

# Effect of Environmental Pollution on Sustainable Development in Nigeria

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**Abstract:** - The Nigerian economy is predominantly oil-driven. Government's over-dependence on oil has slowed down the development of other energy sectors. Also, the continued failure of the government to enforce relevant laws for the protection of the environment has contributed to poverty and deprivation of local community people of their rights to human and acceptable standards of living. Gas flaring and oil spillage are two prevalent environmental pollution in Nigeria that has prevented the country from attaining sustainable development. This paper discusses gas flaring and oil spillage in Nigeria, their effect on the environment and how they can be curbed by diversifying the economy such that strict environmental protection laws can be imposed on operators. Oil spill remediation should be carried out by defaulters, and the community should be duly compensated. Renewable energy has a high initial cost but is a cleaner form of energy and help in attaining sustainable development in Nigeria.

## I. INTRODUCTION

Fossil fuels (coal, oil and natural gas) are the main source of energy, meeting three-quarters of total world energy needs. However, rising concerns about the security of energy supplies and environmental issues associated with fossil fuel usage such as climate change, air pollution and mining accidents, has led to a global search for alternative energy sources (Sesan, 2008).

Exploration and exploitation of petroleum resources have significant economic gains for Nigeria. However, Oil pollution remains the biggest challenge to the economic survival of oil-producing communities. It wipes out aquatic life and crops through regular oil spills. It stokes the air with hazardous gases through gas flaring, leaving its victims unable to find the life that nature originally offered. With the soil and ocean polluted, the key occupations of the people in the community (fishing and farming) are negatively impacted. Besides oil spills and gas flares, millions of barrels of produced water and other toxic wastes are daily dumped into the Niger Delta. The net result has been serial violations of social, environmental, economic and political rights of the local people (Eweje, 2006).

The United Nations states that sustainable development is the ability to meet the energy needs of the present generation without compromising the ability of future generations to meet their own needs. Nigeria has not been able to attain sustainable development due to massive environmental pollution in the Niger Delta. This paper discusses how environmental pollution in Nigeria can be curbed by enforcing

existing energy policies and environmental laws in order to achieve true sustainable development (Social, Economic and Environment). The petroleum pollution activities discussed in this work are gas flaring and oil spillage.

## II. GAS FLARING IN THE NIGER DELTA

Gas flaring is the burning of associated natural gas during crude oil production. Nigeria flares 2.5 billion cubic feet per day of associated gas, and that represents 40% of all natural gas consumed in the continent of Africa (Kankara, 2013). Nigeria is currently the seventh-largest gas-flaring country in the world (Figure 1). Petroleum production operators in Nigeria may encounter associated gas when drilling for oil. This gas can be sold to consumers or used to generate power and then resold as electricity. However, this requires costly investment into pipelines, power plants, and other infrastructure. Therefore, in practice, oil producers opt to sell the oil and burn the gas. In Nigeria, oil producers engage in gas flaring, as a 24 hour-a-day, 365 day-a-year practice. Some of these flares have burned continuously for 40 years with people literally living next door to the deafening, ground-level flares that leap as high as several story building.

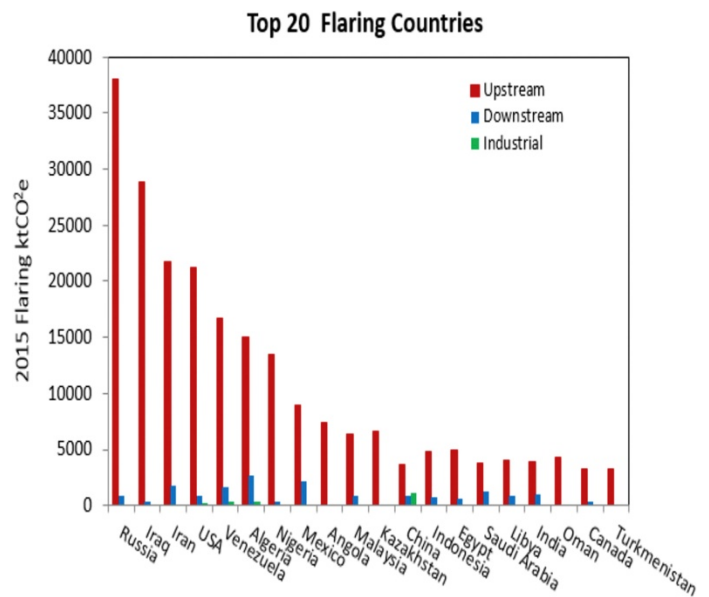


Figure 1: Top 20 Flaring countries (Elvidge et al., 2018)

Gas flaring is a global environmental concern due to its negative effects has on humans, the environment and the economy. The earth is a single system, and hence any event anywhere affects the whole system. With global climatic conditions constantly changing in recent times, gas flaring in Nigeria can no longer be treated as a local phenomenon because of its global implications and consequences (Nelson, 2015).

Despite the detrimental effect of gas flaring on the environment of host communities and the world at large, gas flaring has not been put to an end in Nigeria. This is because the government failed to honour her part of the joint venture agreement by not contributing its share to the cost of installing gas re-injection facilities and other infrastructure required to harness and transport associated gas from oil wells to facilities where it can be stored, processed and distributed (Orji, 2014). Also, the penalties imposed on operators for flaring gas is so meagre than the costly alternative of re-injecting the gas or processing associated gas for domestic use. More so, the insecurity in the Niger Delta region of Nigeria where gas flaring occurs has scared off potential investors that would have invested in the associated gas.

### *2.1 Impacts of Gas Flaring in Nigeria*

Some effects of gas flaring in Nigeria are discussed below:

#### *Health impacts*

There are over 250 identified toxins released from gas flaring, including carcinogens such as benzene and metals such as mercury (Ismail and Umukoro, 2012). These toxins can cause surrounding communities to suffer from increased health risks, including premature deaths, respiratory illnesses, asthma, cancer deformities in children, lung damage, skin problems, reproductive and developmental problems.

#### *Environmental Impacts*

Gas flaring causes climate change as two main greenhouse gases, Carbon dioxide and methane are emitted during gas flaring. It can also cause acid rain due to the emissions of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO) which combine with atmospheric moisture to form sulphuric acid and nitric acid, respectively. Acid rain acidifies lakes and streams and damages vegetation (Ajugwo, 2013). Gas flaring produces black soot which is washed off into the soil, thereby contaminating the land (Ishisone, 2014). This has caused reduced crop yield in the Niger Delta. Also, the roaring from gas flaring activities is a source of noise pollution; the elevated temperature produced by the flare is a source of thermal pollution (Ismail and Umukoro, 2012).

#### *Economic impacts*

Nigeria has a proven natural gas reserve of about 163 trillion standard cubic feet, which in energy terms is substantially larger than its oil resources. The expected life-span of

Nigeria's natural gas is about 88 years, based on the 2001 production rate of 1850 bscf. The needs of the future generation have been compromised, with over 50% of gas produced being flared (Nelson, 2015). A valuable resource which could be used for electricity generation is wasted through gas flaring while electricity supply in the country remains very poor. Gas flaring is estimated to cost Nigeria \$2.5 billion annually, with 66% of Nigerians living below the poverty line (Eferiekose, 2011).

### III. OIL POLLUTION AND THE ENVIRONMENT

The Niger Delta is easily one of the most oil-polluted regions of the world. Environmental groups conversely say more than 300 spill cases occur in Nigeria yearly; this implies an average of one oil spill per day (Human Rights Watch, 1999). Reports have it that most of the spills have occurred offshore and that a high percentage is due to corroded infrastructure. Many of Nigeria's oil-polluted sites are yet to receive attention.

Ogoniland provides one of the countless examples of how oil pollution impacts the environment and local populations in oil-producing countries of Africa. The United Nations Environment Programme (UNEP) undertook an environmental assessment of Ogoniland. The report of that investigation covered groundwater, land, surface water, vegetation, sediment, air pollution, public health, industry practice and institutional issues. UNEP scientists examined more than 4,000 samples, taken from different locations, including those from 142 groundwater wells, drilled for that purpose (United Nations Environment Programme, 2011). The report concludes that oil pollution in Ogoniland is severe and wide-ranging. Both surface water and groundwater have a high concentration of hydrocarbon. There is a high-level concentration of benzene in drinking water at a level 900 times more than the standard set by the World Health Organisation. And it is 1000 times above standards set by the Nigerian government. Causes of the oil spill in Ogoniland include equipment failure in facilities of oil companies, maintenance errors, blowout in the cause of operations, sabotage (oil theft and illegal oil refinery activities).

Several other incidences of oil spill in the Niger Delta as recorded by The Environmental Rights Action/Friends of the Earth Nigeria include 580,000 barrels of spill at Forcados Terminal, 400,000 barrels of oil spilled at Funima-5 offshore, 40,000 barrels of oil spilled at Idoho, 40000 barrels of oil spilled at Bonga, etc.

The methodology and technology adopted in remediating any oil-impacted site depends on the nature of the medium of impact (soil, creeks or swamps). Some of these methods are: **Bioremediation** which involves adding nutrients to impacted soil to enable the breakdown of the hydrocarbon chain; **Thermal desorption** which is done by excavating and heat treating oil-impacted sediments. This process removes the oil from the sediment and the soil could be returned to source after being cleaned. Another method used in remediating oil

spillage is the **Bio-augmentation method** which involves the use of specialized microbial strains in an oil impacted site to enhance the ability of the microbial community to degrade certain compounds and achieve improved soil. Other technologies adopted for groundwater pollution clean-up include **pump and treat, air-sparging, in-situ chemical oxidation** and even a combination of two or more technologies.

#### IV. SUSTAINABLE DEVELOPMENT

Although Nigeria has generated over \$300 billion in revenue from oil exploitation in over 50 years, the socio-economic conditions of local people in the oil-bearing communities is deplorable. They lack good roads, health facilities, schools and teachers, jobs, access to legal services, good nutrition and other basic facilities that make for good living. The Niger Delta is conflict-prone to vehement upheaval against the government for the regulation of its bountiful resources. The Niger delta environment has been polluted by petroleum exploration and production and activities of pipeline vandals and illegal refineries.

In spite of the many existing petroleum and environmental protection laws, the Nigerian government scarcely punishes environmental crimes arising from the activities of oil companies. Government officials in Nigeria understand the national interest in terms of uninterrupted oil production on which they depend for revenues and foreign exchange. There is hardly any incentive to protect the environment if this means regulation or disruption of production.

The gravity of oil pollution and its impact in the region requires oil companies to come into compliance with regulatory pollution laws. The oil companies, however, do not seem ready to comply with relevant oil-related environmental protection laws fully. Environmental impact assessments (EIA) ought to be a good method of evaluating the environmental impacts of projects. But it is often violated in Nigeria because relevant government agencies grant waivers to oil majors on what they call 'high priority projects,' to start developments of projects without undertaking full-length evaluation of impacts of such projects.

Barbier (1987) suggests that for a development to be sustainable, there should be a balance between the pillars of sustainable development in the long term. These pillars are Social, Economic and Environment conditions (Figure 2). Eliminating environmental problems will contribute to achieving progress across all pillars of development (Kankara, 2013)

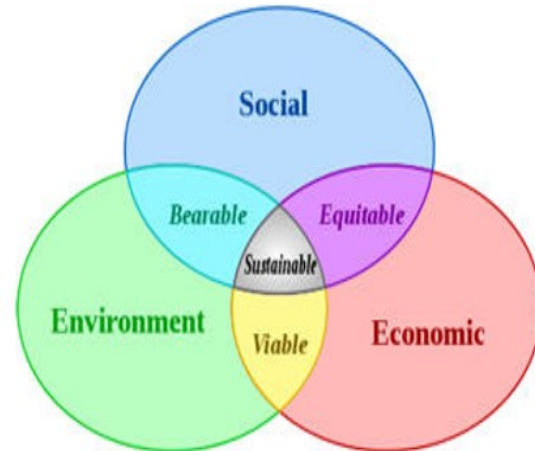


Figure 2: The three pillars of sustainable development (Barbier, 1987)

Environmental protection laws such as the Oil Pollution Act of 1990 (OPA) makes provision for oil company response plans to oil spills. It specifies the national and area contingency response plan. Other government agencies poised to stop the menace of oil spillage in Nigeria include Nigerian Oil Spill Detection and Response Agency (NOSDRA), the National Policy on Environment, Nigerian Environmental Standards and Regulations Enforcement Agency (NESREA), Biotechnology Agency, Department of Petroleum Resources (DPR), Federal Environmental Protection Agency (FEPA), the Federal Ministry of Environment, the Environmental Guidelines and Standards for the Petroleum Industries (EGASPIN), State Environmental Protection Agency, Local Governments environmental laws, etc.

The National Energy Policy (NEP) is geared towards achieving optimal utilization of the nation's energy resources for sustainable development (Energy Commission of Nigeria, 2003). The policy identifies oil, natural gas, tar sands, coal, nuclear and renewable energy as the sub-sectors of the nation's energy sector. The NEP has facilitated increased energy supply and efficient energy utilization in Nigeria. It enhanced local capacity, diversified the energy mix, enhanced investment in the energy sector in the country and created greater awareness of the significance of the energy sector (Bala, 2014). The objectives of NEP include: ensuring optimum development of Nigeria's energy sources diversifying energy sources, achieving national energy security, promotion of local and foreign investment to boost private sector participation in the energy sector, providing efficient energy supply for national development, developing human capacity, and creating an economical and environmentally friendly oil and gas operation.

#### V. RENEWABLE ENERGY

Renewable energy sources are environmentally friendly, self-replenishing, infinite, and consequently considered as the way of the future. They satisfy the criteria for sustainable development (Figure 2). Renewable energy sources have

contributed to Nigeria's energy mix for centuries now, although in a largely primitive way. Fuelwood - or what is commonly referred to as woody biomass - is the longest standing primary energy source for rural Nigeria. Large hydropower has also featured substantially as an energy source, providing about 32 per cent of Nigeria's national electric grid supply. Other renewable energy sources in Nigeria are solar photovoltaics, solar thermal, wind, small hydropower and efficient biomass.

Renewable energy technologies typically have higher initial costs than conventional sources of energy. Hence existing renewable energy projects in Nigeria are very few and are mostly funded and implemented by international agencies and non-government organizations, and they are typically on pilot or demonstration basis. Renewable energy systems have long life spans and low maintenance costs, leading to much lower life cycle costs than conventional systems. Furthermore, there is a general lack of knowledge among the people about the acceptable quality and standards of technology.

Nigeria has not been able to fulfil the conditions for sustainable development by exploiting her non-renewable energy. The continuous power outages, injustice, human abuse, crime, lack of job opportunities, pollution, extinction of species, deforestation, poverty, vandalism and armed conflicts in Nigeria are all evidence that sustainable development has not been achieved. Therefore, it is important for Nigeria to fully develop renewable energy sources to avoid environmental pollution such as oil spillage and gas flaring from petroleum production activities. Renewable energy education should be properly incorporated into the academic curriculum of universities and other tertiary institutions in Nigeria. The application of renewable energy to fields such as engineering, geography and architecture should be taught to increase the awareness and subsequent application of renewable energy in different professions in Nigeria.

## VI. CONCLUSION

In order to achieve sustainable development, the Nigerian government should diversify the economy by exploiting other avenues of foreign exchange earnings this will enable the government to impose strict environmental policies in the energy sector and severely penalize defaulters. Political will must be exerted to punish environmental crimes and make pollution unfashionable.

Nigerian government should prioritize the development of gas gathering and transmission infrastructures to enhance the use of associated gas for critical economic purposes. Incentives for harnessing associated gas should be provided in combination with regulatory requirements to eliminate or reduce flaring.

Operators should be compelled to replace aged pipelines, and there should be strict metering of oil production to discourage oil spills and wastages/leakages, including those caused by oil theft. All spills sites must be remediated by polluters and victims must be duly compensated.

The Nigerian government should increase the awareness of renewable energy sources/ cleaner fuels in the country. There should be a transition from dependence on oil and gas as key energy to renewable energy sources such that fossil fuel dependence is avoided in the interest of the climate and humanity.

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