fish harvesting, consumption and distribution. The results there are getting from the practice is encouraging, there is an increase in job creation amongst the community members who have decided to in cooperate wood fuel harvesting as part of their lives. The study also revealed that the oil spillage affects greatly the lives of the local community as well, hence making the practice an income degenerating activity within the community. The researcher recommended that policy makers' provision for improving and maintaining the water cleanliness level. This will be helping fish production hence food and job creation.

CHAPTER ONE

1.0 Introduction

This chapter will cover the background of the study, statement of the problem, objectives of the study, research question, scope of the study and significant of the study.

1.1 Background

Pollution – The term 'pollution' describes the occurrence and inputs of wastes and the impact of these wastes on the environment. Water Pollution (UN definition) –The introduction by man, directly, or indirectly, of substances or energy to the Water environment resulting in deleterious effects such as: hazards to human health, hindrance to Water activities, impairment of the quality of seawater for various uses and reduction of amenities.

The oil discovery in the world to date stand at over 1 billion barrels of oil, it's clear that the production of oil in these countries may come with both positive and negative environmental effects. It numbers to social, economic and political impacts which need to be factored in the planning processes as the government and companies continue with oil exploration and embark on the process of oil production.

Using experiences from the oil producing countries in and outside Africa, this research paper presents an overview and assessment of oil pollution to the coastal water in Kenya and its possible implication for the enjoyment of a right to a clean and healthy environment and the conservation of the environment as a whole. The evidence available indicates that the global community will rely heavily on oil supplies for the foreseeable future. For instance, according to the Bail Products Statistical Review of the world Energy (June 1995), world primary energy consumption in 1994 stood at 8,000million tones of oil equivalents. Out of this total consumption, oil and gas consumption represented 63% of world energy supply, coal 27%, nuclear energy 7% and hydro-electric 3%.

The United Nation Conference on Environment and Development (UNCED) held in Rio de Janeiro in June 1992, for the first time brought the link between the environment and the socio-economic development. The conference reviewed several environmental issues and resulted in three Conventions namely: the Framework Convention on Climate Change and the Convention

on Biological Diversity (CBD) and UN Convention on Desertification. It also led the Rio Declaration and Agenda 21-Plan of Action.

Agenda 21 includes important dimension of social change and the impact on cultural values that accompany development projects, particularly those within or near remote, poor and vulnerable communities. The agenda provides that investors have a role to play in conserving the environment and ensuring that their business activities do not impact negatively and respect the lifestyle of people, life alternatives and communities in the project areas. It also identifies key issues for environmental management. These include: habitat and biodiversity protection, avoiding air emissions, Water and freshwater discharge, oil spills, oil and ground water contamination and many others.

Water pollution occurs when harmful effects, or potential harmful effects, can result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms. Most source of Water pollution are land based, the pollution often comes from non-point sources such as agricultural runoff and wind blow debris.

Many potential toxic chemicals adhere to tiny particles which are then taken up by plankton and benthos animals, most of which are either deposit or filter feeders. In this way, the toxics are concentrating upward within ocean food chains. Many particles combine chemically on a manner highly depletive of oxygen, causing estuaries to become anoxic.

When pesticides are incorporated into the Water ecosystem, they quickly become absorbed into Water food webs. Once in food webs, these particles can cause mutations, as well as disease, which can harmful to human as well as the entry food webs.

Although Water pollution has a long history, significant international laws to counter it were enacted in the twentieth century. Water pollution was a concern during several United Nations conference on laws of the sea beginning in the 1950s, most scientists believed that the ocean were so vast that they had unlimited ability to dilute, and thus render harmless, pollution. In the late 1950s and early 1960s, there were several controversies about dumping radioactive waste off the coast of the United State by companies licensed by the Atomic energy commission.

Coastal ecosystems

The Kenyan coast features a diverse Water environment including estuaries, mangroves, sea-grass beds and intertidal reef platforms and coral reefs, which are vital for the diversity and reproduction of Water organisms. These coastal ecosystems systems are regarded as some of Kenya's most valuable ecosystems; and some are protected by the six Water national parks and reserves. These coastal ecosystems make up the basis for the livelihood of the large coastal population, but do on the other hand face serious threats from the ever increasing human pressure through tourism, industrial pollution, overfishing, destructive fishing, mangrove logging and other unsustainable use of Water resources.

1.2 Statement of the problem

Water pollution has been in increase at the Coastal area due to oil pollution. Most of it is due to fishing machine used, discharge of cargo residues from bulky carriers pollute ports, waterways and oceans. In many instance vessels intentionally discharge illegal wastes despite foreign and domestic regulation prohibiting such actions. It has been estimated that container ships lose over 10,000 containers at sea each year (usually during storms). Ships also create noise pollution that disturbs natural wildlife, and water from ballast tanks can spread harmful algae and other invasive species. The main challenge is however how to ensure that the community are not affected. Due to increased pollution the coastal water, water borne diseases have been rampaged for examples cholera, dysentery, and bilharzias. The community members are affected each passing day, chronicle pollution in increase hence leading to death of children and some members of the community, reduced economical activities. The central research question for this paper is thus “assessing how oil and coastal water pollution may affect the right to clean and healthy environment and suggesting how the effects can be prevented or mitigated?”

(Source national report on the coastal effect 2001)

1.3 General objective

The purpose of the study or research will be to find the role of oil in Water pollution in Changamwe division in Mombasa County.

1.4 Specific objectives

- i. To identify the sources of oil pollution in changamwe division
- ii. To assess the effects of oil pollution on Water ecosystem in changamwe division
- iii. To find out how Water oil pollution affects the live hood/people on the coastal of Mombasa

1.5 Research question

- i). what are the sources of oil pollution in changamwe division?
- ii). what are the effects of oil pollution on Water ecosystem in changamwe division?
- iii). How does Water pollution affects the people of the coastal Mombasa?

1.6 Scope of the study

The Geographical scope of the study area is that the Kenya coastline extends some 600 kilometers from the border of Tanzania in the south to the border of Somalia in the north. Among its distinctive features are the nearly continuous coast parallel fringing coral reef, the Lamu archipelago, Water National Parks and Reserves, sandy beaches, Mombasa Creek as well as Wasini and other coral Islands. The research will take a period of one year between 2012 march – 2013 march and the content of the research will mainly deal with oil and its roles in the Water pollution. The researcher will cover 50sq kilometers.

1.7 Significance of the study

It might be noted that the environmental impact has been politicized and oil production in particularly is a critical issue in many countries of sub-Saharan Africa. Such production is often implemented under conditions of budgetary constraints and many aids Agencies are willing to support it. This poses a serious challenge with regard to the ownership of recipient countries. Their self-help efforts, which were frequents debated in the 1990s, are naturally discouraged, but few now express worries about becoming aid-dependent. Others relevant questions include: for whose benefit is the environmental issues? And how well do people understand the actual cause of the damage?

It is therefore appropriate for more critical analyses to be conducted from the perspectives of community and the environment, this angle of looking at the benefit of oil not the effect has cause a lot of damage to the community of people within there of study.

- i). This research paper seeks to find out the challenges in financing of oil production as well as issues in maintaining quality of the environment.
- ii). The finding of the research will help the policy makers especially the national environmental management authority (NEMA) to set out the required standard and principles to help in the management of the environment.
- iii). The finding will help the academicians to know more about the effects of oil Water pollution and possible solution and management of the effects
- iv). The findings will help the community to have knowledge on how to maintain the environment and reduce pollution.
- v). The data collected will enable stakeholders in organization and consultants in order to recommend appropriate interventions.

1.8 Limitation of the study

In this study however, some limitation maybe met. In the first instance although it maybe have been useful to include more individuals to attain a broader understanding of the relationship between allowing oil production and the effects caused to the environment and community, in this study it is not possible due to inadequate resources. Consequently, only about 6 sub-divisions will be sampled.

The study may also be limited to a representative sample due to the high expenses involved in terms of time and funds if a longitudinal study is to be conducted. Furthermore, the representative sample to be used is limited in scope to enable the generalization of the findings from the study on the effect of oil pollution on the coastal water. The finding of the study may consequently not be generalized to all sub-division in the country, since different geographical areas may have their own peculiar characteristics in terms of location, the socio-economic status of community members and the cultures.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Oil in the oceans is one of the ugliest forms of Water pollution. Just thinking about oil pollution in the oceans conjures up images of massive tanker spills, oiled seabirds and shorelines covered with gooey black oil. However, oil spills are not the major cause of oceanic oil pollution. Instead the majority of Water oil pollution comes from other sources

Water Pollution

Water pollution occurs when a body of water is adversely affected due to the addition of large amount of materials to the water. The sources of water pollution are categorized as being a point source or a non-source point of pollution. Point sources of pollution occur when the polluting substance is emitted directly into the waterway. A pipe spewing toxic chemicals directly into a river is an example. A non-point source occurs when there is runoff of pollutants into a waterway, for instance when fertilizer from a field is carried into a stream by surface runoff.

Types of Water Pollution

Toxic Substance -- A toxic substance is a chemical pollutant that is not a naturally occurring substance in aquatic ecosystems. The greatest contributors to toxic pollution are herbicides, pesticides and industrial compounds. (Journal, 2010)

Organic Substance -- Organic pollution occurs when an excess of organic matter, such as manure or sewage, enters the water. When organic matter increases in a pond, the number of decomposers will increase. These decomposers grow rapidly and use a great deal of oxygen during their growth. This leads to a depletion of oxygen as the decomposition process occurs. A lack of oxygen can kill aquatic organisms. As the aquatic organisms die, they are broken down by decomposers which lead to further depletion of the oxygen levels. (gesamp, 1977;1993)

A type of organic pollution can occur when inorganic pollutants such as nitrogen and phosphates accumulate in aquatic ecosystems. High levels of these nutrients cause an overgrowth of plants and algae. As the plants and algae die, they become organic material in the water. The enormous

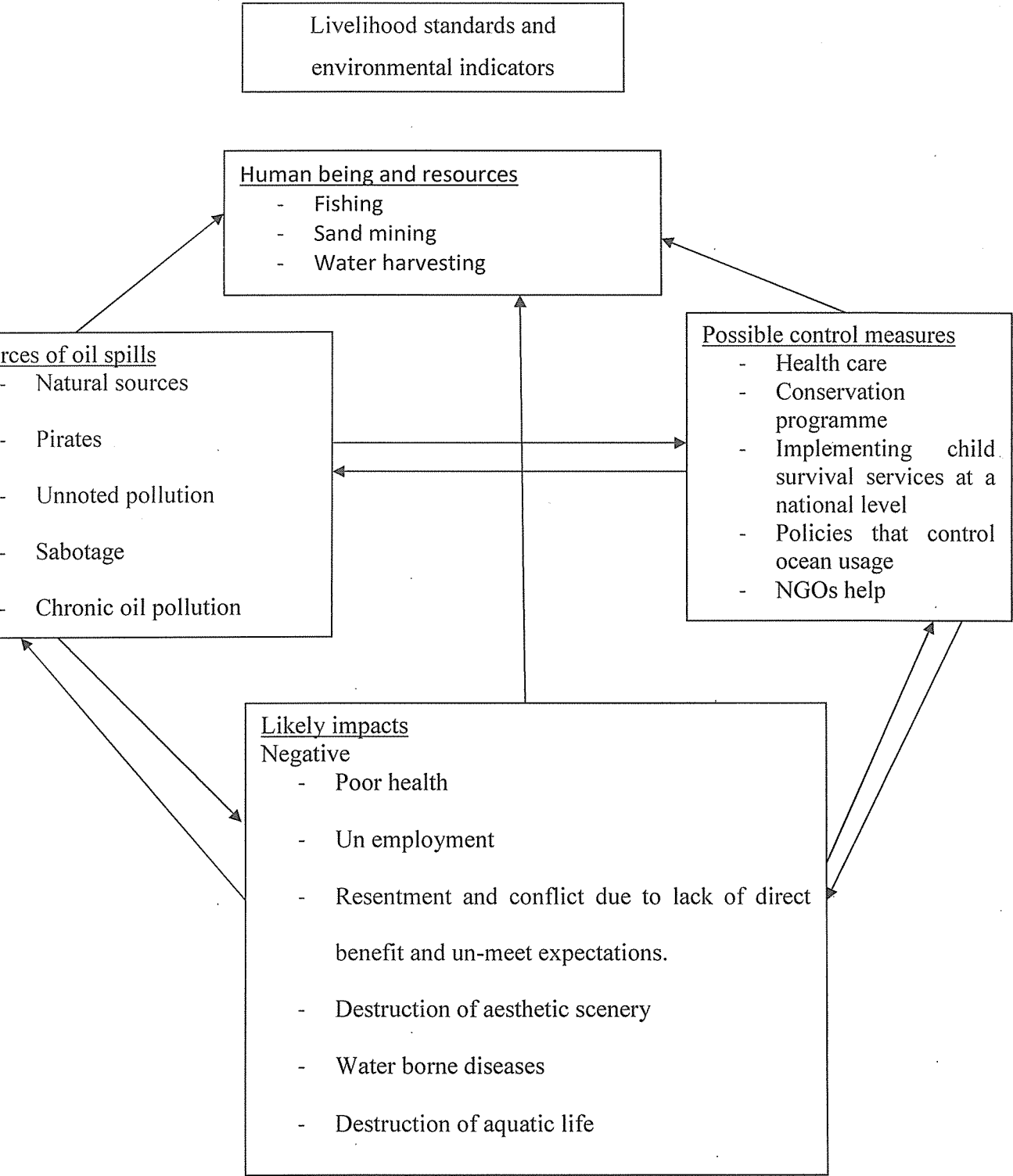
decay of this plant matter, in turn, lowers the oxygen level. The process of rapid plant growth followed by increased activity by decomposers and a depletion of the oxygen level is called *eutrophication*. (Science, 1986)

Thermal Pollution -- Thermal pollution can occur when water is used as a coolant near a power or industrial plant and then is returned to the aquatic environment at a higher temperature than it was originally. Thermal pollution can lead to a decrease in the dissolved oxygen level in the water while also increasing the biological demand of aquatic organisms for oxygen. (benzhitski, 1980)

Ecological Pollution -- Ecological pollution takes place when chemical pollution, organic pollution or thermal pollution is caused by nature rather than by human activity. An example of ecological pollution would be an increased rate of siltation of a waterway after a landslide which would increase the amount of sediments in runoff water. Another example would be when a large animal, such as a deer, drowns in a flood and a large amount of organic material is added to the water as a result. Major geological events such as a volcano eruption might also be sources of ecological pollution.

Oil spills in the coastal water, Water environment fate, and behavior of oil and complex processes of oil transformation in the Water environment start developing from the first seconds of oil's contact with seawater. The progression, duration, and result of these transformations depend on the properties and composition of the oil itself, parameters of the actual oil spill, and environmental conditions. The main characteristics of oil transformations are their dynamism, especially at the first stages, and the close interaction of physical, chemical, and biological mechanisms of dispersion and degradation of oil components up to their complete disappearance as original substances. Similar to an intoxicated living organism, a Water ecosystem destroys, metabolizes, and deposits the excessive amounts of hydrocarbons, transforming them into more common and safer substances. (NOSRCP, 2004)

2.1 Conceptual Framework



(Source marine pollution bulletin 2000)

2.2 Sources of oil pollution in water

Natural sources

Natural sources such as oil seeps from the bottom of ocean enter the water environment. Crude oil is formed during long periods of time through natural processes involving organic matter from dead organisms. Thus, oil exists in many environments and may be naturally spilled due to various factors (including climatic conditions, disturbance, etc.). Such natural Oil pollutions may occur in oceans, due to eroding of sedimentary rocks from the bottom of the ocean (the effect may be similar with that of an accidental Oil pollution from human drilling in oceans such as the recent BP Oil pollution from the Gulf of Mexico). (Science, 1978)

Transportation accidents

In terms of sea transportation, the current situation can be summarized as follows: annually, about 100 accidents and Water problems have occurred on Vietnam Sea. Statistics from 2000 to the first six months of 2005 showed that Vietnam Sea has found 497 accidents, maritime problems, including the 126 big and serious cases. The Oil pollutions related to the port operations in 1995 was 450 tons, in 2000 was 600 tons; Oil pollutions due to Water problems in 1995 was 500 tons, in 2000 was 1,500 tons, then the volume of Oil pollutions from oil tankers up to 3500 tons in 1995 and 7500 tons in 2000 (National Report of Sea Pollution, 2004). This shows that the risk of oil pollution from oil tanker is very high.

Leakage from pipelines

Thousands of barrels of oil have been split into the environment through our oil pipelines and tanks in the country. This spillage is as a result of our lack of regular maintenance of the pipelines and storage tanks. Some of these facilities have been in use for decades without replacement. About 40,000 barrels of Oil pollution into the environment is through the offshore pipeline in Idaho. (Science, 1983)

Piracy

Pirates are stealing Nigeria's crude oil at a phenomenal rate, funneling nearly 300,000 barrels per day from our oil and selling it illegally on the international trade market. Nigeria lost about N7.7 billion in 2002 as a result of vandalisation of pipelines carrying petroleum products. The amount, according to the PPMC, a subsidiary of NNPC, represents the estimated value of the products lost in the process. Illegal fuel siphoning as a result of the thriving black market for fuel products has increased the number of oil pipeline explosions in recent years. In July 2000, a pipeline explosion outside the city of Warri caused the death of 250 people. An explosion in Lagos in December 2000 killed at least 60 people. The NNPC reported 800 cases of pipeline vandalization from January through October 2000. In January 2001, Nigeria lost about \$4 billion in oil revenues in 2000 due to the activities of vandals on our oil installations. The government estimates that as much as 300,000 bbl/d of Nigerian crude is illegally bunkered (freighted) out of the country. (NRSP, 2004)

Unnoted pollution source but occupied a large proportion is the pollution source from land. In total 10,010 tons of polluted oil in 1995, the amount of oil pollution from land hold is about 5,300 tons. According to monitoring data, concentration of oil in water was average 0.26mg/l at the river mouth of Ha Long - Hai Phong Sea and average 0.29 mg/l in Vung Tau - Da Nang Sea. In Ba Ria-Vung Tau, concentration of oil in water varies between 0.14 to 0.52mg/l is exceeded the limit of Vietnam Standards. In general, water quality along the coastal area was only B and C level according to Vietnam Standards 5943-1995 (National Report of Sea Pollution, 2004).

Sabotage

Sabotage is another major cause of oil pollution in the country like Nigeria. Some of the citizens of this country in collaboration with people from other countries engage in oil bunkering. They damage and destroy oil pipelines in their effort to steal oil from them. SPDC claimed in 1996 that sabotage accounted for more than 60 percent of all Oil pollutioned at its facilities in Nigeria, stating that the percentage has increased over the years both because the number of sabotage incidents has increased and because spills due to corrosion have decreased with programs to replace oil pipelines (SPDC, 1996).

Chronic oil pollution is not only restricted to mineral oil, but in fact, numerous lipophilic substances are involved, including mineral oil, while few studies were capable of discriminating between types. While incidents with non-mineral oils are known to occur (Camphuysen *et al.*, 1999), and adverse effects are well known (Bommel  , 1991), the scale and trends in levels of non-mineral oil pollutants in the Water environment are very uncertain (Timm and Dahlmann, 1991; Hak, 2003).

Mineral oil pollution within the North Sea area, there is good evidence that ordinary ships' fuel oils, deliberately discharged with bilge waters, are the main source of oil pollution (Vauk *et al.*, 1987; Vauk *et al.*, 1989; Dahlmann *et al.*, 1994; Fleet and Reineking, 2000, 2001; Reineking and Fleet, 2002). Since the 1980s, when oil sampling and analysis in Germany began, fuel oil residues from shipping were identified as the main source of chronic oil pollution, accounting for nearly 90%.

The clustering of oil slicks around the busiest shipping areas is clearly reflected in oil rates found on beach-washed bird corpses, both in the past (Stowe, 1982) and in recent years (Furness and Camphuysen, 1997; Camphuysen, 2003; Fleet and Reineking 2001). This would suggest that the main source of pollution remained the same over time. It should be stressed, however, that, with the exception of a 3.5 year study on the German coast in the period 1997-2001 (Dahlmann and Secheyaye, 2000; Fleet and Reineking, 2001), there is fairly little concrete information about the sources of pollution in recent years. Regular analysis of oil residues found on beached birds and beaches would provide an insight in any changes in source of oil pollution at sea, and would therefore show where measures for pollution control should be tightened.

2.3 Effects of oil pollution on Water ecosystem

The waters of the Indian Ocean are major sea routes for an estimated 470 million tonnes of oil every year (Salm 1996). More than 100 million tonnes of oil are transported annually through the Red Sea alone (World Bank 1996). This level of shipping incurs a high risk of disastrous Oil pollutions. Furthermore, oil tankers frequently empty ballast and wash engines on the high seas, causing residues of degraded oil to end up on the shore. Port petroleum and oil handling activities also pose threats to the Water and coastal environment. Accidental leakage from ships,

refineries and transport systems are common, especially in Mombasa. Clean-up and disposal of oily wastes is difficult and expensive. Several Oil pollutions off the South African coast have affected African penguins and other Water life. In response, national and regional Oil pollution contingency plans have been established in several African regions.

Plate 1



A picture showing part of the ocean polluted by oil spill and paper waste

Oil pollution occurs most of the time by spillage immediately begins to move and weather, breaking down and changing its physical and chemical properties. As these processes occur, the oil threatens surface resources and a wide range of subsurface aquatic organisms linked in a complex food chain. Many different types of aquatic habitats exist, with varied sensitivities to the harmful effects of oil contamination and different abilities to recuperate from Oil pollutions. In some areas, habitats and populations can recover quickly. In other environments, however, recovery from persistent or stranded oil may take years. These detrimental effects are caused by both petroleum and non-petroleum oil. (UN, 2001)

Oil pollutions in the Niger Delta have been a regular occurrence, and the resultant degradation of the surrounding environment has caused significant tension between the people living in the region and the multinational oil companies operating there. It is only in the past decade that environmental groups, the Federal Government, and the foreign oil companies operating in the Niger Delta began to take steps to mitigate the impacts. Large areas of the mangrove ecosystem have also been destroyed. The mangrove forest was in the past a major source of wood for the

indigenous people. In some places it is no longer in a healthy state to sustain this use (Nwilo & Badejo 2005). The Idoho Oil pollution traveled all the way from Akwa Ibom state to Lagos state dispersing oil through the coastal states, up to the Lagos coast. This culminated in the presence of sheen of oil on the coastal areas of Cross river state, Akwa Ibom state, Rivers state, Bayelsa state, Delta state, Ondo state and Lagos state.

The aquatic environment is made of complex interrelations of food chains and webs between plants and animals and their physical environment. Harm to one species in the environment might mean harm to the next species, and then the next as we move up the food chain. The rate at which oil spreads also determines its effect on the environment. Factors which affect the ability of Oil pollution to spread include surface tension, specific gravity, and viscosity. Oil pollutions are usually more detrimental to surface organisms than to deep water organisms. Therefore, animals that live closer to the shore such as turtles, seals and dolphins risk contamination by oil that washes onto the beaches or by consuming oil contaminated by prey. Sea grasses and sea beds which are used as food, shelter and resting sites by different species might also be harmed by Oil pollutions. (Disaster management, 2007)

Aquatic environments are made up of complex interrelations between plant and animal species and their physical environment. Harm to the physical environment will often lead to harm for one or more species in a food chain, which may lead to damage for other species further up the chain. Where an organism spends most of its time—in open water, near coastal areas, or on the shoreline—will determine the effects Oil pollution is likely to have on that organism.

In open water, fish and whales have the ability to swim away from a spill by going deeper in the water or further out to sea, reducing the likelihood that they will be harmed by even a major spill. Aquatic animals that generally live closer to shore, such as turtles, seals, and dolphins, risk contamination by oil that washes onto beaches or by consuming oil-contaminated prey. In shallow waters, oil may harm sea grasses and kelp beds, which are used for food, shelter, and nesting sites by many different species. (Aquatic, 2004)

Plate 2



A picture showing the effect of oil spill in the ocean

Spilled oil and cleanup operations can threaten different types of aquatic habitats, with different results. For example, Coral reefs are important nurseries for shrimp, fish, and other animals as well as recreational attractions for divers. Coral reefs and the aquatic organisms that live within and around them are at risk from exposure to the toxic substances within oil as well as smothering. Exposed sandy, gravel, or cobble beaches are usually cleaned by manual techniques. Although oil can soak into sand and gravel, few organisms live full-time in this habitat, so the risk to animal life or the food chain is less than in other habitats, such as tidal flats. Mangrove forests are located in tropical regions and are home to a diversity of plant and animal life. Mangrove trees have long roots, called prop roots that stick out well above the water level and help to hold the mangrove tree in place. A coating of oil on these prop roots can be fatal to the mangrove tree, and because they grow so slowly, replacing a mangrove tree can take decades. (Nature Geoscience, 2010)

Sensitivity of Birds and Mammals: Oil pollution can harm birds and mammals in several ways: direct physical contact, toxic contamination, destruction of food sources and habitats, and reproductive problems.

- Physical contact – When fur or feathers come into contact with oil, they get matted down. This matting causes fur and feathers to lose their insulating properties, placing animals at risk of freezing to death. For birds, the risk of drowning increases, as the complex structure of their feathers that allows them to float or to fly becomes damaged.
- Toxic contamination – Some species are susceptible to the toxic effects of inhaled oil vapors. Oil vapors can cause damage to the animal's central nervous system, liver, and lungs. Animals are also at risk from ingesting oil, which can reduce the animal's ability to eat or digest its food by damaging cells in the intestinal tract.
- Destruction of food resources and habitats – Even species which are not directly in contact with oil can be harmed by a spill. Predators that consume contaminated prey can be exposed to oil through ingestion. Because oil contamination gives fish and other animal's unpleasant tastes and smells, predators will sometimes refuse to eat their prey and will begin to starve. Sometimes a local population of prey organisms is destroyed, leaving no food resources for predators. Depending on the environmental conditions, the spilled oil may linger in the environment for long periods of time, adding to the detrimental effects. In calm water conditions, oil that interacts with rocks or sediments can remain in the environment indefinitely.
- Reproductive problems – Oil can be transferred from birds' plumage to the eggs they are hatching. Oil can smother eggs by sealing pores in the eggs and preventing gas exchange. Scientists have also observed developmental effects in bird embryos that were exposed to oil. Also, the number of breeding animals and the of nesting habitats can be reduced by the spill. Long-term reproductive problems have also been shown in some studies in animals that have been exposed to oil. (Science, 1989)

2.4 Water oil pollution and livelihood and people of the coastal region

In April 2000 the pollution from the Erika raised the question of whether the quality of water was acceptable to fill the fens in Guérande, France for the local production of salt, which was necessary for a proper harvest in the year 2000. Pre-spill concentration levels of 16 PAH, considered as priority pollutants, ranged between 5 and 20 ng/l in the water. After the spillage,

water pollution in the fens area (fortunately protected by earth dams) ranged from 20 to over 300 ng/l. In order to respect the precaution principle as regards health and the environment, salt producers in Guérande, agreed against harvesting in 2000. (CEDRE, April 2005). Another major pollution incident was the sinking of the tanker *Prestige* in 2002 on the Galicia bank, a large seamount off the Spanish Galician coast. After the sinking, the wreck continued leaking oil which polluted the sea bed and contaminated the coastline, especially along the territory of Galicia. Some estimated 64 000 tonnes of heavy fuel oil have been spilled (CEDRE1), polluting more than 1000 km of coastlines in Spain and France (ETC-LUSI2). Of the 20 000 oiled birds collected, 75% were dead and only few of those alive made a recovery (EEA, 2003). The Iberian population of the threatened guillemot (*Uria aalge*) was hit worst. Given the broad geographical extension of the pollution and the long time-span of the incident, overall mortality has been estimated to be much higher; estimates range between 100 000 – 200 000 birds (EEA, 2003) and 250 000 to 300 000 birds (WWF, 2003).

The affected area is an important ecological region, supporting coral reefs and many species of sharks and birds. It also supports the fishing industry on which 60% of Galicia's population depends. The coastal pollution forced the region's government to suspend offshore fishing for six months. The World Wildlife Fund (WWF) published a study on the spill's short term ecological consequences (WWF, 2003), noting a decrease in the population of inter-tidal animals. Additional studies showed high concentrations of heavy metals in the affected coastal salt marshes (Andrade *et al.* 2005). Biomarker measurements in fish showed that large areas of the northern Iberian shelf were affected by oil from the *Prestige* and that measurable effects decreased over the period 2002 – 2005 to levels indicating a recovery of the water quality (ICES/OSPAR, 2009; Martínez-Gómez *et al.*, 2009). A recent biological effects study of the spill on mussels on the affected Galician coast, suggests signs of recovery of mussel health but that pre-spill status has not yet been reached (Basque Research, 2009). Little is known about the effects of the oil pollution on the deep sea bed and its biological communities and the rate of recovery.

Oil pollution is one of the major causes of the degradation of critical habitats are complex and range from the patterns of direct resource use by those dependent on the resources that derive from those habitats to a wide range of external factors – pollution from Oil pollutionage and

human habitation, the concentration of external impacts from upstream catchment areas in the coastal zone and the clearance and conversion of coastal habitats to new uses. The degradation of these habitats has impacts on the livelihoods of those who directly depend on them and, potentially, on a far wider range of coastal and Water resource users who exploit species that depend on these habitats for part of their life-cycle. In order to reduce degradation, direct users are liable to have to bear costs by limiting their use of those habitats while a wide range of activities that may be having more indirect impacts – agricultural practices, land conversion, forestry and irrigation schemes in catchment areas – are also liable to incur costs in order to change practices to make them less damaging for critical habitats in coastal and Water areas.

Tourism development has occurred in relatively limited areas of the coastal region, but where it does occur it creates a wide range of new livelihood opportunities and attracts services to coastal areas that might not otherwise be available. This is particularly true of large, mass tourism developments, but these also create threats to the local environment and to the livelihoods of local people who may find themselves displaced by workers and service providers attracted from outside the coastal areas while their traditional sources of livelihood are severely disrupted. Eco-tourism is increasingly gaining currency and would appear to offer possibilities for environmentally sustainable tourism with more pronounced positive impacts on local communities. But due to oil pollution along the coastal regions of Indian ocean achieving a competitive tourist destination is impossible because most of the tourist opt for other options as their destination on learning that there is Oil pollutionage at the coastal beach, hence hindering coastal communities from generating income from tourism.(KRA, 2001)

Pollution generated by increase in shipping and Oil pollutions and the increasing use of chemical inputs in agriculture is both affecting critical habitats in coastal and Water areas, and the livelihoods that depend on them, and is affecting the overall health of coastal and Water ecosystems. Those making direct use of these resources see decreasing access to resources they exploit, declining environmental conditions that may affect their access to safe water and necessary livelihood resources and specific health risks generated by increased pollution. Pollution impacts are often particularly severe in coastal areas where pollution from multiple sources may be concentrated.

Coral reefs, and the sets of livelihoods that depend on them, are a feature of extensive parts of the Bay of Bengal. While most of the east coast of India and the coast of Bangladesh (with the notable exception of St.Martin's Island) are devoid of coral structures, much of the rest of the coasts of the in the region are characterised by the occurrence of coral reefs (Beiras, R. 1998).

The extreme biodiversity of coral reefs, the fact that they are often accessible from the coast and, in some cases, can be exploited on foot means that they are often of considerable importance in providing benefits for local communities. In the case of atoll nations like the Maldives, this dependency of local livelihoods on coral reefs is complete. The land people live on is formed by coral structures and protected from storms and saltwater inundation by surrounding reefs; people use coral reefs on an almost daily basis for the collection of food, produce for sale and the collection of building materials. The advent of mass tourism, on which the national economy is now highly dependent, has been generated by the attractions of reefs and their associated Water life (Beiras, R. 1998).

Everywhere where reefs occur, they support a wide variety of livelihoods and are often of particular importance for poorer people as, at least in the past, they have been resources open and accessible to all and best adapted to small-scale exploitation. They have also provided opportunities for exploitation of Water resources directly by women, enhancing their role in supporting household livelihoods.

As reefs are home to many resident species that are less subject to seasonal variation than many other Water species, they often serve as living "storehouses" that local people can turn to when other elements in their livelihood strategies fail, either because of seasonal shifts in resources or shocks of one sort or another (Whittingham et al. 2003). But this is threaten with the presence of oil pollution in the nature that when there is Oil pollutions in the Indian ocean the coral reefs are damaged by the oil and when doing the clean-up of the Oil pollutionage ad this affects directly the livelihood of the people living around that area affected by the Oil pollutions (Etkin, D.S 1998).

2.5. Control of oil pollution

After the ocean or a water body becomes contaminated by Oil pollution, the most likely question is how to clean up this environment. In some aquatic environments, natural actions work to

reduce the severity of Oil pollution and accelerate the recovery of an affected area. These actions include: weathering: a series of chemical and physical changes that cause spilled oil to break down and become heavier than water, evaporation: occurs when the lighter or more volatile substances within the oil mixture become vapour and leave the surface of the water, oxidation: occurs when oil contacts the water and oxygen combines with the oil hydrocarbons to produce water-soluble compounds, biodegradation: occurs when micro-organisms, such as bacteria, feed on oil hydrocarbons.

Increasing amounts of Water transportation and tanker traffic inevitably results in accidental Oil pollutions. According to the International Tanker Owners Pollution Federation Limited (ITOPF) statistics¹, from 2000 to 2007 there were 149 spills over 7 tons spilling 192,000 tons of oil into the Water environment. The vast majority of spills are small (i.e. less than 7 tonnes) and the number of these Oil pollutions are much higher, however, they make a relatively small contribution to the total quantity of Oil pollution into the Water environment. In fact, a few very large spills are responsible for a high percentage of Oil pollution annually (Connolly and O'Rourke, 2003).

In this context, the International Maritime Organization (IMO) was established as a global specialized agency of the United Nations in 1948. A United Nations Diplomatic Conference in Geneva adopted the Convention on the International Maritime Organization formally establishing IMO⁴ (IMO Convention). The convention came into force in 1958 and the new organization held its first assembly in 1959. The aims of the IMO are summarized in Article 1(a) of the IMO convention as: To provide machinery for co-operation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; and To encourage the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of Water pollution from ships.

IMO introduced a series of measures to deal with accidental oil pollution through requirements designed to prevent tanker accidents and to minimize their consequences by adopting a series of Water environment protection conventions and regulations. However, it can be said that the growth in the amount of oil being transported by sea and especially the effect of the Torrey Canyon disaster gave impetus to the attempts to introduce effective measures concerning both

accidental and operational oil pollution (Akten, 2006). The Torrey Canyon Water accident of 1967 being the cornerstone for the protection of Water environment (Akten, 2006) in which 120,000 tons of Oil pollution demonstrated the scale of the accidental oil pollution. Before this incident, oil pollution resulting from routine tanker operations and from discharge of oily wastes from machinery spaces was recognized as a major problem and some measures dealing with these issues had been put in place⁶ (Mattson, 2006). However, increasing environmental concern with the effect of the Torrey Canyon prompted the introduction of measures directly related with accidental oil pollution.

Man-made clean-up methods include: booms: floating barriers placed around the oil or around whatever is leaking the oil. Booms contain the oil so skimmers can collect it, skimmers: boats, vacuum machines, and oil-absorbent plastic ropes that skim spilled oil from the water's surface after booms have corralled it. The skimmer collects oil into a container so it can be removed, chemical dispersants: materials that break down the oil into its chemical constituents. This helps disperse the oil and make it less harmful to wildlife and shorelines, in-situ burning: igniting freshly spilled oil while it's still floating on the water. High power hoses are used, spraying the oil from the beaches and the animals, all of these methods have their advantages and disadvantages and some of these methods are as harmful to aquatic life and environment as the spillage itself, so it is thus prudent to avoid spillage as much as possible.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section spells out the approaches that were employed by the researcher to acquire the necessary information. These included, the study design, sampling techniques, sources of data and why Changamwe division among others is addressed.

3.1 Research design

The study used descriptive, survey designed, more so a descriptive correlation research design. The design is preferred because it enables the researcher to collect original data from the population at a limited time and resources. Stratified random sampling was used to choose the respondents to who included workers, fishermen and community members.

3.2 Sample scope

Mombasa Island as a city has a population of 939,370, as per the 2009 census, and is located in Coast province. The island is connected to the mainland to the north by the Nyali Bridge, to the south by the Changamwe Ferry and to the west by the Makupa Causeway, alongside which runs the Kenya-Uganda Railway. The port serves both Kenya and countries of the interior, linking them to the Ocean. The city is served by Moi International Airport located in the northwest mainland suburb of Chaani, northwest of Changamwe area.

The city is mainly occupied by the Mijikenda and Swahili people. The major religion practiced is Christianity; Muslims also form a considerable number. Over the centuries, there have been many immigrants and traders who settled in Mombasa, particularly from Iran, the Middle East, Somalia and the Indian sub-continent, who came mainly as traders and skilled craftsmen.

3.3 Why Changamwe area in Mombasa county

Changamwe area is among other divisions in the district was the main focus of the study and the reasons were; it is one of the most overpopulated area in the district, it constitutes both main land and Islands, majority of the oil production workers, fishers and miners come from this

division and this has caused a lot of negative impacts on the physical environment, where soil erosion, deforestation, pollution of the ocean water by the agrochemicals from the factory, oil residues and products from the oil production, these are evident despite the fact that some of the environment education activities were taking place in the study area.

Environmental conservation concepts never existed in most oil production activities due to lack of awareness. Changamwe is slightly polluted as a result of oil production and poor soil management coupled with negligence where a number of people do not properly follow the advice given by the environmentalists.

This therefore means that Changamwe division in particular is still experiencing the greatest environmental pollution from oil spillage, which has limited the conservation of the environment.

3.4 survey population

The research targeted the community members, workers and official who are in position to have impact and the environmental challenges caused by oil pollution. The research also targeted the stakeholders within the community of the study area to be sample as this helped to provide holistic approach in data collection.

3.5 Sampling Techniques

Out of the 120 persons in the division, the major interest were to be put on the producers of oil, fishermen and traders since they are the people involved in major environmental activities and therefore the researcher used the solvens' formula to obtain the sample size from their total numbers and not from the entire population of the division. The purpose of this trend was to do away with biasness in choosing the number of people who are supposed to act as the sample size. Therefore fifty names were picked by the researcher and this represented the sample space.

3.5.1 Sampling Procedure

The study was conducted in different location within Changamwe Division in Mombasa County. The sample of 120 includes; 60 workers, 40 unemployed, 17 fishermen and 3 officials from ministry of environment and the remaining from other related ministry.

Purposive cluster sampling was used for the purpose of the study.

Cluster sampling was used to select an area of research from the division in Changamwe. Then using stratified random sampling the division was divided into sub-group (zones) called strata. The strata's comprises of two sub-divisions from each zone to be selected.

3.6 Sources of data

3.6.1 Secondary sources

This gave a broader understanding of the study concepts; it involved the use journals, text books, news papers and other researched books. These books were obtained from Library, magazine, journals and internet research.

3.6.2 Primary Sources

These are information that were obtained from the field using different instruments such as questionnaires, observation, oral interviews; discussions among others from different respondents for example oil Production Company, fishermen, traders, chiefs, environmentalists and town chairman

3.7 Data Collection methods

These included questionnaires, interviews, personal observations and group discussions, photographs and other relevant documents shall also used to supplement the methods.

3.7.1 Oral interviews

Face –to – face conversation was the main way of interviewing respondents. This ensured that suspicion is avoided at all cost.

3.7.2 Questionnaire

Questionnaires were taken to the study population of Changamwe division in order to enable respondents participate in the research. These questionnaires will be administered to chosen respondents random. This helps to remove the fatigue of moving to every employee of the company. Questionnaires are the most appropriate instruments in collecting data because of the

each which the respondents has to the questionnaires at their convenience and freedom to express their views

3.7.3 Group discussion

Most oil production company workers and fishermen in this study area have various associations and therefore once in a while they can organize and find opportunity to discuss various issues affecting them. The researcher obtained this information from the beach chairman and local chief, out of which randomly selected two groups from each (workers and fishermen associations) in Changamwe village. The groups were informed then mobilized before the days of the meetings. This enabled the researcher to get various in formations from a bigger number of respondents within a shorter time.

3.7.4 Personal observation

Since it was hard to believe on the information obtain through questionnaires and oral interviews, the researcher had to go personally to the beaches, production lands, and to the traders among other people to observe the activities which could probably destroy the natural resources. The use of photographs to show a clear picture of what happens in the area of interest was necessary and records were taken instantly by the researcher.

3.8 Review of relevant documentation

The use of existing literature is paramount to this research. Various literatures from different text books periodic report with different scholars related to oil pollution and environmental effects were utilized.

3.9 Data collection procedures

The researcher took an introductory letter from KIU to the case study area which helped him conduct and complete the research successfully from different groups of individual around Changamwe division.

Upon approval a schedule was prepared and presented before it is administered to the respondents to see how effective the questionnaires were for collection of data needed from the respondent.

After then questionnaires were given to the respondents to fill at their convenient time. Data were collected, presented, interpreted and arranged in order and finally summarized.

3.10 Testing of the research instrument

(a) Reliability

The researcher pre-tested the questionnaires before it administering to the sample population. Ten persons (10) were involved in the pre-testing of the questionnaire and they were allowed to point out the difficulties they faced in filling it. The researcher welcomed their views and modifications were made thereafter before presenting the questionnaires to the respondents.

(b) Viability

The researcher used self-administering as a way of helping workers and fishermen who are illiterate and cannot fill in the questionnaires. The data that is obtained from the field was crosschecked and verified to ensure that they satisfied the research questions. Various techniques such as interviews, personal observation, photographs, and discussions as well as both secondary and primary sources of data were used.

3.11 Data Analysis

Proper analysis was done to check valid entries and any error. Even answers that are given by different respondents were compared in order to be very sure about the final findings. Data was interpreted and presented in descriptive, tabular, and percentages. Data processing involved editing, coding, and tabulation, of the information given the respondents.

3.11.1 Quantitative data analysis

Editing: data was edited to come up with quality data. The researcher checked for accuracy, comprehensiveness consistency and conformity of the data collected. To ensure all questions are applicable, each questionnaire was reviewed.

Tabulation: table construction and interpretation of results was done. This involved the use of percentage distribution of respondents per code and frequency of occurrence. The frequencies

obtained were converted into percentages. This enabled the researcher to be able to identify independent and dependent variables.

3.11.2 Qualitative data analysis

There was collection and analysis of data during and after collection. The answers to research question were during the collection of data. After collection of data, it was analyzed, sorted, classified, assembled together and a final report was written.

3.12 Anticipated problems

This research is expected to be accomplished within the time frame and successfully, however, in the course of the research a number of problems are anticipated.

There is anticipated problem that could arise due to the refusal to give the necessary information by some respondents since they may be biased about the purpose of the research. And hence this may delay the research process.

Some of the respondents are arrogant and they may create the atmosphere that is difficult to collect the required information.

Despite all these anticipated likely problems among others, the researcher therefore ensured that the above problems were minimized in all ways possible.

CHAPTER FOUR

PRESENTATION AND DISCUSION OF RESEARCH FINDINGS

4.1 Demographic characteristics of respondents OF RESEARCH FINDINGS

The characteristics consisted of sex, age, educational background, occupation and population of the respondents for both male and female. (Sample size 120)

4.1.1 Age of respondents

Table1: showing age of respondents

Age of respondents	Frequency	Percentage (%)
18- 26 yrs	40	40
27 -32 yrs	36	36
33- 39 yrs	20	20
40 and above	4	4
Total	100	100

Source: Field data 2012

Table 1 Shows that 40 % of the respondents were between the ages of 18- 26 years, 36% were between the ages of 27 -32 years while 20% of the respondents were of the ages of 33- 39 years and 4% of the respondents were of the age bracket of 40 years and above. This shows that most of the people living around the ocean are of the age bracket of 18- 26 and 27 -32 years because they have the highest percentage that is 40% and 36%. The researcher found out that the mentioned age groups are common in this area because there is a lot of fishing activities going on around the ocean hence those who are energetic are of this age bracket.

4.1.2 Sex of respondents

Table 2: showing Sex of respondents

Sex	Frequency	Percentage (%)
Female	24	24
Male	76	26
Total	100	100

Source: Field data 2012

According to table only 24% of the respondents indicated were female while 76% of the respondents were male. This proves that both male and female were participated in the research though it also proves that a bigger percentage of the respondents are men. This showed that it is mostly men who work in laborious environment.

4.1.3 Educational background of parent as per the responses by students

Table 3: showing Educational background of parent as per the responses by students

Educational background	Frequency	Percentage (%)
Primary level	34	34
Secondary level	48	48
Tertiary level	10	10
University level	8	8
Total	100	100

Source: Field data 2012

In the selected respondents 34% studied until primary level, 48% of the respondents studied until secondary level, 10% were of tertiary education and 8% have reached university. The researcher found out that the level of education was low ,hence indication that education has got no roots in

the coastal region and there are few schools in which is characterized by high dropout rate rates, inadequate infrastructure and lack of resources. The reasons for non attendants or early dropout rates are poverty, lack of resources, early pregnancy and distance from school. The finding relate to the national statistic on education of the coastal region dated 2004 (daily nation)

4.1.4 Occupation of respondents

Table 4: showing occupation of respondents

Occupation	Frequency	Percentage
Farming	14	1.4
Fisher men	44	44
Traders	10	10
Fish venders	18	18
Students	8	8
Teacher	6	6
Total	100	100

Source: Field data 2012

According to the responses given by the respondents as shown in Table 4, 14% of the respondents were farmers, 44% Fisher men, 18% Fish venders, 10% were traders, while 8% were students and 6% were teachers. The reason why Fisher men and Fish venders percentage is high is because the study was carried out around the ocean. The researcher also found out that the greater population are fishermen and fish venders hence indication that the main economic activity in the area is mainly fishing.

4.1.5 Number of people in a house hold

Table 5: Number of people in a house hold

No. of people in a household	Frequency	Percentage
< 5	32	32
5 – 10	46	46
11 >	22	22
Total	100	100

Source: Field data 2012

The above table shows that a big number of household s in Changamwe have 5-10 people with 46%, the followed by those with less than 5 people with 32% and lastly those households with more than 11 people with 22%. This is because there people of Changamwe area still believe in a having many children. The dynamics of these households differ significantly, primarily due to the different methods of leadership based on the needs of the households and deferring cultural needs.

4.2 Sources of oil pollution

Table 6: Response on the sources of oil pollution

Response	Frequency	Percentage (%)
Chronic oil pollution	70	70
Destroyed oil pipelines	20	20
Pirates stealing crude oil	3	3
Natural sources	7	7
Total	100	100

Source: field data 2011

According to the findings chronic oil pollution is a major contributor to oil pollution, it includes mineral oil, while few studies were capable of discriminating between types. While incidents with non-mineral oils are known to occur. Another contributor is crude oil is formed during long periods of time through natural processes involving organic matter from dead organisms. Thus, oil exists in many environments and may be naturally spilled due to various factors such as including climatic conditions, disturbance. Thousands of barrels of oil have been split into the environment through our oil pipelines and tanks in the country. This spillage is as a result of our lack of regular maintenance of the pipelines and storage tanks. Some of these facilities have been in use for decades without replacement. About 40,000 barrels of Oil pollution into the environment is through the offshore pipelines. The last source of oil pollution according to the findings is pirates who are stealing crude oil at a phenomenal rate, funneling nearly 300,000 barrels per day from our oil and selling it illegally on the international trade market.

4.3 Effects of oil pollution on Water ecosystem

Table 7: Response on the effects of oil pollution on Water ecosystem

Effects	Frequency	Percentage
Dying of fish & other organism	40	40
Polluting water/dirty water	25	25
Destruction of breeding grounds	10	10
Destruction of water plants	25	25
Total		

Source: field data 2012

According to the table above the 40% of the respondents believe or confirm that oil pollution causes extinction of fish and other organisms, 25% say it causes pollution of water making it safe for the domestic use , another 25% believes that oil pollution causes destruction of water plant and 10% seen destruction on breeding ground of the organisms when there is oil spillage on the ocean. The researcher found out that most of natural ecosystem has been destroyed, leading to environmental degradation on the area. Increased damage through food chain to the entire population, and increased water pollution leading to eutrophication.

Out of those interviewed a large number assert that oil pollution have greater impact on the aquatic environment hence reduction in fish production at the coast. The economic pattern has been affect because the majority of the community members depend on fishing has a form of earning living.

4.4 Oil pollution effects on the live hood/people

Table 8: A table showing the effects of Oil pollution on the live hood/people

Effects	Frequency	Percentage
Low income/ decrease in Job opportunities	40	40
Health problem	35	35
Reduction in food	15	15
Tourism reduction	10	10
Total	100	100

Source: Field Data 2012

According to the above response oil spillage has several impacts on the livelihood of community members in that 40% of the respondents said oil spillage destroys source of income and also decreases job opportunities to the community members as most of the community members are fisher men.

From the above finding 40% confirmed that due to oil pollution the live hood of community members has been affected due to low income. Most of the community members depend on fishing as the main source of income, job opportunity has gone down. People have lost they lose due to increased pollution in the area. Those who are working the near by industry mainly oil exploration industry have been forced to leave due to introduced polices by the government to help in the maintains of environment.

Due to increased pollution in water body the health problems have emerged increased water borne diseases, for example cholera bilharzias typhoid. Most members if the community has fallen sick especially children the aged due to their vulnerably .

Poor health has increased the level of poverty due to the fact that most individual spend the little income obtain in medical services.

There is also reduction in food source which is confirmed by about 15% of the individual interviews. The researcher found out that due to water pollution. First production has reduced yet it is the main source of food for the people living around the coastal line, destruction of breeding ground has impact negatively on the fish population migration and extinction of these species have been seen.

Another effects of oil pollution has been seen in tourist industries and these was conformed by about 10% of individuals inter viewed . the touristy sector have been affected due to low level of these visiting the site. Hence reduced income obtained by those managing the site hence reduction in low income and loss of job opportunity.

CHAPTER FIVE

DISCUSSION OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter shows the summary of major findings, conclusion and recommendations. The area for further research is also indicated here.

5.1 Summary

The ocean is by far the most significant indigenous food source in Mombasa today. Despite this status, little is understood of the ways in which oil spillage takes place in the ocean. As a result, much uncertainty exists over the environmental consequences of widespread oil and the ultimate sustainability of the ocean as a natural resource. Recent efforts to quantify the effects of oil spillage at national level are a necessary step in rescue the ocean and its aquatic inhibitors.

Based on the result of this study, oil spillage has several and yet not limited effects, it is contributes negatively on the livelihood of community members.

According to the findings most of the local residents of Changamwe the oil spills is mostly done by pirates who are steal from the tanker ships carrying the oil to the Kenyan coast for processing. Others said that it was chronic oil spillage which involves discharge from the ships, and the other way through which oil spills into the ocean is through the destruction of oil pipelines.

According to the response oil spillage has several impacts on the livelihood of community members in that 82% of the respondents said oil spillage destroys source of income and also decreases job opportunities to the community members as most of the community members are fisher men. The respondents also said that wood fuel is affordable and also self sufficient.

The respondents said that the effects of oil pollution effects on the live hood they indicated that poor health 46% and destruction on aquatic life 54% were the major problems of wood oil pollution effects on the live hood/people.

5.2 Conclusions

Oil spillage in the ocean is difficult to disentangle as many other factors including land for agriculture, livestock farming, and human settlement around the ocean depend on it.

If the ocean is taken care of then it will be on a sustainable basis, more aquatic life will be saved lands and in the communities living around the ocean will also benefit cause there will be food and jobs for the fisher men

From the informal discussion, key informants said oil spillage in the ocean should given emphasis to give greater attention in conserving of the ocean to keep the livelihood of the community members and save the aquatic life.

5.3 Recommendations

The government must therefore continue to invest heavily in providing logistical support in order to provide community members with the much needed funds and training on how to conserve the ocean, methods of dealing with the spillage and a way of getting a means of living.

It must invest in people by expanding access to funds, the neediest and providing capital to its citizens to start up something to generate for them income and other requirements for the working poor, those unable to work and special vulnerable and targeting marginalized groups.

This would help improve the standards of food generation, and also provide jobs hence push people away from relying on the ocean in the country thus bettering means of livelihood and standards of living.

Underlying all planning efforts towards ocean conservation is obvious that such programs must meet locally perceived priorities rather than externally imposed perceptions this means that adequate background data on local needs, preference and other relevant factors must be considered before any detailed forest management plan is undertaken in this region. Important decision is to involve individuals in question where solutions would provide a forward way; this is a means of risk aversion in project implementation.

5.4 Areas for Further Research

The researcher recommends that further research should be done on the topic "the effects of oil spillage on aquatic life".

REFERENCE

Aguilera, F., et al, (2010), Review on the effects of exposure to spilled oils on human health. *Journal of Applied Toxicology* N.Y

Akten, (2006), Assessing the impact of major oil spills on seabird populations; Delson Publishers, Chicago USA.

Beiras, R. and Saco-Alvarez, L (1998), Caribbean reef coral *Siderastrea siderea*. *Water Pollution Bulletin* 26(5): 276-282.

Camphuysen *et al.*, (1999), the scale and trends in levels of non-mineral oil pollutants in the Water environment are very uncertain.

Connolly and O'Rourke, (2003), Convention for the Prevention of Water Pollution from Land, Sensitivity Atlas for Coastal Area.

Dahlmann *et al.*, 1994; the Right to a satisfactory Environment and the African commission. Fleet and Reineking, 2000, 2001; public participation and oil pollution, IIED gatekeeper working paper

Guzmán, H. and Holst, I. Effects of chronic oil-sediment pollution on the reproduction of the

Heubeck, M et al, (2003), Assessing the impact of major oil spills on seabird populations. *Water Pollution Bulletin* 46(7): 900-902. Kenya, 76 pp. Copenhagen; Geological Survey of Denmark and Greenland

ICES/OSPAR; Martínez-Gómez *et al*, (2009), Environmental Sensitivity Atlas for Coastal Area.

Karuki, M. (2007); natural report on disaster management, coastal province.

Law, R.J. and Kelly, C. The impact of the "Sea Empress" oil spill. *Aquatic Living Resources*

Li, H. and Boufadel, M.C. Long-term persistence of oil from the Exxon Valdez spill in two-layer Beaches. *Nature Geoscience* 3(2): 96-99, 2010. May 2010 Special edition Water Science Review – 371

Mr. Johnson Kazungu, Director: Kenya *Water and Fisheries Research Institute (KMFRl)* spill using bivalve and sea urchin embryogenesis bioassays. *Water Air and Soil Pollution*

Tenywa, G. (2008). Conservation okay Niger oil exploitation.

Tychsen, J. 2006 (ed.): Ken Sea. Environmental Sensitivity Atlas for Coastal Area.

Vauk *et al.*, 1987; the Nigerian state, oil exploration and community interest

APPENDICES

APPENDIX A: Questionnaire for environmental officer

Preamble

My name is SAMWEL JOHN OLELA, a student from Kampala International University. I am collecting data on oil and coastal water pollution. A case study of changamwe division Mombasa county coast province. Your co-operation and frankness in answering the questions given below will be highly appreciated. All your responses and information obtained will be treated with utmost confidentiality and will be used for analytical purposes only.

PART A

BIO DATA

TICK WHERE APPROPRIATE

1. Sex:

Male () Female ()

2. Marital status

Married () Single ()

3. Educational level

Primary level ()

Secondary level ()

University level ()

PART B

4. Have you experienced a problem of water pollution in this area?

Yes

☐

No

☐

If yes explain

.....

.....

.....

5. What are the causes of Water pollution in Mombasa division?

.....

.....

6. Does oil pollution have some impacts on the livelihood (ecosystem) in Mombasa division?

Yes

☐

No

☐

If yes explain

.....

.....

7. How does it affect the environment?

In fish reproduction

.....

.....

Effect on water quality

.....

.....

8. How have you tried to overcome the issues?

.....

.....

9. What has the government done to overcome this issue?

.....

.....

10. Are there any NGO's or international organization to deal with this issue?

.....

.....

11. What are the possible solutions to Water pollution caused by oil in Mombasa division?

.....

.....

12. What do you think should be done?

.....

.....

.....

Thank you

APPENDIX B: Questionnaires to workers

Preamble

My name is SAMWEL JOHN OLELA, a student from Kampala International University. I am collecting data on oil and coastal water pollution. A case study of changamwe division Mombasa county coast province. Your co-operation and frankness in answering the questions given below will be highly appreciated. All your responses and information obtained will be treated with utmost confidentiality and will be used for analytical purposes only.

PART A

BIO DATA

TICK WHERE APPROPRIATE

1. Sex:

Male () Female ()

2. Marital status

Married () Single ()

3. Educational level

Primary level ()

Secondary level ()

University level ()

4. How many people do you live or stay with as relatives or dependants?

Below 5 persons ()

5-10 persons ()

More than 10 persons ()

PART B

5. In which part of the company do you work at?

.....
.....

6. Since you started working have you ever seen any effect in your health?

Yes

☐

No

☐

If yes explain

.....
.....

7. What about the surrounding?

.....
.....

8. What economic activity do you carry out

- a) Farming
- b) Fishing
- c) Sand mining
- d) Water harvesting

9. What do you think causes these effects?

- a) Physical transportation
- b) Oil spill
- c) Sabotage
- d) Piracy
- e) Leakage from pipeline

Can you please explain how these causes affect water body?

.....
.....

Thank you.