ENVIRONMENTAL EFFECT OF KPO-FIRE IN NIGER DELTA AND FUTURE HEALTH IMPLICATION

Abstract

Crude oil discovery and exploration in the Niger Delta of Nigeria which includes Delta, Bayelsa, Abia, Rivers, Cross River, Akwa-Ibom, Imo, Edo and Ondo States of Nigeria, has led to significant economic growth of the nation especially in the creation of job opportunities also the generation of revenue. Unfortunately, Oil thefts have become the idea that replaced the most crisis and agitations in the Niger Delta communities against the perceived neglect of the areas. This had resulted to widespread operation of illegal oil bunkering activities called Kpofire. Kpofire, as described by the Niger deltan's, is a process of burning crude oil by illegal oil operatives or thieves at isolated locations called bunkering sites or dumpsites in order to extract refined petroleum products. The design for the extraction of the petroleum products involves the sections of steaming and collection. These sections are connected by a very long pipe. Heat is applied to the steaming section using wood from the mangroves that is called 'Ngala' or 'Agala' afterwhich crude oil is used. The products extracted are fuel, kerosene and diesel. One of the major problems of Kpofire is the introduction of soot into the environment. Soot is a product is uncontrolled and incomplete combustion or pyrolisis of materials that contain carbon. The highest constituent of soot is the Polynuclear aromatic hydrocarbon (PAH). The Niger Delta people are faced with daily environmental challenges sucgh as inadequate housing facilities, contaminated drinking water sources, barren lands for agriculture, dead rivers for fishing activities and poor health conditions, soot, which has become a gradual but huge challenge in many Niger Delta communities, has been shown to play a huge role in respiratory, skin, and reproductive health conditions. However, vulnerability is seen more in babies and children (particularly because their respiratory organs are not matured enough), the elderly, and people with preexisting health conditions, also heart or lung diseases (such as asthma). High exposure to PAHat prenatal stages is linked to a low IQ and lead to increased behavioral problems in the early-age child and childhood asthma. A collective effort is needed to put a stop this menace called kpofire in order to avoid environmental pollution thereby endangering the health of the people of Niger Delta.

Keywords*: Kpofire, Niger Delta, oil bunkering, soot*

1.0 Introduction

Our environment consists of both the living and non-living elements and their influences on human life. Resources for production are supplied by the environment and these resources include both the renewable and non-renewable resources. One very important non-renewable resources provided by our environment are petroleum. Petroleum, which is also known as crude oil, yellowish black naturally occurring liquid that is found in geological formation beneath the Earth's surface. When refined it produces various kind of fuels. Petroleum components are separated by a technique known as fractional distillation, which is the separation of a liquid mixture into different fractions by their boiling point using distillation techniques, typically using a fractionating column. Once extracted, crude oil is refined and separated easily by distillation into various products for direct use or for use in manufacturing, such product may include; gasoline (petrol), kerosene to asphalt, diesel and

chemical reagents that are used to make plastics, pesticides and pharmaceuticals. Petroleum is useful in the manufacturing of a wide range of materials. Production of petroleum is highly profitable and aided economic development in the 20th century, with some countries, that were the so called "oil states", gaining high economic and international power because they were in charge of oil production. Nigeria had been known as an agrarian (agricultural) economy state, due to its export of agricultural products from the late 50s to early 70s before oil exploration in commercial quantities began. Crude oil was first discovered in Nigeria in 1956 in Oloibiri, the now Bayelsa state by the Shell D'arcy Petroleum Development Company of Nigeria, a consortium of Shell and British Petroleum which was then known as Anglo-Iranian. Crude oil has been used widely in Nigeria and has been of much advantage to the nation. It has brought about a significant economic growth of the nation especially in the area of job opportunities creation and revenue generation. All of the crude oil produced in Nigeriaare gotten from numerous, small producing fields that are located in the swamps of the Niger Delta. Unfortunately, Oil thefts have replaced the crisis and agitations in the Niger Delta communities against the perceived neglect of the areas. Oil spillage and explosion has been made a common occurrence in the Niger Delta region as a result of illegal oil bunkering or oil theft (Campbell, 2015). The consequences of some of these oil spills have become very obvious. The United Nations Environment Program (UNEP) discovered in their environmental assessment of Ogoniland in Rivers State that the mangroves has been destroyed, the soil and groundwater has been polluted, the streams and fishes in the streams has been killed and rivers as a result of oil spill contamination, and it represents a genuine danger to general wellbeing of humans (UNEP, 2011). The Niger Delta people are currently faced with varoius environmental challenges such as poor health conditions, inadequate housing facilities; contaminated drinking water sources, barren lands for agriculture, and dead rivers for fishing activities.

This study is carried out based on secondary data sourced from textbooks, magazines newspapers, journals, articles, newsletters, and interviews.

2.0 Study area

Niger Delta is a region located in the southern coast of Nigeria. It features as a major geomorphic part of the coastal zones of Nigeria. It stretches from the Benin river at about 450km eastward and terminates at the entrance (mouth) of Imo river. It is made up of different ecological zonee such as the fresh water, swamp mangrove, creeks, estuaries and barrier island (Ukong, 2009).

The Niger Delta, as defined officially by the Nigerian government, is over about 70,000 km^2 (27,000 sq mi) and makes up 7.5% of the Nigerian land mass. History and cartography has it that in 2000 the Niger Delta region was made up of the present-day Bayelsa, Delta, and Rivers States. However, the regime of Obasanjo

added Abia, Akwa-Ibom, Cross River State, Edo, Imo and Ondo States in the region (Otoabasi, 2011).

Image :1 Map of Niger Delta Region Showing the States. (Source: nairametrics.com)

3.0 Kpo-fire

Kpo-fire, as described by the Niger deltan's, is a process of burning crude oil by illegal oil operatives or thieves at isolated locations called bunkering sites or dumpsites in order to extract refined petroleum products. It is simply a local process of extracting petroleum product by heating the crude in fabricated oven. It is also a local word that is used to describe fire incident that take place when illegal refining of crude oil or breakage of fuel pipe line is carried out. It is also considered as the local name for refined products gotten illegally from illegal oil bunkering activities**.**

4.0 Production process

The extraction of the petroleum products involves a steaming and collection sections. The two sections are connected via a very long pipe. The drums used for this process are constructed by welders to be about 15mm thick. The pipe that connects the boiler and the collector drum is about 72 to 90 feet long and about 16mm thick. The collection drum is 15mm thick and has no lid. The length of the pipe is so long in order to reduce the magnetic power of fuel and kerosene. Mangrove wood called 'Ngala' or 'Agala'is used to start the the initial fire thereafter crude oil is used (Daminabo *et al*., 2017).

The boiling point of each fraction is unknown. Fuel is identified as the first product that comes out by its colour and smell. The second as kerosene as it has lighter colour and also by its smell. The last of the product is identified as diesel as it is dark green in colour and also by its odour. A pumping machine is used to transfer the product at the end of each distillation to another container where it is allowed to cool.

5.0 Soot

The production of soot into the environment has become one of the major problems of Kpo–fire. . Soot is a product is uncontrolled and incomplete combustion or pyrolisis of materials that contain carbon. (Omidvarborna *et al.,*2015). Thus, soot may be gotten from waste oil, fuel oil, gasoline fuel, diesel fuel, coal, wood, paper, rubber, plastics and resins or household refuse. The burning of these products produces heat or energy in domestic fireplaces, domestic furnaces, industrial furnaces, and vehicle engines. The illegal refining of crude oil is responsible for the soot in this region. The burning of seized stolen crude by security operatives and setting ablaze crude oil sites by some oil contractors in the industry, all in the name of cleanup are other factors responsible for generation of soot. Soot is a pseudonym for a type of particle pollution called PM 2.5, which is an air pollutant that is made ou of a variety of other pollutants like chemical acids, metals and dust particles. The diameter of the particle is about 2.5 micrometers or less. And consist of different amounts of carbon, organic compound, resins, and inorganic materials. Incomplete combustion brings about the formation of soot. For incomplete instead of complete combustion to be achieved, the fuel is allowed to burn at a lower temperature with a slightly reduced supply of oxygen. The fuel breaks into small particles that include soot when it burns This soot settles out as a dark powdery deposit (ACS, 2013). At very low concentrations soot capable of darkening surfaces or making particle agglomerates, such as those from ventilation systems, appear black. 'Ghosting', which is the discoloration of walls and ceilings or walls and floors is primarily caused by soot where they meet.

The dominant component of soot are the Polynuclear aromatic hydrocarbon (PAH) molecules. individual PAH molecules forms ordered stacks that agglomerate into primary particles (PP). These species have been identified in crude oil (including asphaltenes), are persistent organic pollutants present in many environmental soil and sediment samples, and have been shown to be responsible for infrared (IR) emission bands associated with many interstellar environments Because of the high thermodynamic stability of polynuclear aromatic hydrocarbon (PAH) molecules, (Buseck *et al.,* 2012).

Figure 1: Atmospheric condition in Niger Delta on a moderate soot day. (Ibira, 2022)

Figure 2: Atmospheric condition in Niger Delta on a high soot day. (Ibira, 2022)

Figure 3: Burning tanks containing illegally refined crude products in Rivers state (Ibira, 2022).

6.0 Environmental Effects of Kpo-fire

Environmental pollution has become one of the most serious challenges faced in the human society today. Air, water and soil are the three basic areas of environmental pollution are. Environmental pollution is brought about by an unfavourable change in the environment which has a negative impact on plants and animals.

One of the most common environmental challenges in the Niger Delta is crude oil refining and oil pollution by crude oil and it's bye products as a result of illegal refining ("Kpo-fire"). It was observed in a study that the as the concentration of the residue (soot) increases, the effects on the fungal population and diversity also increases. The decrease in species composition and the fungal populations observed are because of the effect of the illegally refined crude oil residue on the soil fungal population and diversity. Hence, this can affect agricultural product and it quality. The ecological balance is consequently affected by the continual dumping of this residue into the soil environment, this is because these organisms play very important role in the ecosystem (Douglas, 2018).

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Soot also have a tendency to form in chimneys in domestic houses possessing one or more fireplaces. A chimney fire can be ignited and created when a large deposit of soot is formed. This problem can be minimized or eliminated by regular cleaning by a chimney sweep. Soot, precisely diesel exhaust pollution, accounts for over one quarter of the total hazardous pollution in the air (Omidvarborna *et al*., 2014)

7.0 Future Health Implication

As said earlier, soot is a byeproduct of the incomplete combustion of organic (i.e carbon-containing) materials, such as wood, fuel oil, plastics, and household refuse. A number of carsinogens such as arsenic, cadmium and chromium can be contained in the fine black or brown powder that makes up soot.

Exposure to soot was first associated with skin cancer of the scrotum among British chimney sweeps in 1775. Since then, many studies have shown that chimney sweeps have high risk of scrotal and other skin cancers. Other studies carried out in several European countries on chimney sweeps have also shown that exposure to soot has an associations with other cancers, including lung, esophageal, and bladder cancers. People are exposed to soot via inhalation, ingestion, or absorption through the skin (IACR, 2012).

Lung tumors in rats have be found to be associated with lifetime inhalation of high concentrations of soot. These studies were however conducted to evaluate the role

of mutagenic organic material in the induction of lung tumors. Black soot, which is gradually becoming a persistent challenge in many Niger Delta communities, has been shown to be the cause of the upsurge in adverse respiratory, skin, and reproductive health conditions. Black soot-related health disorders were responsible for about 25,000 deaths in the region as shown by a 2019 report.
It is also shown that long-term exposure to urban air pollution containing soot increases the risk of coronary artery disease. (Kristin *et al*., 2007)

The PAHs in soot are known mutagens. a mutagen is any physical or chemical agent that permanently changes material, usually DNA, in an organism and consequently lead to the increase in the frequency of mutations above the natural background level. Mutagens are genotoxic as they can cause changes to the DNA. They are capable of affecting the transcription and replication of the DNA, which can lead to cell death in severe cases (Buseck *et al.,* 2012; Rundel, 2001)

Adverse health consequences on the population health can be caused by soot. However, vulnerability is seen more in babies and children (particularly because they have premature respiratory organs). The elderly, and people with preexisting health conditions, including heart or lung diseases (such as asthma) (WHO, 2017).
Intense gas flaring has been reported to cause physiological damages in recent times, these damages include birth defects which occur during the reproductive cycle of women in their first trimester of pregnancy (Gobo *et al.,* 2010).

Reports has shown that workers exposed to polycyclic aromatic hydrocarbons (PAHs) has shortened telomere length and influenced by individual genetic variations in telomere-binding proteins (Duan *et al.,* 2020.) impaired Immune function that can increase cancer susceptibility is associated with shortened telomeres (Eisenberg, 2011). Aging, mortality and aging-related diseases can be associated to Telomere shortening. High prenatal PAH exposure is connected to a low IQ and increased behavioral problems in the early-age of a child and childhood asthma (Perera *et al.,* 2014; Rengarajan *et al*., 2015).

Conclusion

This is clear that the environments and the health condition of the people of Niger Delta are in a serious danger if measures are not put in place to stop activities that caused production of soot. And provide a remedy system to cushion the damages and the future effects on the environment and the health of occupants of the Niger Delta environ. The constituent of soot are very lethal to human as it is capable of causing health conditions like skin, esophageal, and bladder cancers, heart or lung diseases etc. The increase in the release of this residue into the soil environment, will lead to changes in the ecological balance, since it is capable of killing soil microorganisms. These organisms have very great role they play in the ecosystem.

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