ENVIRONMENTAL IMPACTS OF CRUDE OIL SPILLAGES IN IBENO LOCAL GOVERNMENT AREA OF AKWA IBOM

BY

MARY BILLY
DEPARTMENT OF MICROBIOLOGY
FACULTY OF SCIENCE
AHMADU BELLO UNIVERSITY, ZARIA

ABSTRACT

Oil spillage has a major impact on the ecosystem into which it is released. The rate of oil spills have been rising with the increasing tempo of petroleum exploration and exploitation, of which the Ibeno community is a part, and the level of pollution needs to be determined to know the level of degradation of the environment and therefore alert relevant authorities of the imminent catastrophe. It is observed that despite regulatory laws, environmental pollution through oil spillage still abounds at an alarming rate, thus, the need in this research work to examine the environmental impacts of crude oil spillages and the level of degradation on the host communities with specific reference to Ibeno local government area of Akwa Ibom State, Nigeria.

Keywords: ***Crude Oil Spillage, Soil, Crop, Ibeno LGA of AKS***

INTRODUCTION

Environmental impacts are consequences of human actions on nature either directly or indirectly. Human activities have caused a major shift in the order of operations of the forces of nature in so many ways. One of the causes of environmental degradation is pollution. Pollution is the adulteration of the original state of a thing. Pollution comes in diverse forms either air pollution, water pollution or land pollution. They are caused majorly by human activities although some naturally occur. Causes of environmental pollution or degradation are numerous and this research is aimed at examining the environmental impacts of one of them which is crude oil spillage (Jike, 2001).

Oil spillage is the release of liquid petroleum hydrocarbon into the environment due to human activities, and is a form of pollution. The term often refers to marine oil spills, where oil is released into the ocean or coastal waters. Oil spills include releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills of refined petroleum products (such as gasoline, diesel) and their by-products, and heavier fuels used by large ships such as bunker fuel, or the spill of any oily white substance refuse or waste oil. Spills may take months or even years to clean up. Oil also enters the marine environment from natural oil seeps. Public attention and regulation has tended to focus most sharply on seagoing oil tankers. Oil spillage is one of the greatest environmental problems. Oil communities have been at the receiving end of this environmental problem. The problems have generated a lot of concerns within the three tiers of government especially in oil producing states. Oil spillage is one of the contentious issues facing the government, the oil industry and the host communities of the Niger Delta region which Ibeno

Local Government Area is one of them. Crude oil describes a broad range of hydrocarbon-based substances (Achi, 2003).

Crude oil spills are mainly caused by equipment failure, operational errors, and leaks from obsolete pipes or willful damage – (that is sabotage). Many of the oil facilities and operations are located within sensitive habitats – including areas vital to fish breeding, sea turtle nesting, mangroves and rainforests. These areas have been severely damaged, contributing to increased biodiversity loss, pollution of water and land resources, deforestation which has culminated in poverty, as a result of the loss of livelihood of indigenes. Due to the many forms of oil-generated environmental pollution evident throughout the region, farming and fishing have yielded limited output compared to the pre-oil exploration years. Also drinking water sources are polluted, thus potable water have become very scarce.

Statement of the Problem

Oil spills have posed a major threat to the environment, which has led to near total annihilation of the ecosystem. Thus, life in this area is becoming increasingly unbearable due to the ugly effects of oil spills. Intermittent oil spillages have rendered vast stretches of indigenous farmlands useless. Therefore as important as oil might seem to the nation's economy, the people perceive the discovery of oil as a threat to their life support system – the land. Oil development occurred in the Niger Delta without a comprehensive, strategic plan which would have protected its natural resources. More than four decades of oil exploration and production activities have left a severely degraded environment in Niger Delta oil region of southern Nigeria. Exploration activities in this region over the past four decades have not employed best available technological practices. However, on Monday, January 12th, 1998, the 24 – inch pipeline from the Mobil platform to the Mobil Qua Iboe terminal ruptured, resulting in the release of approximately 40,000 bbl (approximately 6000 tons) of light Nigerian crude oil into the environment (Olagbende, 1999). Oil being lighter than water formed slicks which spread over the surface of the ocean, influencing surface tension, viscosity, pour point (that is, temperature of solidification) wind, currents and waves. Within days, the oil spread swiftly with the current, covering the entire Ibeno water area up to the shores, and moving westwards, reached the Lagos Five Cowries Creek on the 25th January 1998. A vast array of agricultural farmlands and products were destroyed, causing fish genocide and destroying other environmental resources, as well as affecting the health and general living conditions of the people living in this community and its environs. The spill is generally having a negative consequence on human health, due to the consumption of contaminated seafood. This study therefore seeks to examine the environmental impacts of crude oil spillages in Ibeno Local Government Area of Akwa Ibom State.

Purpose of the Study

The aim of this work is to examine the environmental impacts of crude oil spillages in Ibeno Local Government Area of Akwa Ibom State and this will be achieved through the following objectives:

1. To determine the effect of crude oil spill on the soil of the study area
2. To determine the impact of oil spill on crops at the study area

Literature Review

Environmental Impacts of Oil Spill Incidents on Nigerian Coastal Areas

Since the discovery of oil in Nigeria in the 1950s, the country has been suffering the negative environmental consequences of oil development. The growth of the country's oil industry, combined with a population explosion and lack of enforcement of environmental regulations has led to substantial damages to Nigeria's environment, especially in the Niger Delta region. Oil spills are the uncontrolled discharge of oil or its by-products including chemicals and wastes, into the environment. When oil spillage occurs, the oil being less dense than water floats. The highest most volatile hydrocarbons start to evaporate initially decreasing the volume of spill somewhat but polluting the air. Then a slow decomposition process sets in, due to sunlight and bacterial action. After several months, the mass may be reduced to about 15 percent of the starting quantity, and what are left are mainly thick asphalt lumps. These can persist for many months (Carla, 2002). The soil is then contaminated with a gross effect upon the terrestrial life. As the evaporation of the volatile lower molecular weight components affect aerial life, so the dissolution of the less volatile components with the resulting emulsified water, affects aquatic life (Akpofure, Efere and Ayawei, 2000).

The harmful effects of oil spill on the environment are many. Crude oil kills plants and animals in the estuarine zone. Oil settles on beaches and kills organisms that live there. It also settles on the ocean floor and kills benthic (bottom-dwelling) organisms such as crabs. Oil poisons algae, disrupts major food chains and decreases the yield of edible crustaceans. It also coats birds, impairing their flight or reducing the isolative property of their feathers, thus making the birds more vulnerable to cold. Oil endangers fish hatcheries in coastal waters and as well contaminates the flesh of commercially valuable fish. In the Nigerian coastal environment, large areas of the mangrove ecosystem have been destroyed. The mangrove was once a source of both fuel woods for the indigenous people and a habitat for the area's biodiversity, but is now unable to survive the oil toxicity in its habitat.

Socio-economically, Ibeno local government area has been seriously affected as a result of oil company activities located in this area. Obviously, the major impact is on local farmers and fishermen, many of which are no longer able to fish or farm. Due to the impact of oil spill on fish resources, it has affected most fishermen’s income in the area. Some fishermen have had their boats and fishing equipments damaged by the spilled oil. The contamination of Ibeno land as well as the coastal amenity areas has also led to interference and loss of recreational activities such as diving, angling, fishing activities, bathing and boating. Small restaurant owners and many others who gain their livelihood from the tourist trade have also suffered temporary losses. Quite a few industries in Ibeno LGA and its environs that depend or rely on sea water for their normal operations are also adversely affected by oil spills. Another negative effect caused by oil spills in this community includes the loss of tourism. Ibeno has got a lot of tourist centers, pointedly, the Ibeno beach, which has suddenly been affected by this oil spill. It has led to decreased resident and non-resident vacation/pleasure visitor traffic in this spill affected area. This is due to lack of available visitor services.

Causes of Crude Oil Spills

Crude oil spills are caused by a multitude of factors in the Niger Delta. Oil spills constitute a unique class of environmental problem. The United State Environmental Protection

Agency (USEPA), (2000) recognizes oil pollution as resulting from accidental oil spills and natural oil seepage. In essence, there are diverse causes of oil spills. According to Ahman (1997) in a paper at the opening session of a workshop during an Environmental Day states that the "immediate causes of the spillages range from break up or damage to oil tankers or storage vessels to sabotage by aggrieved people". In a similar vein, Ofomata (1997) observed that in addition to blowout, cases of local oil spills can occur as a result of improper handling or mishaps such as burst pipes or from continuous seepage from the jetties during the loading of vessels. Poorly maintained infrastructure fails under high pressure. Accidents may occur and pipelines running over ground get ruptured. The burgeoning trade in stolen oil means that local people tap into lines and wells damaging them or leaving them leaking. Sabotage of pipes is common, often by local people hoping to get cash compensation. Drilling accidents have been a growing concern as more areas of the continental shelves are opened to drilling. Normally, the drill hole is loned with a steel casing to prevent lateral leaking of oil, but occasionally, the oil finds an escape route before the casing is complete. This is what happened in Santa Barbara in 1979 when a spill produced 200–square kilometers (about 80-square miles) oil slick. Alternatively, drillers may unexpectedly hit a high-pressure pocket that causes a blow out (Carla, 2002). Tank disasters are becoming larger all the time. In 1991, the war in the Persian Gulf demonstrated yet another possible cause of major oil spills, destruction of major pipelines and refinery facilities. Where the spills are due to failing equipment, the oil companies are clearly responsible. But where they are blamed on sabotage, the companies and government blame local people and criminal gangs. Oil spills in Nigeria occur due to a number of causes; they include corrosion of pipelines and tankers (accounts for 50% of all spills), sabotage (28%), and oil production operations (21%, with 1% of the spills being accounted for by inadequate or non-functional production equipment (Nwilo and Badejo, 2007).

The largest contributor to the total oil spill is corrosion of pipes and tanks. Corrosion is the rupturing or leaking of production infrastructures that are described as, "very old and lack regular inspection and maintenance". A reason that corrosion accounts for such a high percentage of all spills is that as a result of the small size of the oilfields in the Niger Delta, there is an extensive network of pipelines between the fields, as well as numerous small networks of flow lines (the narrow diameter pipes that carry oil from wellheads to flow stations) allowing many opportunities for leaks. The transport of huge quantities of oil creates opportunities for major oil spills through a combination of human and natural hazards (Nwilo and Badejo, 2007).
It should also be noted that drilling and transport in stormy seas cause spills. This explains the reasons for all plans to drill for oil along the seismically active California and Alaska Coasts have been controversial because of the damage that spills could cause to these biologically rich coastal ecosystems (Cunningham and Cunningham, 2002).

In onshore areas, most pipelines and flow lines are laid above ground. Pipelines which have an estimated life span of about fifteen years can be considered to be old and susceptible to corrosion at this age. Unfortunately, many of the pipelines are as old as twenty to twenty-five years (Human Rights Watch, 1999). Damaged lines may go unnoticed for days and repair of the damaged pipes take even longer. Oil siphoning has become a big business with the stolen oil quickly making its way onto the black market (Human Rights Watch, 1999) while the popularity of selling stolen oil increases, the bodies are piling up. Take for instance in late December 2006, more than 200 people were killed in the Lagos region of Nigeria in an oil line explosion (CNN, 2006). The 2006 explosion started after the oil line was tapped by people siphoning the oil with intentions of black market resale (CNN, 2006).

Environmental Impact of Oil Spillage

Marine contamination

The impact of oil spill on marine life depends largely on the physical and chemical characteristics of the particular oil and the way these change with time, a process known as 'weathering'. The specific gravity, viscosity, chemical composition and toxicity of the pollutant are the main properties which determine the likely impact of oil on sea organisms. The type of environment oiled is also important, e.g. sandy, rocky, salt marsh or mangrove. When oil spills into the ocean, it's especially likely to harm animals and plants at two interfaces (places where different things come together):

(i) Near the surface of the water, where water and air meet, and

(ii) Along the shore, where water and land meet.

According to Akpofure et al. (2000), the oil activities in the area have resulted to situations whereby complete polluted water is bequeathed to the children. The communities' shorelines have been washed away or eroded due to the high volume of deep-sea exploration and exploitation activities. With the expansion of oil production, the incidence of oil spills has greatly increased. Available records show that a total of 6,817 oil spills occurred between 1976 and 2001 with loss of approximately three million barrels of oil in the region. Approximately twenty-five percent spilled in swamps and sixty-nine in off-shore (UNDP Report, 2006). Besides oil spills as source of water pollution, canalization and wastes discharged into freshwater swamps and into the sea are other sources (Akpofure et al., 2000). In an attempt to shorten travel time and improve access to oil fields and production facilities, oil companies have constructed canals that in some cases have caused salt water to flow into fresh water zones destroying freshwater ecological systems. The toxic effects of oil on marine life depend on the duration of exposure and oil concentration in the environment. The presence of toxic components does not always cause mortality, but may induce temporary effects like narcosis and tainting of tissues, which usually subside over time. Oil spills in the ocean destroy small sea organisms, fish, seabirds, sea mammals, shorelines and may contaminate the ocean floor for many years after the event.

Soil contamination

Soil exists in many forms and its definitions vary according to application. The soil scientists identified it as the unconsolidated mineral material on the immediate surface of the earth that has been subjected to and influenced by genetic and environmental factors. Oil spill contamination of the top soil has rendered the soil unsuitable for plant growth by increasing the toxic contents of the soil (Odu, 1981). Soil chemical fertility which include the macro nutrients (such as nitrogen, phosphorus and potassium), trace element (manganese, zinc, copper, iron, molybdenum, boron, chloride, and cobalt), cation exchange capacity, electrical conductivity and soil pH are affected by crude oil soil contamination as a result of toxic heavy metals present (Obire and Nwabueze, 2002).

Oil hamper proper soil aeration as oil film on the soil surface acts as a physical barrier between air and the soil. Oil pollution affects the physicochemical properties of the soil such as temperature, structure, nutrient status and pH. The general region in which water is held in the soil is called the aeration zone and the water present in it is called vadose water. At lower depths, adequate amounts of water will fill voids to produce a zone of saturation, the upper level of which is the water table. Water in the zone of saturation is called groundwater. The surface tension of water is drawn slightly above the water table to a region known as the capillary fringe (Markert, 1994).

Crude oil contaminants will carve out their pathway by leaching into the soil, come in contact with the ground water from the water table and subsequently discharge its content into the canals, lakes, rivers and then to the sea. Soil is not just a simple environment, lots of chemical, physical, biological and geological factors constantly interact to vary its composition. The fate and integrity of soil, sediments and waters in these spill areas continue to degrade due to contaminants accumulated from crude oil, petrochemicals and petroleum related products. From the environmental point of view, the parameters to characterize the soil and sediment will depend on organic contaminants and the metals, especially the heavy metal content and their species in the soil (Miguel and Salvador, 1998).

METHODOLOGY

The following procedures were adopted to achieve the objectives of this work.

Sample Collection Procedures

The researcher visited the site of oil spillage in Ibeno local government area chosen for this study. Soil samples was obtained from the site of the oil spill and at distances 100m, 200m, 300m, 400m and 500m from the source of the oil spill for analyses. The soil sample obtained outside the site of the spill served as the control soil sample (SSC). At these various distances each, soil samples at depths 5m, 10m, 15m and 20m will be obtained and analyzed respectively and for the control too. Crop samples will also be gotten at the site of the oil spill in the area at distances 100m, 200m, 300m, 400m and 500m respectively for analyses. The crop samples obtained outside the spill site served as the control. Both surface stream and underground stream water samples was collected 100m, 200m, 300m, 400m, 500m and 600m away from the site of the oil spillage in the community and also from outside the oil spill site which will serve as the control. Hand-dug well water which is the main source of water supply in this area also be analyzed in the laboratory for heavy metals. For the purpose of this study, water was collected to test its suitability for drinking purposes and ability to support and sustain aquatic life.

Sample Analyses

For the water test, the following primary parameters was investigated for; PH value, dissolved oxygen, Turbidity, Exchangeable cations -; Calcium (Ca^{+}), Magnesium (Mg^{2+}), Sodium (Na^{+}), Potassium (K^{+}). Anions like Nitrate (NO^{3-}), Sulphate ($SO4^{2-}$) etc, will be determined. Heavy metals like Iron (Fe^{2+}), Cadmium (Cd), Lead(Pb^{2+}), Chromium (Cr^{2-}), Biological oxygen Demand(BOD), Dissolved Oxygen Demand (DO), Chemical Oxygen Demand (COD), Dissolved Carbon dioxide (CO_2) will also be determined.

Results and Discussion

SOIL SAMPLES

The results obtained from the experimental work carried out on the soil samples are presented in Table 1

Table 1: Determination of Heavy Metals in Soil samples Collected in the Study area Ibeno Spill Site at Different Distances.

Samples	Distances (m)	K mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	Zn mg/kg	Pb mg/kg	Cu mg/kg	Cr mg/kg	Fe mg/kg	Mn mg/kg
S_1	10	52.98	19.20	52.01	13.82	12.55	2.63	6.36	0.99	14.61	13.81
S_2	20	54.61	19.41	47.10	13.54	16.31	1.81	4.83	0.80	8.03	4.03
S_3	30	30.96	11.08	50.56	12.44	13.16	0.93	2.93	2.4	4.75	3.62
S_4	40	47.82	10.86	38.40	13.86	16.25	1.17	3.01	1.82	3.80	2.36
S_5	50	38.08	10.56	47.60	14.32	17.77	0.75	2.51	0.93	4.27	1.90
S_6	60	35.84	18.32	53.10	12.96	11.43	0.92	2.90	1.09	4.53	2.81
S_7	70	42.41	12.43	41.73	10.76	9.17	1.56	3.21	0.77	3.85	0.93
S_8	80	31.63	14.10	48.00	11.28	18.14	0.85	2.34	1.14	3.50	1.73
S_9	Control	75.83	392.00	196	205	3.00	ND	1.481	ND	1.68	0.19
W.H.O MAXIMUM STANDARD		-	-	-	-	3.0	0.01	1.0	2.0	0.3	0.05

(Source: Researcher's field work, 2015)

According to Singh and Mishra, (1987) it was reported that crude oil contamination may cause an increase in heavy metals in the soil and also decreases soil nutrients. This is in agreement with the results of this study as presented in table 1 which shows the effect of crude oil contamination in soil samples obtained from Upenekang oil spilled farm in Ibeno Local Government Area of Akwa Ibom State. The potassium concentrations of the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 30.96 mg/kg to 54.61 mg/kg as against 75.83 mg/kg obtained from the control sample obtained from a non-oil contaminated farm in the study area. This shows a decrease in the potassium contents of the soil samples obtained from the oil spilled farm indicating soil contamination due to the crude oil spill. The calcium concentrations of the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 10.56 mg/kg to 19.41 mg/kg as against 392.00 mg/kg obtained from the control sample obtained from a non-oil contaminated farm in the study area. This shows a decrease in the calcium contents of the soil samples obtained from the oil spilled farm indicating soil contamination due to the crude oil spill. The magnesium concentrations of the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 38.4 mg/kg to 53.1 mg/kg as against 196 mg/kg obtained from the control sample obtained from a non-oil contaminated farm in the study area. This shows a decrease in the magnesium contents of the soil samples obtained from the oil spilled farm indicating soil contamination due to the crude oil spill. The sodium concentrations of the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 10.76 mg/kg to 14.32 mg/kg as against 205 mg/kg obtained from the control sample obtained from a non-oil contaminated farm in the study area. This shows a decrease in the sodium contents of the soil samples obtained from the oil spilled farm indicating soil contamination due to the crude oil spill. According to Obire and Nwabueze, (2002) it was reported that soil chemical fertility which include the macro nutrients (such as nitrogen, phosphorus and potassium), trace element (manganese, zinc, copper, iron, molybdenum, boron, chloride, and cobalt), cation exchange capacity, electrical conductivity and soil pH are affected by crude oil soil contamination as a result of toxic heavy metals present. This is in agreement with this study as the soil nutrients as observed from the experimental results of the soil samples obtained from the crude oil contaminated farm as presented in table 1 were observed to be lower than those obtained from the non-oil contaminated soil. This shows the effect of crude oil spill on agricultural soils. Decrease in soil nutrients for a long period of time due to crude oil spills will lead to soil infertility as reported by Wyszkowska, Kucharski, Jastrzębska and Hłasko, (2001). According to Singh and Mishra (1987), it was found that the contamination of soil with petroleum hydrocarbon leads to an increase in the iron, zinc, copper, nickel, manganese, lead and chromium contents of the soil. This is evident in this study as the soil samples obtained from the crude oil spilled farm had high concentrations of these heavy metals when compared to the non-oil contaminated soil. The zinc concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 9.17 mg/kg to 18.14 mg/kg as against 3.0 mg/kg obtained from the control sample obtained from the non-oil contaminated farm in the study area. This shows an increase in the zinc contents of the soil samples obtained from the oil spilled farm indicating soil contamination due to the crude oil spill.

According to Tobias, Ezejiofor, Ihejirika, Ujowundu and Ngwogu, (2013) in their study on "Environmental Metal Pollutants Load of a Densely Populated and Heavily Industrialized Commercial City of Aba, Nigeria", it was reported that the World Health Organisation's maximum permissible limit of zinc concentration in agricultural soil is 3.0 mg/kg which is less than the zinc concentrations obtained from the soil samples obtained from the crude oil contaminated farm. The lead concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 0.75 mg/kg to 2.63 mg/kg. The lead concentration in the control sample obtained from the non-oil contaminated farm in the study area was not detected. This was as a result of the non-oil contamination of the farm. The lead concentrations in the soil samples obtained from the oil spilled farm were higher than the World Health Organisation's maximum permissible limit of 0.01mg/kg in agricultural soil as reported by Tobias, et al. (2013). This was as a result of the crude oil spill on the farm which contaminated the soil. The copper concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 2.34 mg/kg to 6.36 mg/kg.

The copper concentration in the control sample obtained from the non-oil contaminated farm in the study area was observed to be 1.481 mg/kg which is lower than the copper concentrations in the soil samples obtained from the oil spilled farm. The copper concentrations in the soil samples obtained from the oil spilled farm were higher than the World Health Organisation's maximum permissible limit of 1.0 mg/kg in agricultural soil as reported by Tobias, et al. (2013). This was as a result of the crude oil spill on the farm which contaminated the soil. The chromium concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 0.77 mg/kg to 2.4 mg/kg. The chromium concentration in the control sample obtained from the non-oil contaminated farm in the study area was not detected. This was as a result of the non-oil contamination of the farm. The chromium concentrations in the soil samples obtained from the oil spilled farm were within World Health Organisation's maximum permissible limit of 2.0 mg/kg in agricultural soil as reported by Tobias, et al. (2013) except the soil sample obtained at 30m from spill which had chromium concentration higher than the World Health Organisation's maximum permissible limit. The Iron concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 3.50 mg/kg to 14.61 mg/kg. The Iron concentration in the control soil sample obtained from the non-oil contaminated farm in the study area was observed to be 1.68 mg/kg. The Iron concentrations in the soil samples obtained from the oil spilled farm were above World Health Organisation's maximum permissible limit of 0.3 mg/kg in agricultural soil as reported by Tobias, et al. (2013). The manganese concentrations in the soil samples obtained from the oil spilled farm at different distances as presented in table 1 were between 0.93 mg/kg to 13.81 mg/kg. The manganese concentration in the control sample obtained from the non-oil contaminated farm in the study area was observed to be 0.19 mg/kg which is lower than the manganese concentrations in the soil samples obtained from the oil spilled farm. The manganese concentrations in the soil samples obtained from the oil spilled farm were observed to be higher than the World Health Organisation's maximum permissible limit of 0.05 mg/kg in agricultural soil as reported by Tobias, et al. (2013). This was as a result of the crude oil spill on the farm which contaminated the soil. Heavy metals were present in the soil samples obtained from the crude oil contaminated farm as presented in table 1 which was as a result of the effect of the oil spill on the soil. Soil metal contents as high as revealed in this study for some areas have serious public health implication for the residents of this metropolis, given the catalogue of health effects associated with exposure to metals generally, and toxic heavy metals in particular. In general, heavy metals are systemic toxins with specific neurotoxic, nephrotoxic, fetotoxic and teratogenic effects.

Conclusion

It was concluded that crude oil contaminated soils affects crop yield and toxic heavy metals are ingested by plants as evident in this study. Heavy metal toxicity can directly influence behaviour by impairing mental and neurological functions, influencing neurotransmitter production and utilization, and altering numerous metabolic body processes. Toxic heavy metals have been implicated in many health defects arising due to their toxic effects involving several body tissues, organs and systems.

Recommendation

The following are recommended:

1. Use of dispersants as a first response option to oil spills should be considered along with mechanical clean-up. Implementation of this recommendation must consider spill size, logistical and contingency planning.
2. Crude Oil should be chemically dispersed to reduce chronic impact on some habitats and soil components
3. Regulatory bodies should consistently check the oil-producing companies to see if they are following standard procedures in all their activities.

REFERENCES

Achi, C. (2003). Federalism and Resource Allocation: The Nigerian Experience. Nigerian *Journal of Oil and Politics* 1 (1), 16-35.

Ahman, J. Smith, S. & Glock M. D. (1997): Oil Producing Minorities and the Restructuring of Nigerian Federalism. *Journal of Common Wealth and Comparative Politics* 33 (1), 46-78.

Akpofure, E. A., Efere, M. L. & Ayawei, P. (2000). Integrated grassroot post- impact assessment of acute damaging effects of continuous oil spills in the Niger Delta. A *paper report on oil spillage in the Niger Delta*.

Carla, S. D. (2002) *"The Impact of Oil on a Developing Country*: The Case of Nigeria. Ibadan: Evans Brothers (Nigeria Publishers) Limited.

CNN, K. P. (2006) The Oil Industry, Extra-Ministerial Institutions and Sustainable Agricultural Development: A Case Study of Okrika LGA in Rivers State. *Nigerian Journal of Oil and Politics* 2 (1), 60-78.

Cunningham, S. D., Anderson, T. A., Schwab, P. & Hsu F. C. (1996). Greenpeace Oil Briefing No. 5: *The Environmental Impact of Oil London*: Greenpeace.

Jike, V. T. (2001) The Status of Oil Spill Control Planning in Nigeria. *International Seminaron the Petroleum Industry and the Nigerian*

Markert, N. (1994) Degradation and Weathering of Crude Oil under Tropical Conditions. *International Seminar on the Oil Industry and the Nigerian Environment*. Lagos: NNPC.

Miguel, M. S. & Salvador, R. I. (1998) Oil and Gas Exploration and Production in the Isoko Urhobo *Area of Delta State, Nigeria,* 1958-1995. Ph.D.Thesis, Unpublished. Ilorin: University of Ilorin.

Nwilo, D. A. & Badejo, J. C. (2007) Oil and the minority question. In the National Question in Nigeria: *Comparative Perspective*, edited by a.

Obire, I. S. & Nwabueze, G. A. (2002) Vultures Feast: Shell, Human Rights, and Oil in the Niger *Delta,* San Francisco: *Sierra Club Books.*

Odu, D. (1981) Bioremediation of Soil artificially Contaminated with Petroleum Hydrocarbon Oil Mixtures: Evaluation of the Use of Animal Manure and Chemical Fertilizer. *Bioremediation Journal*. 14(4):189–195,

Ofomata, K. D. (1997) . Revenue Allocation and the Oil Producing States in Nigeria, in Alapiki, Henry (ed), Perspectives on Socio-Political and Economic Development in Nigeria. Owerri: *Springfield Publishers*.

Olagbende, F. (1999) The oil –eating Microbe: *A remedy to pollution menace*. In: The Post Express, Property and Environment, of Monday February 21, 2000. 28.

Singh, D. & Mishra, A. (1987) Managing physicochemical parameters in compost systems to enhance degradation of petroleum wastes from a sludge dam. *African Journal of Biotechnology*. Vol. 13(7), 857-865, DOI: 10.5897/AJB2013.12257

Tobias, I., Ndubuisi, A. N. Ezejiofor, A. C., Udebuani, E. U. Ezeji, E. A., & Ayalogbu, C. O. (2013) , The next Gulf? Oil politics, environmental apocalypse and rising tension in the Niger Delta, *African Centre for the Constructive Resolution of Dispute* (ACCORD), Occassional Paper Series, 1(3)

UNDP Report (2006). The Ogoni uprising: Oil politics, minority agitation and the future of the Nigerian state, *African Affairs,* 94(1995), 325–344.

USEPA, (2000) *Oil Based Environmental Degradation and Internal Population Displacement in the Niger Delta*. Paper presented at the second National Conference of the faculty of Business and Social Sciences, University of Ilorin, Ilorin, Nigeria, February 27-28, 2007.

Wyszkowska, N. I., Kucharski, C. H., Jastrzębska, S. & Hłasko, P. N. (2001): Microbiological properties of soil contaminated with diesel oil. *Acta Agrophis*., 51: 113–120.

Human Rights Watch, (1999) The Price of Oil. *New York*: Human Rights Watch, P. 60.