

**GAS FLARING, ENVIRONMENTAL POLLUTION AND ABATEMENT
MEASURES IN NIGERIA, 1969 – 2001**

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ABSTRACT

The paper examines the environmental impact of gas flaring on the oil-bearing enclave of the Niger Delta, Nigeria. It seeks to evaluate the abatement measures put in place by the Federal government of Nigeria and the oil producing companies to tackle the externalities occasioned by gas flaring. The study makes use of both primary and secondary sources of information and data to analyze the issues in contention. The findings of the study show that the ecological costs of gas flaring on the inhabitants of the oil bearing region of the Niger Delta in particular and the nation in general are searing. There are strong indications that the implementation of regulations and incentives to abate gas glaring in Nigeria has not gone far enough. The author suggests the need for upward review of the current tax/charges paid by defaulting companies who still engage in gas flaring. In practical terms, there is a need for a change in property rights in Nigeria in order to focus on sustainable development and community participation. As it were, participation and community involvement where institutions are weak or enforcement is expensive can be effective in enforcing sustainable resources use.

Keywords: Degradation, Ecological Cost, Niger Delta, Oil-bearing Enclave, Gas Exploitation

INTRODUCTION

Much of the debate on the impact of oil exploration and production on the environment in Nigeria has focused on oil spillage and the consequent environmental degradation. In

contrast with oil hydrocarbon, which has been an object of wide and detailed ecotoxicological studies, natural gas and its components have often been left outside the sphere of environmental analysis. A concomitant ancillary of oil business in Nigeria is the presence of associated and non-associated gas, which in most cases, is flared (Cranford, 1998). It would appear the issue of gas flaring attracts little attention from scholars in Nigeria probably because when compared to other effects of oil production such as oil spills, which have immediate degradation effects on the environment, the issue of the impact of gas flaring is not easily visible.

It must be noted that in the course of oil production associated gas is routinely flared. However, the Nigerian case attracts more attention given the volume that is flared. It is estimated that about 2 billion standard cubic feet of gas is currently flared in Nigeria. Nigeria accounts for over 75 per cent of gas flared in Africa. The average rate for OPEC countries is 18 percent (*The Guardian*, August 2001). At the beginning of the oil industry in the Niger Delta region of Nigeria, communities in the region saw the flames from gas flare stacks as evidence of development and it was localized. Available evidence suggests that from a phenomenon with purely localized manifestation, it has already become massive enough to warrant agitation from the oil-bearing enclave of the Niger Delta. It would be patently absurd therefore, to consider as Beckerman (1972) in fact does that, environmental Pollution (read gas flaring) “is merely a micro-economic problem”. In point of fact it involves the entire human race and is essentially a macro problem. Recently there have been a number of structural shifts in the pattern of world energy consumption. This has been encouraged by the increasing public concern over environmental pollution and the increasing demand for cleaner environment. Thus, it is the safety and the environmentally friendly aspect of natural gas as an energy source, which is prompting a steady increase in world gas demand.

Arguably, the rise in the demand for gas has its attendant negative impact on the environment. It is puzzling that in spite of the unequivocal pursuit, at least on paper, as attested to by being party to major international environmental agreements such as convention on Bio-diversity, Climate change, and Ozone layer protection among others,

Nigeria still allow gas flaring. The cost of continued flaring of gas cannot be quantified. In the paper, attempt is made to examine the environmental impact of gas flaring and its abatement measures in Nigeria. In doing this, the paper is organized into a number of sections. We begin with an introduction and closely followed by analysis of gas development in Nigeria. The third part of the paper discusses environmental cost of gas flaring while the fourth segment examines government and oil industry's gas flaring abatement measures. We conclude by proffering some policy options.

THE EXPLORATION AND PRODUCTION OF NATURAL GAS IN NIGERIA

The exploration and production of natural gas in Nigeria is accidental to the exploitation of crude oil. Undoubtedly, so far, no deliberate effort has been made to explore for gas in Nigeria. Nigeria has a considerable reserve of natural gas. The present largest production sites of oil are also the production sites of gas, the latter is often found with petroleum (associated gas). Gas production started in 1957 with an output of 2,014 million cubic feet and for now, it has increased to about 2 billion standard cubic feet; but about 60 percent of the over 2 billion standard cubic feet is flared. It is to be noted that 12 percent of gas produced in Nigeria is re-injected to enhance oil recovery (Dike, 1991).

Nigeria has an estimated 157 Trillion cubic feet of proven natural gas reserve, 9th largest in the world. With this enormous quantity of gas, Nigeria is generally acknowledged as a gas province with little oil on it (Okoroji, 1996; Gaius-Obaseki, 1996; Eghre and Omole, 1999). It would appear that because of the high gas-oil ratio in Nigeria's formation, gas fields were not developed. Nevertheless, the earliest moves at commercializing natural gas were made by Shell/BP in 1960 with an agreement to supply gas to some manufacturing units in Aba, south eastern Nigeria and the State owned Power Company then called Electricity Corporation of Nigeria, for electricity generation. In 1995 British Gas Corporation indicated its intentions to buy Nigeria's Liquefied Natural Gas and this gave Nigeria the impetus to consider a proposal to explore her gas reserves. Unfortunately, with the discovery of commercial quantity of natural gas in the Southern North Sea, the corporation suspended discussions on the project (Okoh, 2001).

The production of gas, despite record of huge associated and non-associated gas reserves, has been low while its commercial exploration for domestic use and export has never been anywhere close to that of oil. Rather flaring of associated gas has been the norm (Bankole, 2001). In any case, there is more gas east of the Niger Delta than in the West. In spite of the fact that there is some independent gas fields, about half of the reserves is associated gas (*Niger Delta Environmental Survey*, 1996).

The cost of continued flaring of gas cannot be quantified. For one, flaring of gas implies that a potential source of energy is being wasted. Besides, a huge source of revenue has been going up in flames. The truth for now is, suffering from economic constraints; measures to manage the environment are considered luxury more fit for the rich and developed countries (*Natural Resources Forum*, 1992). In energy terms, the reserve of gas is twice as much as the nation's crude oil reserves. Given the current production reserves ratio, Nigeria's gas deposit could last for 100 years (Gaius-Obaseki, 1996). In fact Nigeria only ranks next to Algeria in natural gas endowment in Africa.

In spite of the massive endowment of natural gas much of it is flared. With an elevated stack, the flaring is carried out through the top of a pipe or stack where the burner and igniter are located. This is a common practice in the oil production process. Hence, it is not necessarily an ecological or social crime to flare gas. However, the Nigerian case attracts more attention because of the volume of the gas flared since the beginning of commercial oil production in the country.

Table 1: Gas Produced and Flared, 1958–1994

Year	Gas Production (Mm3)	Gas Flared (Mm3)
1958	46	-
1959	1.40	-
1960	144	-
1961	310	-
1962	487	-
1963	626	-
1964	1,029	-
1965	2,250	-
1966	2,907	-
1967	2,634	-
1968	1,462	-
1969	4,126	-
1970	8,039	7,957
1971	12,975	12,790
1972	17,122	16,848
1973	21,882	21,487
1974	27,170	26,776
1975	18,656	18,333
1976	21,276	20,617
1977	21,924	20,952
1978	21,306	19,440
1979	27,618	26,073
1980	24,885	22,904
1981	17,202	14,162
1982	14,830	11,940
1983	15,207	11,948
1984	16,251	12,817
1985	18,426	14,846
1986	17,900	13,917
1987	15,580	12,291
1988	20,212	14,737
1989	26,300	18,730
1990	28,163	21,820
1991	31,587	25,934
1992	32,465	24,588
1993	33,445	25,406
1994	33,928	25,934

Source: *Nigeria Delta Environmental Survey (NDES), 1996. Volume 1, Socio-Economic Characteristics*, Lagos: NDES.

Table II: Value of Gas Produced, Utilized and Flared (N Billion), 1961-1998

Year	Gas Produced	Gas Utilized	Gas Flared	Penalty on Gas Flared
1961	8.79	-	-	-
1962	13.78	-	-	-
1963	17.75	-	-	-
1964	29.17	-	-	-
1965	98.08	-	94.08	-
1966	100.11	7.44	9.27	-
1967	189.89	7.23	182.53	-
1968	105.40	10.89	94.51	-
1969	297.44	4.61	292.82	-
1970	587.62	8.00	573.03	-
1971	936.89	14.85	922.62	-
1972	1234.33	19.75	1214.75	-
1973	2030.31	36.80	2001.52	-
1974	2530.89	36.70	2494.18	-
1975	1737.91	30.09	1707.72	-
1976	1981.67	61.20	1920.48	-
1977	2032.07	80.79	1951.68	-
1978	1908.27	97.44	1810.84	-
1979	2556.67	178.59	3379.06	-
1980	2286.93	302.88	2878.93	-
1981	1594.08	472.13	1745.71	-
1982	1993.51	320.62	1547.42	-
1983	1415.14	420.42	1548.46	-
1984	2106.13	445.57	1660.57	2526.60
1985	2406.54	602.25	1804.29	2745.34
1986	2428.45	624.80	1803.65	2744.36
1987	2225.23	644.89	1580.34	2404.59
1988	3280.50	892.02	2387.88	296.65
1989	4070.25	1021.09	3043.01	3704.10
1990	10234.80	1950.48	7260.84	4419.13
1991	25482.60	5508.00	19974.60	4802.82
1992	25988.04	6081.48	19905.76	24230.29
1993	27280.80	6407.10	20873.70	25402.51
1994	27280.30	5483.70	21797.10	26532.52
1995	28431.00	6572.34	21858.66	26607.45
1996	57429.00	14353.20	43075.80	20217.01
1997	60183.00	16820.48	39259.08	23894.06
1998	57888.44	17636.12	40743.00	49594.51

Source: Okoh, R. N. (2001). "Cost-Benefit Analysis of Gas Production in Nigeria", In: NES, *National Resource Use, the Environment and Sustainable Development* (Ibadan: Nigerian Economic Society), p. 401.

Table 1 show that the production of natural gas has grown rapidly over the years. For instance, in 1958 only 46 million cubic meters (Mm³) were produced, but this increased to 1,462 in 1968 and 21,306 in 1978. For the early 1990s, the figure has been between 28,000

and 34,000 each year. Unfortunately, only an insignificant proportion of the quantity of the natural gas produced is utilized. Most of it is flared. In 1970, as much as 99 percent of gas produced was flared. Apart from the economic loss consequent upon this practice, there are also adverse environmental and potential health implications (*Niger Delta Environmental Survey*, 1996).

Table II is explicit on the monetary value of gas produced, utilized and flared. The total quantity of natural gas produced between 1961 and 1998 was 285306.95 million tons. Of this quantity, 49372.94 million tons (17.31 percent) were used, while 234021.19 metric tones (82.69 percent) were flared. In 2000, total gas production was 1.718 million standard cubic feet, which is 24.6 percent higher than the previous year figure. This rose again to about 52 percent in 2000. Consequently, in keeping with anticipated zero-flare regime in 2008, the rate of gas flare has been in the decline (Central Bank of Nigeria, 2001).

Understandably, Nigeria has the highest rate of gas flaring in the world. The production of natural gas increased by 21.0 percent to 57,530 million cubic meters (Mm³) in 2001, owing to increased oil production and the high gas-oil ratio in most producing wells. Of this output, the quantity utilized and flared increased by 35.1 and 9.0 percent to 29639.8Mm³ and 278902Mm³, respectively. The reduction in the proportion is not unconnected to expansion in gas utilization projects (Central Bank of Nigeria, 2001). In spite of tremendous reduction in gas flared, there are still massive flare sites in the Niger Delta. Each day, up to 2.7 billion cubic feet, about 70 percent of the gas released during oil production is burned off.

The flaring of gas in Nigeria is a national problem and one is ill at ease to realize that the practice had been sustained this long because of the skewed argument the oil industry has always canvassed. For once, it had been argued that the technology needed to mitigate gas flaring is possibly beyond their reach, hence their demand for sufficient time to acquire it (Alexander Gas and Oil Connections, 2001). It must be stated that the above argument is not tenable because oil firms are not just realizing the effects of gas flaring. In any case,

the technology is there for them to acquire. How is it possible to have less gas flaring in Europe and in the North Sea?

Exploration and production technology is commonplace in Europe because of strict environmental laws. This has also facilitated deep water and ultra deep water drilling for oil. From another perspective, the inability of government to meet up cash-calls obligations to oil-companies constitutes a major obstacle for the oil firms. Hence, the argument goes that government cannot creditably enforce gas-flaring laws, or penalize oil companies. While the argument is right, it exaggerates the effects of the government insolvency to the gas phenomenon. In any case joint venture arrangement is a recent contract obligation. It must be noted that Nigeria lacks utilization infrastructure. As it were, when most of its oil facilities were built in the 1960s and 1970s, at a time when gas was not a popular energy source in the world, little thought was given to gas collection facilities. More importantly is the fact that associated gas requires an expensive network of compression facilities and pipelines to link scattered fields that do not produce sufficient quantity of gas to be commercially viable on their own.

Apart from the above, other reasons have been advanced for gas flaring in Nigeria. There is the issue of inadequate industries using gas (ADCG, 1996). The technology to convert available gas to Liquefied Natural Gas is costly and has uncertain returns (Ojinaka, 1996) and inadequate storage facilities for Liquefied Petroleum Gas (Chukwuma, 1996). There is also the argument that because of the geology of Nigeria's oil fields re-injection of gas is, according to the oil companies, not usually an economic option (Human Rights Watch, 1999). In other words, mundane economic exigency and gain takes pride of place over safe and healthy environmental practices (Aghalino, 1999).

While the above explanations may appear plausible, it is relevant to stress that the colossal flaring of gas in Nigeria should be attributed the more to the laxity in the implementation of Nigerian Environmental laws. This contrasts sharply with what is obtainable in Europe and North America. For example, data collected by the Alberta Energy and Utilities Board in Canada shows that in 1996, about 92 percent of gas was conserved or used in some

other ways. The remaining 8 percent were flared. This socially responsible attitude towards gas conservation is in tune with environmental requirement in Canada.

GAS FLARING AND ENVIRONMENTAL POLLUTION

From the foregoing analysis, it is obvious that much gas is produced in Nigeria. What is not in doubt is that much of it is wasted through flaring. The point is, associated gas is routinely flared in the course of production and processing of oil. Flaring is a means of “safely” disposing of waste gases through the use of combustion. Nevertheless, Nigeria has the dubious reputation of having the highest gas-flaring rate in the world. While other producing countries have put in place policies and programs that ensure that associated gas produced was economically utilized, Nigeria has allowed the oil companies to flare the associated gas with impunity. This, in fact, is largely due to the fact that the penalty imposed on gas flaring has been too low to serve as deterrent. Yet gas is an exhaustible resource with massive revenue and foreign exchange earning potential for the country. The point should be made that, gas flaring has led to severe environmental and ecological problems for the oil-bearing communities in particular and Nigeria in general.

It has been estimated that about five hundred million Naira (N500, 000.00) is lost to gas flaring daily in Nigeria (*The Guardian*, August 1998). An adjunct to this is the colossal destruction of the environment through the charring of vegetation in gas flare sites. Ikelegbe (1993) has shown that flaring sites around Isoko area of Delta State generates tremendous heat, which is felt over an average radius of 0.5. Perhaps, more alarming is the destruction of the mangrove and rainforest vegetation with its attendant loss of numerous trees and plants with their potential economic and pharmaceutical values (Aghalino, 2002). The concomitant loss of bio-diversity has been well documented. Suffice it to say that mankind is the ultimate loser in this assault on Mother Nature (Commonwealth Secretariat, 1989).

The 1997 Shell Petroleum Development Company (SPDC), annual report acknowledged the fact that certain gasses used by the oil industry deplete the stratospheric ozone, which filters ultra-violent radiation to the earth surface. Because of the heat emitted from flare

sites, within a radius of 100 meters, the soil elements are highly degradable as their mean values are lower than those further away (Isichei and Sanford, 1976). In addition to this, total land lost when seen from the over 1,000 flare sites is enormous (Alakpodia, 2000). On the positive side, local inhabitants benefit from the heat through the drying of local products such as Cassava (tapioca). Ironically the enormity of the risk they take by being close to the flare sites may be beyond their comprehension.

The main effects of gas flaring have been in the form of acidic precipitation. The incineration of sour gas produces sulfur 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. 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. The acid rain problem is evidenced by the fact that the corrugated iron roofs of the people of the oil-bearing enclave now last less than five years whereas before now they last for well over 20 years.

The presence of soot in the gas that is flared is a tacit violation of the Department of Petroleum Resources’ Environmental Guidelines and Standards (1991), for the petroleum industry. It specified that during gas flaring, pre-treated ‘clean’ gas shall be burnt and flare shall be luminous and bright (<http://www.nseph.com/paper-2htm>). In point of fact, Shell Nigeria disputes the acid rain claim, stating that Nigerian gas is “sweet’ or low in sulfur and therefore less likely to cause acid rain, a claim backed by the World Bank in their 1995 (World Bank, 1995). The position of the World Bank is arguably unscientific, as there are a plethora of studies on the deleterious effects of gas flaring. Yet the position of most of the oil firms in trying to conceal the impact of gas flaring is far from unique, as this would seem to be the global claim by oil majors. Oil companies repeatedly tell us that there is no harm done by their activities either to human and the marine organisms. They characterize their action as responsible, benign and harmless.

Gas flaring has also been blamed for a range of health effects including respiratory illness, hearing loss and serious childbirth problems. But the oil industry disputes this when they insist that “flaring has been blamed for asthma, bronchitis, skin problems and breathing problems in Delta communities. There is no doubt that respiratory problems are common in Nigeria, including the Niger-Delta, but there is no evidence to input a connection with gas flaring.

In Uzere, crude oil was discovered in commercial quantity in 1958. Gas flares were ignited well over forty years now, and have burnt fiercely and noxiously since then. Aside from the deafening howl of the rage of flares, the thick smoke, which bellows into the sky, has poisoned two lakes - Ovie and Eni. The Ovie Lake, which was once the community fisherman’s constant destination, had dried up. Its waters are lipid, almost motionless, as acid rain along with frequent oil spills has adversely affected this once rippling source of protein (Tell, 1997). Most of the rivers in the region are acidic due to acid rain (*The Guardian*, February 1998). The acid rain question, which raised a lot of debate between the North European countries in the 1960s, is here with us (Aghalino, 1999). The consensus of aquatic biology research is that acidification leads to a reduction in species richness (Stokes, 1986).

Important economic and botanical plant specie has been destroyed. Traditional healers must now search further before herbs; bark of trees and roots could be sourced for treatment of minor ailments. It must be noted that plants sustain life. They provide the new source for medicines and genetic stock (Awake!, 1998). One major problem, which the people had to contend with, is noise pollution. For example, the Utorogun Gas plant creates much noise and vibrations on the land and houses at about 6 kilometers radius from it (Ikelegbe, 1993). Visitors to the Niger Delta have always complained of how the people in the region talk at high pitch tone. This may not be unconnected with long exposure to intense noise and vibration from gas flare stacks.

Environmental noise pollution had been recognized in recent years as a serious threat to the quality of life enjoyed by the people in the industrialized nations. As early as 1969, the

Walsh-Healey Public Act was amended in the United States of America. This was done to include for the first time a Federal clause on industrial noise. Beside, the Noise Control Act of 1992 was enacted (Cunniff, 1977). Curiously, there seems to be little in this direction in Nigeria. Indeed, scientists have concluded that when one is exposed to intense noise level, ear cells may be damaged temporarily or permanently. It may also lead to speech impairment. Noise from flare stacks must have chased and scared away wild games and fish from streams. Ironically, the flares burn off energy into the atmosphere within sight of villages that have no electricity.

The Niger Delta, as a coastal area is among the places most likely to become vulnerable to the effects of global warming. Of particular concern is the likely impact of rising sea levels, tidal waves and flood. In the long run, Nigeria's low-lying coasts stand threatened by sea-level rise, particularly because most of its major and rapidly expanding cities are on the coast. If sea level rises, inundation could occur along more than 30 percent of the Nigerian coastline. This may place land at risk many kilometers in land (Awosika *et. al.*, 1992).

Furthermore, gas flaring would seem to have escalated the loss of biological diversity. The development of the gas industry has resulted in the rapid extinction of a number of plant and animal species. This as it were, has led to a concern about the ability of the Niger Delta region of Nigeria to sustain the biological diversity. Bio-diversity refers to the wide variations seen in plant and animal life on the planet. At least three types of diversity exist: genetic, specie and ecosystem. Many reasons exist to protect biological diversity. However, moral, ethnical and aesthetic reasons are commonly cited to protect and preserve the beauty of the natural environment for present and future generation.

There is also the problem of light pollution. Once the sun is set behind the mangrove, its light is replaced by the glow from roaring natural gas flare close to village edge. In a way, the oil industry has "banished darkness" from the oil-bearing enclave of the Niger Delta. The social implication of this is that, the joy of playing in the night under the conspicuous presence of the moon is now a thing of the past due to the ubiquitous flare sites.

GOVERNMENT AND OIL INDUSTRY ABATEMENT MEASURES

In recent years, due to pressure from oil bearing communities and global environmental movements, attempt have been made by the Federal Government and the oil industry to abate gas flaring and enhance natural gas utilization in Nigeria. The effort of the government is encapsulated in: (a) ending flaring and addressing environmental issues; (b) extend gas (associated and non-associated) penetration in domestic markets; (c) facilitate development of power sector in particular; (d) facilitate growth in industry; (e) capture economic value of gas in both domestic and export market and thereby generate as much revenue from gas (as oil) within the decade; and (f) increase private sector participation (Okogun, 2004). While the above policy options are noteworthy, it is relevant to stress that if recent history is anything to go by, it is obvious that the nation has never been found lacking in policy initiatives. What is worrisome is that policies are never pursued to their logical conclusion.

The above observation notwithstanding, the government has put in place some initiatives to abate gas flaring. These include: the establishment of the National Fertilizer Company of Nigeria (NAFCON), Aluminum Smelter Company of Nigeria (ALSCON) and the Liquefied Natural Gas Project (NLNG), which perhaps is the most ambitious gas project in the country. There is also the proposed West African Gas Project. Natural gas is also used to fire most of the National Electric Power Authority's thermal stations (*Nigerian Tribune*, 2001). Indeed the \$3.8bn Nigeria Liquefied Natural Gas (NLNG) facility on Bonny Island, which was completed in September 1999, is expected to process 252.4 billion cubic feet of LNG annually. The third LNG production train, with an annual capacity of 130.6 Billion Cubic Feet (BCF), began operations in November 2002. The third train will increase NLNG's overall LNG processing capacity to 383 billion cubic feet per year (<http://www.eia.doe.gov/cabs/Nigeria/Background.html>).

The government is also into joint venture arrangement with other multinational oil companies regarding the West Africa Gas Project to provide gas for electricity generation and to support industrial expansion and economic development in the sub-region. On August 11, 1999, the governments involved in the project, namely the Republic of Benin,

Ghana, and Nigeria, signed a Memorandum of Understanding with a consortium of companies consisting of Chevron, Ghana National Petroleum Corporation, the Nigeria National Petroleum Corporation (NNPC), SPDC, Solbagaz and Sotgaz for the project development (OPEC Bulletin, 2000:29). Several customers have signed long-term purchase agreements with the NLNG. Plans for additional LNG facilities are being developed. For example, Nigeria and the United States of America's oil firms of ChevronTexaco, Conoco and ExxonMobil had signed a Memorandum of Understanding to conduct feasibility studies for a second LNG facility. The Escravos Gas Project (EGP), in which the NNPC holds a 60 percent share and Chevron Texaco 40 percent, is another project that has expanded Nigeria's natural gas industry. The first phase of the EGP (EGP-1) processes 165 Million metric cubic feet per (Mmcf/d) of associated natural gas, which is supplied to domestic market by pipelines. Phase two of the EGP (EGP-2), which processes an additional 135 Mmcf/day of gas, began operation in 2000. More projects have been initiated to encourage local consumption of gas. The oil firms, cooperating as minority equity partners in joint ventures with the state-owned NNPC are undertaking new gas utilization projects.

Several distribution schemes are planned to help promote consumption of gas in Nigeria.

The proposed \$580 million Ajaokuta-Abuja-Kaduna Pipeline will supply natural gas to central and Northern Nigeria. Gaslink, which supplies natural gas to nearly 30 industrial customers in Lagos, Ikeja industrial district, planned to include 150 industrial customers, 250,000 residential/commercial customers and 25 independent power producers. Nigeria initiated discussion with Algeria on the possibility of constructing a "Trans-Saharan Gas Pipeline. The 2,500 mile (4,000km) pipeline would carry gas from oil fields in Nigeria's Delta region via Niger to Algeria's Beni- Saf seaport terminal on the Mediterranean (<http://www.eia.doe.gov/cabs/Nigeria/Background.html>). It is relevant to add that most of the oil companies are also in the process of setting up power plants that will utilize gas.

Apart from the drive toward increases gas utilization, there is extant legislation aimed at reducing gas flaring in Nigeria. The Petroleum (Drilling and Production) Regulation Decree No. 51 of 1969 provides that licensee or leasee must submit feasibility study, program or proposal for gas utilization not later than five years after the commencement of production. It is to be noted that the regulation does not carry any penalty clause. Producers may flare gas for five years before feasibility study. In spite of this leeway given to the oil majors in Nigeria, they refused to catch on to it.

The Associated Gas Re-injection Decree 99 of 1979 mandates producing companies to submit proposals for utilization of natural gas. They were expected to stop gas flaring from 1st of January 1984. The Decree empowered the Minister of Petroleum Resources to grant permission to the oil companies to flare gas based on certain conditions. Consequence for violation is forfeiture of the acreage concerned. The Decree could not be enforced for it was totally unrealistic in terms of the time frame for its implementation. What is important here is that, the record of command and control approach in gas flaring abatement does not look promising. It would appear that economic instrument might be more likely to compel the oil firms to change their current attitude toward gas flaring abatement.

The Associated Gas Re-injection Amendment Decree 7 of 1985, introduced a penalty charge of two kobo/1000 standard cubic feet, (standard cubic feet) of gas flared at the fields where authority to flare was not granted. In 1990, the penalty was increased to fifty-kobo/10000 standard cubic feet. This was further raised to ten Naira/1000 standard cubic feet in 1998. The Associated Gas Framework Agreement (AGFA) was introduced in 1991/1992 as a fiscal incentive for natural gas utilization. It must be noted that the AGFA involved broad-based package such as processing, production, transmission and supply of gas to the NLNG (Bankole, 2000). The Fiscal Incentive Guarantee and Assurance Decree (FIGAD) 30 of 1990 was meant to hasten the development of the NLNG project rather than gas flaring. It exempts companies involved in the NLNG project from import duties and export charges. It also grants them tax holidays.¹

In addition to legislation and fiscal incentives, government has established the following institutions to aid and co-ordinate gas development in the country. These include the Nigerian Gas Company – a subsidiary of the NNPC with responsibility for gas gathering and transmission in the country. There is also a gas division in NNPC with responsibility for coordinating gas investment and management of government interest in joint venture arrangement (Etete, 1995).

While it would appear that the government and the oil majors are making effort to abate gas flaring through monetizing it, there are copious barriers to gas utilization in Nigeria. Earlier on we identified some reasons why the oil firms did not pay due attention to gas utilization until recently, yet on the part of the government there are some intrinsic and debilitating institutional barriers to gas exploitation in Nigeria. There is conflict of interest between State's role as gas sector regulator and its extensive commercial participation in gas activities. Due to its stake, the Nigerian State, as a regulator cannot be an impartial regulator as it has significant economic interests in the gas sector. Besides, the structure of the industry is not enabling. The dominance of the Nigerian Gas Company in downstream sector has made it a cog as it is both a monopoly service provider and de facto regulator. This, as it were, is a major deterrent to the entry of new players. There are also legal constraints to gas utilization. There is no separate legislation recognizing downstream gas as a commodity. The legislation on gas production is intricately tied to the rules applicable for oil production in Nigeria.

CONCLUSION

In this paper, effort has been made to examine the environmental impact of gas flaring and the consequent measures taken so far by the government and the oil industry to abate gas flaring in Nigeria. It is opined that enormous quantity of gas is flared in Nigeria. This ranks Nigeria as the major culprit in gas flaring in the world. Understandably, the government and the oil firms have attempted to confront the problem of gas flaring in Nigeria. On the part of the government, the approach towards gas abatement has been command and control and the use of economic instruments. On the part of the oil firms,

they have invested heavily on gas utilization plants. This is plausibly geared towards meeting the zero-flare ultimatum in 2008.

It is reasonable to conclude that from the quantity of gas currently flared in Nigeria, there are strong indications that the implementation and effects of regulation and incentives to abate gas flaring is still suspect. More needs to be done to turn down the flare stack in Nigeria. In this regard we align with Frank (1997), when he argued that taxation is one solution to the problem of negative externalities. Although, it is not always the ideal answer, it does offer several important advantages over direct regulation in many situations. Thus it is suggested that there is need for an upward review of the tax paid for penalty for gas flared in Nigeria. Taxation of negative externalities provides a source of government revenue and may as well discourage incessant gas flaring. In practical terms, there is a need for a change in property rights in Nigeria in order to focus on sustainable development and community participation. As it were, 'participation and community involvement where institutions are weak or enforcement is expensive can be effective in enforcing sustainable resources use and adapt local condition to development needs.

What is needed evidently is essentially a conservation-oriented economy and not one of which self-exciting entrepreneurs are a driving force. This is particularly so because it is difficult to see how the menace of gas flaring in Nigeria can be dispelled as long as the oil majors are not denied what Rachael Carson once called the right to make a dollar at whatever cost to the environment (Carson, 2002).

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