



Health, Safety and Environmental Implications of Fossil Fuel Exploitation

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ABSTRACT

Exploitation and utilization of fossil fuel has enormously boosted the development of the world economy and human society. Energy being an essential material necessary for survival and development, its exploitation and utilization has boosted the development of many countries' economy. While there are numerous advantages of using fossil fuels to include: their high energy concentration, low cost and ease of accessibility; they can also be harmful to the environment. Fossil fuels has caused land degradation, and water and atmospheric pollution oil spillage and gas flaring during exploration, transportation, usage and vandalization as the case could be have led to land degradation, aquatic and air pollution. Therefore, for environmental sustainability, it is pertinent that stakeholders rise to challenge and address these problems.

Keywords: Health, safety, pollution, environment, degradation

INTRODUCTION

Fossil fuels are hydrocarbons, primarily coal, fuel oil or natural gas, formed from the remains of dead / leached plants and animals; it could also be seen as buried combustible geologic deposits of organic materials, which are dead, formed from dead decayed plants and animals which have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over period of hundreds of millions of years (Paul et. al., 2009).

The exploitation and utilization of fossil fuel has enormously boosted the development of the world economy and human society. For instance, energy from fossil fuels such as coal and petroleum are essential for the production of electricity production, transportation, heating, and many other purposes. However, the extraction and processing of fossil fuels, in addition to use, have profound impacts on the environment (Maron et. al., 2013).

Aquatic phytoplankton and zooplankton which died and sedimented in a very large quantities under anoxic conditions some million years ago began forming petroleum and natural gas due to anaerobic decomposition. Over geological time this organic matter, mixed with mud, became buried under further heavy layers of inorganic sediment. The resulting high temperature and pressure caused the organic matter to be chemically altered, first into a waxy material known as kerogen, which is found in oil shales, and then with more heat into liquid and gaseous hydrocarbons in a process known as catagenesis. Despite these heat-driven transformations the energy released in combustion is still photosynthetic in origin (Schmidt-Rohr, 2015)

There is a wide range of organic compounds in any given fuel; the specific mixture of hydrocarbons gives a fuel its characteristic properties, such as density, viscosity, boiling point and melting point. Fuels such as natural gas contains only very low boiling, gaseous components; others such as gasoline or diesel contain much higher boiling components.

Fossil fuels are of great importance because they can be oxidized to carbon dioxide and water, producing significant amounts of energy per unit mass. The use of coal as a fuel predates recorded history. Coal was used to run furnaces for the smelting of metal ore. While semi-solid hydrocarbons from seeps were also burned in ancient times, they were mostly used for waterproofing and embalming (Bilkadi, 1992)

Commercial exploitation of petroleum began in the 19th century, largely to replace oils from animal sources (notably whale oil) for use in oil lamp; natural gas, once flared-off as an unneeded byproduct of petroleum production, is now considered a very valuable resource (Kaldany, 2006)

FOSSIL FUEL EXPLOITATION

Energy being an essential material necessary for survival and development, its exploitation and utilization has boosted the development of the many country's economy. Energy from fossil fuels is essential for electricity production, transportation, heating, and many other purposes. However, its exploitation, extraction and processing, in addition to use have profound detrimental impact on the environment (Maren et. al., 2013).

One of the large oil spills which leaked about 4.9 million barrels of crude oil into the Gulf of Mexico and the some other oil spills in our country, Nigeria have focused attention on the severe disasters associated with fossil fuel exploitation yet the alarms over the environmental impacts of using fossil fuels are dated back to as early 20th century. Natural Edge Project, NEP (2007), noted that Guy Challenger, a coal engineer, was one of the first to raise alarm over the increase of carbon dioxide (CO₂) level in the atmosphere. Guy Challenger cautioned that using fossil fuels would contribute to global warming and it was one of his empirical results that prompted the recent efforts to understand and address climate changes (NEP, 2007).

Nigeria is a country blessed with abundant supply of coal, oil and natural gas as it has estimated to have proven reserves close to about 35 billion barrels of oil, 2.7 billion tons of coal and 187 trillion barrels standard cubic feet of natural gas (Draft National Energy Master Plan, 2007). Oil and gas related operations are the most obvious industrial activities in the country. Oil and gas resources account for over 95% of the country's export earnings and 82% of the government's total revenue. However, the steady exploitation of fossil fuels occurs with severe impact on the environment.

Oil spillage and gas flaring during exploration, transportation, usage and vandalization as the case could be have led to land degradation, aquatic and air pollution. Therefore, for environmental sustainability, it is pertinent that stakeholders rise to challenge and address these problems. Government has to effectively play its regulatory roles; investors should adhere to international best practices in energy exploitation while engineering and scientific agencies must ensure they adopt modern technologies in the confine of their professional ethics (Maren et. al., 2013).

Human and industrial activities such as energy exploitation have inflicted harsh and most times irreversible damage to the environment and resources and if not properly managed, many of our current practices would put serious risk at the future that we wish for human society, plant and animal kingdoms, and would so alter the living world that it would not be able to sustain life in the manner that is expected (World Bank, 1991)

FOSSIL FUEL EXPLOITATION AND ITS BENEFITS

The benefits of fossil fuel exploitation abound and cannot be overemphasized. In our country, Nigeria, crude oil accounts for 90% of export earnings, 95% foreign exchange earnings and 82% of budgetary revenue (Diezani, 2011).

The revenue from the oil sector is seen to be the mainstay of most country's economy as it is ploughed into other sectors for developmental purposes. Apart from revenue generation, fossil fuel exploitation has provided the teaming population many job opportunities.

Energy utilization has improved the leaving standard of citizens since what would have been done manually is now being done by machines powered by energy from fossil fuel.

Nigerian coal has been found suitable for boiler fuel, production of high calorific gas, domestic heating, formation of coke and in the manufacturing of a wide range of chemicals such as waxes, resins, adhesives and dyes. The characteristic properties such as low sulfur, low ash content and low thermoplastic properties, make these sub-bituminous coals ideal for coal-fired electric power plants (WHO, 1997).

FOSSIL FUELS AND THE ENVIRONMENT

Fossil fuels are natural non-renewable resources formed by a natural process of the decomposition of plants and other organisms, buried beneath layers of sediment and rock, and have taken a long time (quantified in terms of millions of years) to become carbon-rich deposits (Nunez, 2019). Major examples of fossil fuels are coal, crude oil, and natural gas, all considered as such because they were formed from the fossilized, buried remains of plants and animals. It is also important to note that these sources provide about 80% of energy needs. As for the major types of fossil fuels: crude oil, or petroleum, is a liquid fossil fuel composed mainly of hydrocarbons (hydrogen and carbon compounds); coal is that solid, black, carbon-heavy chunk of sedimentary rock; while natural gas is an odorless gas composed mainly of methane.

The Organization of Economic Cooperation and Development glossary of statistical terms defines the environment as the totality of all the external conditions affecting the life, development, and survival of an organism. Streamlining the concept based on this definition would portray the environment simply as consisting of land, water, and air.

There is an undeniable link between fossil fuels and the environment, and this is presented in those chemicals and compounds which make up fossil fuels. The presence of carbon, methane, and the likes in excessive quantity makes it difficult to ignore, as the impact on the environment is clear. Take for instance plastics, which are made from fossil fuels and are biodegradable. The creation of such plastics affects the environment in many fundamental ways – one being how it affects the cleanliness of the environment; another being that the biodegradable nature of such plastics makes them decomposes at some point, releasing the chemicals in the atmosphere and water bodies. It has been stated that every year, eight million metric tons of plastics enter our ocean

Effects of fossil fuel exploitation on the environment

While there are numerous advantages of using fossil fuels to include: their high energy concentration, low cost and ease of accessibility; they can also be harmful to the environment. Fossil fuels cause land degradation, and water and atmospheric pollution.

- Coal mining and land degradation

The impact of fossil fuels specifically on land is both direct and indirect. It can occur in a number of ways, including land clearing for the purpose of establishing facilities and networks that enable the processes needed for the extraction, transportation, and processing of fossil fuels. The fossil fuel industry requires a large portion of land to develop infrastructure such as wells, pipelines, access roads, as well as facilities for processing, waste storage, and waste disposal (Denchak, 2018). This could even involve scraping and blasting to expose underground coal or oil.

Coal exploitation and mining has great impact on the environment. The removal of soil from the area to be surface mined alters and destroys natural soil characteristics and reduces its productivity for agriculture and biodiversity. Dust degrades air quality in the immediate area. Waste and coal storage piles yield sediment to streams and leached water from these piles are most times acid and contain toxic trace elements which renders surface water unfit for agriculture, human consumption, bathing, e.t.c (Bascom et al. 1996)



It is clear that mineral exploration present an indelible mark to the ailing environment, most significant is the alteration of the ecological settings. With large deposit of mineral resources across Nigeria from Jos (tin and columbite), Edo (lead), Enugu (coal), Ogun (limestone) has recorded negative effects of mining on the environment. Records have shown that the solid mineral sector is the second major source of pollution after crude oil (Adekoya, 2003).

As large heap, dump of solid wastes, tailing and effluent get released; they distort the natural sanity which interferes with the quality of life and regular functioning of the ecosystem (Nnabo and Taiwo, 2001).

One of the factors that are always associated with mining is the influx of people which often exert pressure on already stressed environment. Because local artisan are most times ill equip with expertise, machineries, lack of laws and regulations governing their operations and environmental standard, it is expedient to witness a more pronounce decay in the form of landscape damages, increased soil erosions, deforestations, loss of vegetations, loss of cultivable lands and ecological imbalances. Also, buildings collapse due to noise and vibration during blasting of rocks with explosives has been a usual occurrence. Widespread environmental deterioration in the form of air particulate emissions, chemicals flow from abandoned mines, radioactive waste, water contamination and land degradation are the order of the day.

One of the first effects and casualties of coal mining in any region is loss of Vegetation and deforestation. The vegetation damages usually occur at the time of mining. It is evident that rural communities in Northern part of Edo State have suffered immensely from ecological problems. Decreased in kola nut plantation output in Shagamu to its adjacent cement factory location has been recorded; This challenge, having been crossed matched to the gradual encroachment of Sahara desert in the tropics and concomitant depletion of Lake Chad basin, are responsible for the increased atmospheric carbon (VI) oxide concentration and global warming (Aigbedion, 2005).

With sufficient arable lands getting rapidly depleted due to clearing of vegetation, setting of camp sites, excavator and heavy machinery installation cum road construction for easy traffic, a lot of protective plants, cash crops and plantations are lost through accelerated soil erosion and flooding, thus leading to economic loss (Aigbedion, 2005).

Aesthetic nature of any environment is in relation to its landscape formation and soil erosion. In Nigeria, the presence of numerous abandoned mined pits has been observed in Jos mining zone and has tampered with the serenity of the region. The destruction of natural landscape, creation of pit and indiscriminate dumping of heaps are observed in Imeke, Igara and Ikpeshi where granite and marble quarries are explored. In Nkalagu, Gboko and Ashaka some of the open hole which result from exploitation serve as an artificial lake for local communities. Apart from dreaded landscape that accompanied this activity in Jos and Bukuru metropolis in the 1970s, some part of its environment such as Gyel and Sarbobarki has continue to feel the negative impact

of mining. As difficult as restoration of landscape due to mining is, one viable option remains that is, waste filling of the pits once mining is over. However this is unattainable because most miners are not landowners and so are careless about the community (Ogola et. al., 2001).

As world human population continues to rise, couple with advancement in technology and innovations, there has been concomitants decline in environmental quality and life sustenance ability has been recorded (Kogbe and Obialo, 1976).

Mining activities such as excavation has exposed all the landscape to severe erosion as its prevalent underlain by crystalline rocks where quarrying activities occur on daily basis.

The alteration of natural environmental equilibrium through exploration has initiated a number of geological hazards which include flooding, landslide and subsidence. Certainly, this altered geological structure is not without consequences as it leads to loss of life and properties. In Nigeria, Niger delta and Iva valley in Enugu, cases of subsidence have been noted due to oil drilling and coal mining respectively (Aigbedion, 2005).

Undoubtedly, most communities near mining sites witnesses slight earth movement due to blasting of rock. As mining involves the removal of large amount of soil which contains radioactive materials, the possibility of their intake by human through food chain is understandable (Ajakaiye, 1985).

Following build-up of chemical agents in the air, water and soil against biotic life, their radiation effects are seen to be concentration dependents (Ademola, 2008).

In Jos, Plateau State, associative by-product of mining of tin such as monazite, pyrochlore and xenotime are radioactive. The remnant of these materials which were abandoned at the closure of mining operation still exact their effects till date (Møller and Mousseau 2013).

Aliyu and Ramli (2015) opined that emitted radiations induce changes in immunology, physiology, point mutation and increase in disease frequency. However, there have been records of mysterious death by people who are believed to have used monazite soil for construction of houses (Aigbedion, 2005).

- **Water Pollution**

Fossil fuels impact the water in several ways, and unlike land, the fuels may get mixed with a substance that is continuously flowing. Hence, harmful chemicals are mixed with freshwater that provides a source of water for consumption. Additionally, fossil fuels affect marine wildlife and the ecosystem by contaminating the water, ultimately affecting the people and animals dependent on the marine ecosystem. In this light, fossil fuels lead to water pollution. Water pollution occurs when harmful substances (usually chemicals) contaminate a body of water, such as a stream, river, lake, ocean, or aquifer, thereby degrading water quality, and making it dangerous to humans or the environment. This pollution may occur in several ways. One prominent way which countries of the world still find difficulties in addressing is oil spills



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The world has experienced a plethora of spills, in which millions of gallons of oil have spilled into the oceans. There was the Exxon Valdez oil spill, a manmade disaster that occurred when an oil tanker spilled 11 million gallons of crude oil into Alaska's Prince William Sound on March 24, 1989. The Exxon Valdez oil slick covered 1,300 miles of coastline and killed hundreds of thousands of seabirds, otters, seals, and whales. Even today, there are vestiges of crude oil which remain in some locations (History, 2018).



There was also the Prestige Oil Spill accident in November of 2002, which occurred near the coastline of Spain in the city of Galicia and was reported to have spilled almost 18 million gallons of oil into the ocean, damaging all the marine ecosystem there. There was the Torrey Canyon, the Deepwater horizon and many more spills which have left our oceans vulnerable. Beyond ostensible oil spills which would alert any mind, there are some offshore oil extraction activities initiated by the hydrocarbon industry which can have numerous adverse environmental impacts even without suffering a significant oil spill. For instance, drilling activities fundamentally affect the aquatic ecosystem, and such activities only help spread remains of oil spills.

Another issue to note is fracking. Fracking is a process which involves pumping water and various chemicals down an oil or gas well under the influence of high amounts of pressure, thereby breaking bedrock and shale to enable the possibility of extraction of oil deep within the bedrock. It is in the process of injecting chemicals underground that groundwater contamination could occur.

Fracking also consumes a massive amount of water, and according to the United States Geological Survey (USGS), each process uses between 1.5 million and 16 million gallons of water to frack a single well (Denchak, Fracking 101, 2019). A resultant effect might be a reduction of water resources in areas where freshwater supplies are needed for drinking and irrigation. This is because water used for fracturing is too contaminated to return to its source, and as such, it is typically disposed of deep underground, where it is removed from the freshwater cycle. Moreover, over 80% of the world's wastewater – and over 95% in some least developed countries – is released without treatment (UNESCO, 2017). Part of this is from the discharges from fossil fuel extraction processes.

- **Atmospheric Pollution**

Fossil fuels, maybe more ostensibly, affect the atmosphere the most, given the nature of the chemicals which they are made of. Carbon dioxide for instance, which enters the atmosphere through burning fossil fuels and methane, which is emitted during the production and transport of fossil fuels, are both greenhouse gases (GHGs), and this fact is essential. This is because GHGs undergo a process known as the greenhouse effect. The greenhouse effect is a natural process that warms the Earth's surface. When energy from the Sun reaches the earth, some of it is absorbed and re-radiated by greenhouse gases. Essentially, this is what keeps the earth at certain temperatures. So if there is more GHG emission, there will be more gases that capture heat from the sun, raising the average temperature of the earth. This in turn leads to climate change, affecting the pattern of the weather in the short run and changing climate patterns entirely in the long run.

Climate change today is largely fueled by anthropological activities, and it continues to rise. The WMO Greenhouse Gas Bulletin showed that globally averaged concentrations of carbon dioxide (CO₂) reached 407.8 parts per million (ppm) in 2018, up from 405.5 ppm in 2017 (World Metrological Organization, 2019). The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, also forecasts a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century (NASA, 2019). A continuous rise in temperature levels will only serve to facilitate climate change, resulting in such effects as droughts and heat waves, a rise in sea levels, desertification, forest fires, storms, and hurricanes, with a further effect on land, water, and ecosystems.



Odjugo and Osemwenkhae (2009) researched the effect on gas flaring on maize yield size and concluded the sand content of the soil, pH, bulk density, air and soil temperatures increased toward the flare site. For optimum yield of maize within the Niger Delta where gas flaring is taking place, a recommendation that maize must not be cultivated within 2km of the bund wall of the flare sites was made. Research findings show that there is indeed a correlation between environmental variables resulting from gas flaring and the development of certain ailments found in individuals residing in such area.

Acid rain results in environmental degradation including soil and water contamination, and roof erosion; the incineration of sour gas produces sulphur oxides, which are released into the atmosphere. The end result of these compounds when they combine with atmospheric compounds, namely oxygen and water is what is called acid rain, which produces a lot of negative environmental effects (Uyigüe and Agho 2007)

This Local and regional problem is predominant in developing nations like Nigeria where environmentally unethical gas flaring has contributed significantly to the degradation of the environment in the region. The concentration of acid in rain water appears to be higher in the Niger Delta region and decreases further away from the region. The acid rain caused by gas flaring has altered the vegetation of the Niger Delta area. On a casual observation of the flares in the Niger Delta one sees that they are sooty and are evidently burn at low efficiency (Bassey, 2008).

Gas flare sites, which often times are situated close to villages, produce “soot”, which is deposited on building roofs of nearby villages. When it rains, this soot runs off the roofs of building and pollutes the soil and water aquifers of the people (Uyigüe and Agho 2007).

Effects of fossil fuel exploitation on human health

All the environmental implications of fossil fuel exploitation in one way or the other affects human health.

Human beings and the natural environment are on a collision course. Human activities such as energy exploitation inflict harsh and often irreversible damage on the environment and on critical resources. If not checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know

Exploitation of fossil fuels can cause multiple [health issues](#), including asthma, cancer, heart disease, and premature death. Combusting the [additives](#) found in gasoline - benzene, toluene, ethylbenzene, xylene produces cancer-causing ultra-fine particles and aromatic hydrocarbons. Globally, fossil fuel pollution is responsible for one in five deaths. In the United States, [350,000 premature deaths](#) in 2018 were attributed to fossil fuel-related pollution, with the highest number of deaths per capita in states like Pennsylvania, Ohio, and West Virginia.

- **The release of carbon monoxide from gas flaring**

This is one of the harmful gases released during flaring; it is normally referred to as smoke. This gas causes reproduction problems to man which is normally identified as Reproductive toxicity of Carbon monoxide. Carbon monoxide is therefore a suspected and primary cause of reproductive toxicity. The exposure to it has the potential to negatively affect the human reproductive system. However, the gas has a wide range of applications in the food, chemical and oil industries. The severity and nature of the adverse effect is variable and can be influenced by factors such as sex, level of exposure and individual sensitivity to the chemical. **Effects of oil spillage**

Published studies have looked at both self-reported symptoms and biomarkers (laboratory results from samples) in people who came into contact in some way with oil or gas following spills. Self-reported symptoms can be grouped into respiratory problems, irritations (eye, skin, etc.), neurological effects (headache, dizziness, etc.) and traumatic symptoms (pain). Symptoms were, in many cases, related to the intensity of the exposure. In other words, the closer the person was to the spill or the more time they spent near the spill, the greater the symptoms. These findings suggest that each time local Ecuadorian Amazonian people are exposed to a spill they suffer these same symptoms. The nonstop contact with oil among indigenous people in the

northern Ecuadorian Amazon would presumably have a cumulative effect, making individuals more vulnerable once an accident occurs (Ramirez et al. 2017).

- **Oil spills' effects on human life**

Oil spills may occur all around us. Since oil products include a lot of common fuels, it is obvious that oil spills may happen at high rates and in many locations, including residential areas. Surface oil spills are easy to identify and will leave visible traces such as oil stains, as well as other characteristic signs such as odors due to the vapors emitted by the spilled oil. The underground oil spills are more difficult to catch and yet may be more problematic (oil may reach groundwater more easily and travel with it). Both surface and underground oil spills have the potential to contaminate soils, sediment, water (groundwater and surface water bodies), and air (due to many volatile compounds emitted by the spilled oil into the air).

Oil spills have negative impacts on the residents of the affected areas. These [effects can be aggravated by severe weather conditions](#). An example in this sense is the Murphy oil spill (due to the failure of a storage tank at the Murphy Oil USA refinery) that had particularly affected residential areas in Louisiana. This happened because of the contamination of flood waters following the levee breaks during Hurricane Katrina in August 2005.

- **Effects on the General Population**

The effects of oil spills on humans may be direct and indirect, depending on the type of contact with the oil spill.

Direct exposure to oil spills – occurs close to where people live or work and where they may come in contact with oil spill components:

- **By breathing contaminated air** - since oil and products (petroleum products) have many [volatile compounds which are emitted as gases](#) from spilled oil, the air becomes contaminated with those volatile oil products or vapors producing specific odors. Even when odors are not felt, a health risk may exist for some individual compounds if residents are exposed (breathe the air) for a long time. Of course, when the smell is obvious the health risk increases. Once in the air, contamination may travel over long distances. Of course, that vapors will also become more diluted with the distance traveled. So, the original contamination levels at the source along with specific weather conditions may dictate the final spreading of oil contaminated air vapors.
- **By direct contact with the skin** - people may come in direct contact with oil and/or oil products while walking in a contaminated area (e.g., beach). An initial irritation will be obvious. Additionally, contaminants may be absorbed through the skin and enter the body

Indirect exposure to oil spills - even when people live in places far from where the actual oil spill took place:

- **By bathing in contaminated water** - for example swimming in a contaminated water stream - even when an oil sheen may not be visible, dissolved oil contaminants may exist in the water if it was impacted by an oil spill
- **By eating contaminated food** - some oil compounds bio-accumulate in living organisms and may become more concentrated along the food chain. Humans may become [exposed to concentrations of contaminants in the food](#) that could be orders of magnitude higher than in the contaminated environment. This is especially problematic since residents could be exposed even if they live far away from an oil spill if they consume food coming from a spill affected area

The main oil spill effects include a variety of diseases, negative economic impact, pollution with crude oil or petroleum products (distillates such as: gasoline, diesel products, jet fuels, kerosene, fuel oil, as well as heavy distillates like hydraulic and lubricating oils) and the aesthetic issues that affect the residents of the affected areas in multiple ways.

The negative economic impact is a major effect of oil spill pollution. It can affect the community where the oil spill occurred in a number of ways, among which the following are the most important:

- Long-term ceasing of activities such as fishing in the polluted waters that affects fishermen and fisheries if a very large amount of oil is spilled; for example, the BP oil spill in the Gulf of Mexico had already impacted many local fishermen's and fisheries' normal activity, and this looks like a long-term effect due to the very large amount of spilled oil. Effects on local fishermen are detailed below.
- Property value reduction depends on the magnitude of the oil spill and affects all the properties in a certain area exposed to oil spill pollution; this negative effect on property value applies not only to those properties directly affected by the oil spill, but to all the properties in a certain area exposed to oil spill pollution or at risk of becoming polluted at some point in time
- The reduction of tourism in the affected areas;
- The disturbance of land and sea traffic, which affects import-export activities;

The aesthetic and recreational impact is related to the visible effects of oil spill pollution (oil slick, sheens) appearing on coast waters, shoreline, and beaches, wetlands, etc. When more serious, the complete closure of such recreational areas may occur, at least temporary, until the spill is removed and the cleanup process ends.

- **Effects on local fishermen, seamen and ship workers**

Health problems due to the exposure to spilled oil or its volatile compounds may appear. [Oil-spill pollution diseases](#) are obviously not restricted to fishermen, affecting the population (residents) living in the affected area alike.

Large oil spills, which usually occur in the oceans, affect commercial fishermen, seamen living in the affected areas and ship workers on the ships near the oil spill location. Fishermen are directly affected by large marine oil spills that contaminate the fish species swimming in the oil-polluted water, along with ecosystem livelihoods. Seamen can be affected if they bathe in [contaminated water](#) – for example swimming in a contaminated water stream. Even when an oil sheen may not be visible, dissolved oil contaminants may exist in the water. Last but not least, ship workers can inhale the fine particulate matter resulted from oil spills.

Fishermen and local ship workers can lose their jobs for extended periods of time due to government bans and restrictions on fishing. Until the oil spill is stopped and the [clean-up of all oil pollution is completed](#), thousands of square miles may be closed. Being hard to predict and quantify in terms of dollar loss, this aspect is maybe the most subtle and dangerous one.

Fishing restrictions can generate economic drops in the living area, affecting fishermen and residents from the area alike. Even if a fisherman is willing to start a new job and a new life, there may be limited options for him. This is due to the general economic downturn as a result of oil spill pollution.

SAFETY IMPLICATION OF FOSSIL FUEL EXPLOITATION

Fossil fuel exploitation and other activities involve many different types of equipment and materials. Recognizing and controlling hazards is critical to preventing injuries and death.

Vehicle Collisions

Workers and equipment are required to be transported to and from well sites. Wells are often located in remote areas, and require traveling long distances to get to the sites. Highway vehicle crashes are the leading cause of oil and gas extraction worker fatalities. Roughly 4 of every 10 workers killed on the job in this industry are killed as a result of a highway vehicle incident

Explosions and Fires

Workers in the oil and gas industries face the risk of fire and explosion due to ignition of flammable vapors or gases. Flammable gases, such as well gases, vapors, and hydrogen sulfide, can be released from wells, trucks, production equipment or surface equipment such as tanks and shale shakers. Ignition sources can include static, electrical energy sources, open flames, lightning, cigarettes, cutting and welding tools, hot surfaces, and frictional heat

Falls

Workers might be required to access platforms and equipment located high above the ground. OSHA requires fall protection to prevent falls from the mast, drilling platform, and other elevated equipment.

Confined Spaces

Workers are often required to enter confined spaces such as petroleum and other storage tanks, mud pits, reserve pits and other excavated areas, sand storage containers, and other confined spaces around a wellhead. Safety hazards associated with confined space include ignition of flammable vapors or gases. Health hazards include asphyxiation and exposure to hazardous chemicals. Confined spaces that contain or have the potential to contain a serious atmospheric hazard must be classified as permit-required confined spaces, tested prior to entry, and continuously monitored.

Ergonomic Hazards

Oil and gas workers might be exposed to ergonomics-related injury risks, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures, and performing the same or similar tasks repetitively. Risk factors and the resulting injuries can be minimized or, in many cases, eliminated through interventions such as pre-task planning, use of the right tools, proper placement of materials, education of workers about the risk, and early recognition and reporting of injury signs and symptoms.

High Pressure Lines and Equipment

Workers might be exposed to hazards from compressed gases or from high-pressure lines. Internal erosion of lines might result in leaks or line bursts, exposing workers to high-pressure hazards from compressed gases or from high-pressure lines. If connections securing high-pressure lines fail, struck-by hazards might be created

Electrical and Other Hazardous Energy

Workers might be exposed to uncontrolled electrical, mechanical, hydraulic, or other sources of hazardous energy if equipment is not designed, installed, and maintained properly. Further, administrative controls such as operating procedures must be developed and implemented to ensure safe operations.

Machine Hazards

Oil and gas extraction workers may be exposed to a wide variety of rotating wellhead equipment, including top drives and Kelly drives, draw works, pumps, compressors, catheads, hoist blocks, belt wheels, and conveyors, and might be injured if they are struck by or caught between unguarded machines

CONCLUSION

The role of energy (fossil fuel) for socio-economic development was discussed. However it is finite and its exploitation has negative impact on the environment. Thus, it is in our best interest that for sustainable development, stakeholders must adopt measures that would provide a reasonable degree of protection of its ecological human environment from pollution, whether it emanates from the coal, oil and gas industry or other sources. Such measures should discourage discharge of harmful effluents, into the environment through the adoption of appropriate prevention and operational techniques and the most effective and current technologies that have little or no negative environmental impacts. The Nigerian government should go beyond command and control approach to pollution abatement but adopt various economic instruments to combat fossil fuel industry induced environmental pollution and diversify the energy resources of the country. Engineers and scientist should insist on best practices in the energy sector while the related professional bodies keep eagle-eye on their members to ensure strict compliance to professional ethics. Government should stimulate demand and attract investors in renewable energy technology in Nigeria to reduce over dependence on fossil fuels.

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