

Gas Flaring in the Niger Delta Nigeria: An Act of Inhumanity to Man and His Environment

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Abstract—The Niger Delta Region of Nigeria is home to about 20 million people and 40 different ethnic groups. The region has an area of seventy thousand square kilometers (70,000 KM²) of wetlands, formed primarily by sediments deposition and makes up 7.5 percent of Nigeria's total landmass. The notable ecological zones in this region includes: coastal barrier islands; mangrove swamp forests; fresh water swamps; and lowland rainforests. This incredibly naturally-endowed ecosystem region, which contains one of the highest concentrations of biodiversity on the planet, in addition to supporting abundant flora and fauna, is threatened by the inhuman act known as gas flaring. Gas flaring is the combustion of natural gas that is associated with crude oil when it is pumped up from the ground. In petroleum-producing areas such as the Niger Delta region of Nigeria where insufficient investment was made in infrastructure to utilize natural gas, flaring is employed to dispose of this associated gas. This practice has impoverished the communities where it is practiced, with attendant environmental, economic and health challenges. This paper discusses the adverse environmental and health implication associated with the practice, the role of Government, Policy makers, Oil companies and the Local communities aimed at bring this inhuman practice to a prompt end.

Keywords—Combustion, Emission, Environment, Flaring, Gas, Health, Niger Delta.

I. INTRODUCTION

MORE than ever before human activity relating to uncontrolled greenhouse gas (GHG) and its effects on the earth is gaining greater space in the global academic and policy discussion. Rising temperature, melting glaciers, greater precipitation, extreme weather events, and volatile are now of frightening dimension. The greenhouse effect commonly referred to as "Global Warming", Which codifies the observation relating to increase warming of the northern hemisphere by more than 1°F of over the last 100 years, and in particular the 1980s and 1990s through the start of the 21st century have been ascertained to be the warmest in the last 1000 years. The above concern and its consequences have brought the muster faced and inhuman practice known as gas flaring into greater visibility in the last few decades.

Gas flaring is the burning of natural gas associated with oil extraction processes. Some of the world's largest crude oil deposits sit together with large deposits of natural gas, known as associated gas. Oil exploration companies around the world prefer to have the oil deposit without the associated gas and therefore whenever gas exists with oil reserves; it is flared to protect the processing equipment when unexpected high

pressure develops within the well. In an ideal world this associated gas would be sold to consumers, or it would be used to generate power and then resold as electricity. But this requires costly investment into pipeline, power plants, and other infrastructures hence many oil exploration companies opt to engage in this environmental non friendly process known as Gas flaring as it is the case in the Niger Delta - Nigeria.

A. Gas Flaring in the Niger Delta

Gas flaring in the Niger Delta Nigeria began simultaneously with oil extraction in the 1960s by Shell-BP. Nigeria flares more natural gas associated with oil extraction than any other country, with estimates suggesting that of the 3.5 billion cubic feet (100,000,000m³) of associated gas (AG) produced annually, 2.5 billion cubic feet (70,000,000m³), or about 70% is wasted via flaring. This equals about 25% of the UK's total natural gas consumption, and is the equivalent to 40% of the entire African continent's gas consumption in 2001. Statistical data associated with gas flaring in Nigeria are notoriously unreliable, but Nigeria may waste \$2.billion per year by flaring associated gas. The Nigerian government has not enforced environmental regulations effectively because of the overlapping and conflicting jurisdiction of separate governmental agencies governing petroleum and the environment and as well as the non-transparent governance mechanisms. Neither the Federal Environmental Protection Agency (FEPA) nor the Department of Petroleum Resources (DPR) has implemented anti-flaring policies for natural gas waste from oil production, nor have they monitored the emissions to ensure compliance. From an economic perspective, the Nigerian government's main interest in the oil industry is to maximize its monetary profits from oil production. The imposition of environmental tax on oil exploration companies, as a flare reduction tool, is completely ineffective in Nigeria. Oil companies find it more economically expedient to flare the natural gas and pay the insignificant fine than to re-inject the gas back into the oil wells. Additionally, because there is an insufficient energy market especially in rural area, oil companies do not see an economic incentive to collect the gas. From a social perspective, the oil-producing communities have experienced severe marginalization and neglect. The environment and human health have frequently been a secondary consideration for oil companies and the Nigerian Government. However, although there may be reasons for the continuous gas flaring, this work projects many strong arguments suggesting that it should be stopped.

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Corporation's accountability to the people and environment surrounding them imply that oil companies should be required to re-inject the gas, to recover it, or to shut down any extraction facilities in which the gas flaring is occurring. Because of this massive oil exploration in the Niger Delta, the ramifications for human health, local culture, indigenous self-determination, and the environment are severe. As is the case in most oil producing regions of less developed countries, the economic and political benefits are given significantly more weight by the government than the resulting damage to the environment and human health.

II. ENVIRONMENTAL EFFECT

Nigeria has been an oil-producing country for decades, but portions of their production process specifically gas flaring, causes adverse affects on the environment. The practice of Gas flaring leads to significant increases of carbon emissions in to the atmosphere and its combustion release high amounts of soot and carbon monoxide. Gas flaring releases large amounts of methane, which has a high global warming potential. The methane is accompanied by the other major greenhouse gas, carbon dioxide, of which Nigeria was estimated to have emitted more than 34.38 million metric tons of in 2002, accounting for about 50% of all emissions in the country and 30% of the total CO₂ emissions. Beyond the greenhouse gases, gas flaring is also responsible for particular matter, sulfur dioxide, nitrogen oxide, and carcinogenic substances such as benzene and toluene. By contributing these greenhouse and other harmful gases to the atmosphere, gas flares contributes to climate change as well as acid rain in Nigeria. Companies operating in Nigeria harvest natural gas for commercial purpose, but prefer to extract it from deposit where it is found in isolation as non-associated gas due to the cost of separating commercially viable associated gas from the oil. In western Europe, 99% of associated gas is used as an energy source or re-injected into the ground. While flaring in the west has been minimized, but in Nigeria it has grown proportionally with oil production. Much of the immediate environments where flaring take place do experience significant climatic change which impacts a negative rain fall pattern causing extreme of floods and droughts, graduating heat, and humid conditions. This situation is catalyzed by the geography of the Niger Delta as much of the lands are not only low lands, but below the sea level. Therefore, when rivers overflow as a result of ecological change it causes salt water to flood the lands making it unusable for agriculture. The environmental damage resulting from gas flaring directly affects human and aquatic life. It includes pollution of water and contamination of the soil. In addition to human angle, damages to the environment effect vegetation, livestock and agriculture in general. The impacts on agriculture are well established. In agriculture, gases emission reduced the soil moisture [1], and capable of affecting crop yield through impacting nutrients availability in the soil [2]. Similarly, black dusty carbon particles flared into the atmosphere can lead to weaker hydrological cycle that connects directly to availability and quality of fresh water [3]. Damage from consumption of

the toxic emissions by the surrounding vegetation can affect the quality and aesthetic value of plants and reduces their economic value [4]. CO₂ sink in the atmosphere [5], resulting water can become harmful to vegetation [6] and aquatic life [7].

III. HEALTH EFFECT

Gas flares have potentially harmful effect on the health and livelihood of the communities in their vicinity, as they release a variety of poisonous chemicals including nitrogen dioxide, sulphur dioxide, volatile organic compound, benzene, toluene, xylene and hydrogen sulfide, as well as carcinogens like benzopyrene and dioxins. Human exposed to such substances can suffer from a variety of respiratory problem. These chemical can aggravate asthma, cause breathing difficulties and pain, as well as chronic bronchitis known to be emitted from gas flares in undocumented quantities, is well recognized as a cause for leukemia and other blood-related disease. A study done by Climate Justice estimate's that exposure to benzene would result in eight new cases of cancer yearly in Bayelsa State alone.

Some other health hazards and effects associated to gas flaring and oil pollution include increased environmental temperature, heat-wave/mental heat and of course global warming. This condition dehydrates surrounding, habitats, eco-system, food chain, nitrogen cycle, oxygen cycle, flora and fauna, animal vegetation that thereby cause their actual death or poor yields of environmental resources. The presence of carbon and traces of nitrogen and sulfur in natural gas leads to the production of various oxides and sulfides. When these chemicals are inhaled through the nostrils it goes down to the lungs and settles as thick carbon monoxide which blocks the passage of oxygenated blood to the heart of human beings and animals. The oxides and sulfides in hydro-carbon with gaseous chemicals when flared combine with water in the atmosphere to form various types of corrosive acids such as nitric and sulfurous acids that irritates the human skin and prevent plants chlorophyll from functioning. This also leads to cancer of the skin.

Most Gas flares in the in Niger Delta are often located close to local communities, and regularly lack adequate fencing or protection for villagers who may risk working near heat of the flare. Many of these communities claim that nearby flares cause acid rain which corrodes their homes and other local structures, many of which have zinc-based roofing. Some people resort to the use of asbestos-based material, which is stronger in repelling acid rain deterioration. Unfortunately, this only contributes to their declining health and the health of their environment. Asbestos exposure increases the risk of forming lung cancer, pleural and peritoneal mesothelioma and asbestosis.

IV. SOCIAL ECONOMIC EFFECT

Gas flaring in the Niger Delta has a lot of implications to the socio-economic well-being of the inhabitants of the area, Flared gas contained hazardous substances which includes

methane, propane, ethane, iso-butane, n-butane etc, when combine with atmosphere moisture form an acid rain which falls on roofs and farmlands where farm household sources of livelihood are sourced thereby causing serious health hazards and damages to crops as well as live stocks in the area.

Environmental Right Action [8] reported that located close to gas flares may have serious health impacts in the form of respiratory illness, asthma, blood disorders, cancer, painful breathing and chronic bronchitis communities.

According to [9] it was estimated that, more than 100 million cubic meters of gas is flared annually around the globe, despite the incentive to capture the associated gas and bring it to market; that the quantity of gas flared in the Niger Delta region is enough to cover the annual gas consumption needs of Germany and France put together. Consequently, more attention is focused on the oil sector by the Nigerian government resulting in the neglect of the agricultural sector of the economy and ignores the link between oil extraction and environmental impact as well as social and health problems it has created. [10], reported gas flaring wastes destroyed resources in the natural environment and thus deprived the rural poor in developing economies cleaner and cheaper source of energy resources. However, farm household in the Niger Delta region especially in Bayelsa state firmly perceived that gas flaring affects virtually every aspect of their livelihood [11]. Farm household in Bayelsa state especially Ogbia Local Government are impoverished. Over 30 thousand people are being affected by gas flaring thereby resulting in diverse health abnormalities. Despite the various incentives given to farm households in Ogbia, their poverty status (incidence) increased geometrically in recent times while household food insecurity becomes a major challenge. Available records from the health institutions shows that over 50% of the farm households suffer from various respiratory diseases (asthma etc) [11].

Oil exploitation has left the indigenous farm households of the Niger Delta community with less fertile farmlands as well as clean water from rivers and streams and weaken the family and communal bonds causing social tension among various groups and institution in the region. The effect of gas flaring is multifaceted causing undesirable ecosystem disequilibrium. [12] stressed that, gas flaring contribute maximally to climate change, food insecurity, low income, lost of vegetation, pollution of water bodies etc.

A review of related literature exposes the role of agriculture to human existence [12] and [13] described agriculture as the pivot in the development of human civilization. Many countries across the globe have subsidized as well as invested in agriculture for raw materials as well as ensuring food security to citizenry among others.

[14] Nigeria exports about 12 million barrel of oil daily and this comes from 12% of the country's landmass, located in indigenous people a community who's economic and livelihood activities are deprived. Household in such areas especially farmers are actually impoverished due to the effect arising from crude exploitation mostly gas flaring. Apart from the release of green house gases into the atmosphere, gas

flares are said to release about 45.8 billion kilowatt of heat into the atmosphere [15]. Gas flaring raise the temperatures and render large area of land inhabitable and uncultivable by farm households. [16] emphasized that, due to increased temperature, climate variability proliferation of pests and widespread disease these have seriously affected agricultural activities causing serious negative effect (impacts) of well-being of farm household in the Niger Delta.

V. DISCUSSION AND CONCLUSION

A new start is desperately needed for the Nigerian gas industry, both in its relation with its western co-partners and on the issue of natural gas flaring in the Niger delta. This is needed, not merely for the health of the Nigerian economy, but also, literally for the health of its people. The declaration of Force Majeure on 40% of the supply of Nigerian natural gas to the country's Bonny Island Liquefied Natural Gas (LNG) plant in early December 2008 is the culmination of a decade-long three-sided struggle between the Nigerian Government, the oil and gas companies and the inhabitants of the region in which they operate. In relation to the former issue, gas flaring has been illegal in Nigeria since 1984. It has been punished by fines on the companies, these being mitigated in recognition of reality by being tax deductible. If this seems faintly ridiculous, it is joined by Presidential pronouncement that gas flaring will cease on such and such a date. In practice, the level of investment required, plus the length of time needed to put in place the kind of projects thought by the Government to solve the problems, make nonsense of any strict timetable or legal fiat. There are in practice three ways to stop flaring. The operating companies can find a market for the gas and gather it from the individual wells, re-inject it for increased oil flow or they can shut in the oil they are producing. In relation to the latter, Nigeria's oil production has fallen from around 2.5 million barrels a day (mbd) to 2.1 mbd, or by 400,000 bd. Even at an average price of around \$50 a barrel, this is a revenue loss of \$20 million a day, or \$3.7 billion a year. Logically, to maximize the reduction in flaring, the best choice is to shut in those wells producing the lowest level of crude for the highest level of associated gas. Some of the companies may have been doing this, hence the fall in crude production but there is little clarity on production changes due to security, strategic decisions, or other problems.

Environmental taxation has from the onset been an integral part of the gas flaring legal regime in Nigeria and has been one of government's frontline policies in seeking to eliminate flaring. It is imperative to note in respect of Nigeria's use of environmental taxation as a flaring reduction tools, that the underlining idea has always been as a punitive tool rather than a resource management tool. In essence the taxes imposed have always been viewed from the angle of being penalties and fine on the oil companies for flaring rather than a taxes imposed to raise revenue from wastage of the country's gas resources. The significant of this approach is that in fixing the tax rate, little account is taken of the actual value of the gas being flared, but rather on the need to punish the oil companies for continuous flaring, leading to significantly low

level of tax on the flared gas. The result of this is the fact that while the country loses an estimated USD 2.5 billion annually from flared gases that could have been sold, revenue realized from the fines in recent years is a paltry 20 - 50 million Naira (or US\$ 150,000 - US\$ 370,000) annually. In essence, the country loses 100 times more from flaring than it realizes from revenue paid by the oil companies for flaring. On the effectiveness of environmental taxes in flaring reduction in Nigeria, it is beyond doubt that it has neither had any appreciable impact on flaring reduction, nor has it led to investment in innovative technologies for gas capturing and utilization facilities by the oil companies. The relatively low level of the tax compared to the high cost of gas utilization facilities meant that the oil companies were simply comfortable to continue flaring and pay the penalty rather than commit substantial investments in gas utilization facilities.

In summary therefore, environmental taxation, as a flare reduction tool, is completely ineffective in Nigeria and as a resource management tool, it is a complete monumental economic waste as the country realizes less than US\$ 1 million annually from such taxes while losing over US\$ 2.5 billion annually in flared gas and endangering the host communities to health risk, environment degradation and poverty. The lack of proper environmental accountability and integrity on the part of the oil and gas companies operating in this region over the decades has resulted in colossal damage to the environment. On the other hand, the failure of effective regulatory controls of the oil gas operations by the government has helped to worsen the situation. Government overdependence on the oil sector (oil accounts for 95% of foreign exchange earning and 80% of budgetary revenues) is a fundamental problem that heightens regulatory failures. Therefore there is need for government to adopt measures that would provide ecological and human protection as the oil business in the country at the present is inevitable.

From a technological perspective, it is possible to stop gas flaring in the Niger Delta either by re-injection or utilization of the gas to generate power. All that is needed is set up the framework to achieve this. This may involve substantial investment and may be unsustainable economically if the volume of gas flared is not enough to recoup the investment. Even so, it may be a viable option on environmental or other grounds. Gas flaring in the Niger Delta Nigeria should be brought to an end because of the monumental waste of resources especially in a country like Nigeria where energy demand surpasses supply and where over 70% of the population still lives in abject poverty. In addition, the extent of environmental degradation that gas flaring causes is enormous and therefore stopping gas flaring will bring to an end the negative environmental, health and social economic effects associated with the practice.

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