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Global Quest for Zero Routine Flaring: An Appraisal of Nigeria's Legal and Regulatory Abatement Frameworks

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Abstract

This paper evaluates Nigeria's commitment to ending gas flaring within the context of the global quest for zero routine flaring by 2030. Nigeria has adopted a combination of strategies since 1969 to achieve zero flaring. Within this period, several unrealized flare-out dates were set. Several factors are responsible for the non-realization of the flare-out targets. These include Nigeria's weak institutional framework, the unattractiveness of economic payoffs associated with investing in gas-gathering infrastructure and the unwillingness of international oil companies (IOCs) to readjust their operations to accommodate zero gas flaring. Using data from secondary sources, the paper locates the non-realization of the various flare-out dates between legal enactments and economic permutations. A related factor is the huge capital outlay required to develop gas-gathering infrastructure vis-à-vis the uncertainty surrounding the gas market in Nigeria. The paper recommends the adoption of a holistic implementation strategy as a stimulus to extract commitments from all stakeholders towards zero gas flaring by 2030.

Introduction

Gas flaring, which is the disposal of gaseous and liquid hydrocarbons through combustion at oil and gas production and processing sites, constitutes a serious global problem (Johnson et al., 2001; Anomohanran, 2012; Huang & Fu, 2016). Gas flaring has been designated a monumental economic waste as it leads to multibillion dollar losses to the global economy. According to World Bank sources, gas flaring cost the global economy an estimated US$20 billion in 2018 (PWC, 2019). Gas flaring has also been implicated in causing environmental catastrophes manifesting in health complications, low life expectancy and widespread poverty (Hassan & Kouhy, 2013; Emam, 2015; Giwa et al., 2017). In spite of these negativities, oil companies still dispose of associated gas in the course of oil production though flaring. The basic justificatory reasons often associated with gas flaring include the prohibitive cost of efficient gas-gathering infrastructure, remoteness of production sites, and lack of pipelines and other gas transportation infrastructure (Huang & Fu, 2016; Ojijiagwo et al., 2016). Additional, safety reasons have been indicated. Experts contend that flaring is warranted at times to protect against the dangers of over-pressurizing industrial plant equipment (Huang & Fu, 2016). Apart from flaring gas for safety purposes, which is often an occasional occurrence, other reasons for flaring gas are unjustifiable. It is for this reason, therefore, that the global community initiated the global gas flaring reduction (GGFR) partnership and the 2030 target to end routine flaring.

Nigeria subscribes to the global efforts to stop gas flaring. The country's foremost efforts at stopping gas flaring started in 1969 when it enacted the Petroleum (Drilling and Production) Regulations Decree. Specifically, regulation 43 of the decree required oil companies to send proposals to the minister of petroleum about their gas utilization plans not later than five years after commencing production. However, through the instrumentality of the Associated Gas Reinjection Regulation Act of 1979, gas flaring became illegal in Nigeria on 1st January 1984. Since then, Nigeria has set several dates for the termination of gas flaring, which never materialized. However, appreciable progress in terms of reduction in the volume of flared gas has been recorded since 2010. Thus, from flaring about 98.98 percent of associated gas in 1958 when oil production started, the figure steadily came down, especially since 2010 from 19.32 to 11.04 percent as at 2018. (Ologunorisa, 2001; DPR, 2018).

Although a number of papers have examined gas flaring as well as associated legal and regulatory frameworks in Nigeria, none has explicitly explored the dynamics and interconnections between legal instruments and economic permutations. Additionally, there appears to be little or no attention to the link between economic factors and the recent downward trends in the volume of flared gas in Nigeria. The consideration of these issues constitutes the contribution of this paper. In evaluating the zero gas flaring efforts of Nigeria, the paper finds that Nigeria has deployed two major strategies in its quest to actualize zero gas flaring. Initially, emphasis centered on the enactment of legislative instruments. Thus, several laws were made which ultimately failed to induce compliant behavior from the IOCs. The IOCs underpinned their inability to meet the flare-out deadlines on technological and infrastructural deficits and the enormous costs associated with remedying these deficits. Thus, the Nigerian government evolved a complementary strategy to incentivize compliance by providing tax holidays and encouraging the establishment of gas-gathering infrastructure (Ejiogu, 2013; Jaillet & Laurent, 2017). The paper also finds that the underlying reasons for the failure of the various flare-out deadlines are domiciled, not in the legal instruments but in the primacy of economic permutations. While appropriate legislation is relevant, it is the provision of incentives and the deepening of the economic environment that will guarantee a sustainable march to ending gas flaring in Nigeria.

Nigeria's Oil Sector: A Theoretical Underpinning

Crude oil production started modestly in Nigeria in 1958 in two oil fields - one at Oloibiri and the other at Afam - that yielded some 5,100 barrels per day (Steyn, 2009; Duru, 2014). From this modest beginning, Nigeria's oil sector has expanded in leaps and bounds with about 606 oilfields (comprising 355 onshore and 251 offshore) and about 5,284 oil wells all over the Niger Delta region (Anifowose et al., 2014; Eke, 2016). From these oil fields, Nigeria has been producing millions of barrels of oil that peaked at some point at 2.5 million barrels per day (mbpd). Nwozor et al. (2019, p. 9) have pointed out that with the exception of the period that Niger Delta militants disrupted oil production activities between 2004 and 2009, Nigeria's average daily oil production since 1999 has hovered between 2.1 and 2.5 mbpd.

Nigeria is a major player in the global oil industry because of its natural hydrocarbon endowments, the quality of its crude oil and its potential capacity to produce beyond OPEC quota. With regard to the quality of crude oil, Nigeria is known to produce high value, light crude oil characterized by low sulphur content. Nigeria is ranked the largest oil producer in Africa and among the top fifteen in the world. According to OPEC's 2018 data, Nigeria has proven crude oil reserves of 36,972 billion barrels, thus, making it the 10th country with the largest crude oil reserves in the world (OPEC, 2019). Despite these huge crude oil holdings, the Nigerian government still aspires to expand the volume of its proven oil reserves to 40 billion barrels by 2020. It plans to achieve this expansion by adding one billion barrels year-on-year till 2020 (Jeremiah, 2018; Nwozor et al., 2020). In addition to huge crude oil reserves, Nigeria also has natural gas in abundance, which places it among the top 10

countries with vast natural gas deposits. As at the end of 2018, Nigeria's proven natural gas reserves stood at 5,675 billion standard cubic meters (OPEC, 2019). All these hydrocarbon holdings are concentrated in the Niger Delta region. Despite these endowments, the region is characterized by a paradox of lack in the midst of plenty. While the Niger Delta produces immense oil wealth for Nigeria, its people are victims of environmental degradation from land pollution, gas flaring and indiscriminate disposal of oil production wastes into the water body (UNDP, 2006; Ite et al., 2018; Nwozor, 2020). This oil-induced alienation has been at the roots of the diverse manifestations of criminality and violence that characterize the region (Obi, 2010; Nwajiaku-Dahou, 2012).

In trying to appraise gas flaring in Nigeria within the context of its legal and regulatory frameworks, this paper uses a modification of the pollution haven hypothesis (PHH). The key thrust of PHH is that the relatively lax environmental regulations in developing countries underpin their attractiveness to pollution-intensive industries since it will provide an escape route for them to avoid paying costly pollution control costs (He, 2006; Zheng & Shi, 2017). All the major players in Nigeria's oil sector are IOCs whose operations elsewhere show massive investments in gas-gathering infrastructure because of stringent anti-pollution laws. Thus, noncompliance to zero-flaring laws in Nigeria depicts double standards, which is driven by the use of their enormous financial weight to exploit the lax implementation system.

Contextualizing the Political Economy of Gas Flaring in Nigeria

Gas flaring is incentivized by cost calculations by oil companies. In other words, they engage in gas flaring to reduce operational costs, often to the detriment of the people and the environment. Crude oil has associated gas, which must be separated at the point of exploitation. Three standard options are available to oil companies namely: re-injecting the gas to the ground for future reuse, deploying gas-capturing equipment to harvest gas for domestic and commercial purposes, and flaring the gas into the atmosphere (Agboola et al., 2011). The last option, gas flaring, is quite easy and therefore attractive to oil companies. The negative impacts of gas flaring, ranging from pollution, associated economic waste and destruction of biodiversity, led Environmental Rights Action et al (2005); UNDP (2006) to describe it as a human rights, environmental and economic monstrosity. Gas flaring has been part and parcel of Nigeria's oil industry from the inception of oil exploitation in 1958. At first, it was not considered a problem because of general ignorance about its negative environmental impacts. But with the advent of new knowledge about its negative impacts on the environment and economy, concerns began to arise. In the first decade of oil production, it was estimated that Nigeria flared about 98.98 percent of its gas (Ologunorisa, 2001).

Gas flaring became an issue from 1969 when the Nigerian government outlawed it and directed IOCs operating in the country to comply within five years, by taking steps towards the utilization of gas being flared. This target was unmet by the IOCs prompting the Nigerian government to set another target for 1984 which also fell flat in stopping the menace. The enactment of the Associated Gas Re-injection Act in 1979 formalized its determination to end gas flaring. The Act provided a 5-year moratorium for IOCs to stop gas flaring. It also introduced penalties for non-compliance. Thus, by virtue of this law, gas flaring became illegal from January 1, 1984. It has been contended by scholars that the penalty regime specified by the Act was not deterrent enough to induce compliance (Agboola et al., 2011; Edu, 2011; Mohammed, 2016). Table 1 below shows the top ten gas flaring countries in the world. Nigeria is ranked 7th. There is a progressive reduction in gas flaring in Nigeria, although at a very slow pace.

Table 1: Top ten gas flaring countries by volumes, 2015 -2019 (billion cubic meters)

S/N	Country	2015	2016	2017	2018	2019	2019-2018 change

1	Russia	19.62	22.37	19.92	21.28	23.21	1.93
2	Iraq	16.21	17.73	17.84	17.82	17.91	0.09
3	United States	11.85	8.86	9.48	14.07	17.29	3.22
4	Iran	12.10	16.41	17.67	17.28	13.78	-3.50
5	Venezuela	9.33	9.35	7.00	8.22	9.54	1.32
6	Algeria	9.13	9.10	8.80	9.01	9.34	0.33
7	Nigeria	7.66	7.31	7.65	7.44	7.83	0.39
8	Libya	2.61	2.35	3.91	4.67	5.12	0.45
9	Mexico	5.00	4.78	3.79	3.89	4.48	0.59
10	Oman	2.43	2.82	2.60	2.54	2.63	0.10
	Global Total	146	148	141	145	150	5.0

Source: World Bank, 2020

The non-actualization of the target of 1984 led the Nigerian government to set several other deadlines that never led to an abatement in gas flaring in Nigeria. Table 2 below shows a snapshot of various deadlines set by the Nigerian government for zero flaring. At the expiration of each of these deadlines, the excuse for non-realization centered on the expensive nature of gas-gathering infrastructure needed to effect gas utilization and re-injection (Ejiogu, 2013). Thus, the government was forced not only to repeatedly postpone the deadlines but also adopt an incentive approach. A major lapse in government's approach to zero gas flaring has been the absence of a coordinated platform to pursue it. Added to this is lack of synergy among stakeholders. For instance, this lack of synergy manifested in 2009 when Nigeria's Senate, the executive arm and oil companies set conflicting deadlines. The Senate set December 2010, the executive arm fixed December 2011 and oil companies slated 2013 (Ebiri & Akpan, 2018). Interestingly, none of these deadlines resulted in zero gas flaring.

Table 2: A snapshot of flare-out targets in Nigeria

Year of policy document	Moratorium	Deadline for Zero Flaring	Outcome
1969	5 years	1974	Not achieved
1979	5 years	1st January 1984	Not achieved
1984	1 year	1st January 1985	Not achieved
1990	14 years	1st January 2004	Not achieved
1999	Additional 2 years	1st January 2006	Not achieved
2008	2 years	2010/2012	Not achieved
2018	2 years	2020	In progress

Source: Reconstructed from multiple documents

Nigeria has been a major gas flarer. According to Gboyega et al. (2011), in 1991, when the world average for flared gas was 4 percent, Nigeria's rate was 76 percent which accounted for 13 percent of the world's total volume of flared gas. At this point, it was second only to Russian Federation. But since 2010, there has been significant reduction in the volume of flared gas. Between 2008 and 2017, it is estimated that Nigeria flared some 4.498 trillion standard cubic feet (tscf) of gas (Ejoh, 2018). It is further estimated that Nigeria flares between 130 to 150 billion cubic meters of gas annually. This flared gas not only contaminates the environment with 400 million tons of CO_2 but also contributes massively to global warming and climate change (Fawole et al., 2016; Soltanieh et al., 2016; Giwa et al., 2017). Research about the effect of gas flaring has linked it to greenhouse gases, precursor

gases, volatile organic chemicals (VOCs), polycyclic aromatic hydrocarbon (PAH), particulate matter (PM) and black carbon. All of these gases have serious implications for the global environment and human health (Fawole et al., 2016; Giwa et al., 2017).

Beyond environmental degradation, gas flaring constitutes a multi-billion dollar waste to the economy. The Nigerian government announced in December 2017 that there were 178 active gas-flaring sites in the country (Eboh, 2017a). However, recent reports from Gas Flare Tracker, a data portal that monitors live data of active flare sites within countries, indicated the existence of 222 active gas-flaring sites across the Niger Delta region (Budgit, 2018). Research has shown that from these sites over 250 identified toxins are released. Undoubtedly, these toxins contribute to greenhouse gases and have detrimental effects on human and animal health as well as plant growth (World Bank, 2004; Soltanieh et al, 2016; Fawole et al., 2016). The bottom line is that gas flaring in Nigeria has had widespread impoverishing consequences, particularly in the Niger Delta region. According to World Bank sources, flared gas can potentially deliver up to 750 billion kilowatt-hour (kWh) of electricity, which could meet the energy needs of Nigeria alongside many neighboring African countries (World Bank, n.d; Hassan & Kouhy, 2013).

The wider economic cost of gas flaring can be reconstructed by available facts. A ten-year estimate of revenue loss through gas flaring, that is, between 1999 and 2009, was put at about US$ 188 billion at an average of US$17billion per annum (Anomohanran, 2012). The NNPC recently disclosed that oil companies in Nigeria flare 700 million scf per day which could potentially generate 5,000 megawatts of electricity per day or fetch ₦868 million into the state treasury (calculation based on US$4 per 1000 scf and exchange rate of ₦310 to a dollar) (Eboh, 2018). It is estimated that over 30 million residents of the Niger Delta region are under health, livelihood and survival threats. To lend credence to the destructive effects of gas flaring, several studies have linked serious health challenges in the region to exposure to over 250 toxins released into the atmosphere (World Bank, 2004; Environmental Rights Action et al., 2005; Gobo et al., 2009; Ana et al., 2009; Buzcu-Guven & Harriss, 2012; Hassan & Kouhy, 2013; Ejiogu, 2013; Giwa et al, 2017; Budgit, 2018). The result is that life expectancy at birth in the Niger Delta region is now 40 years as opposed to the national average of 52.9 years (CBN, 2015; Giwa et al., 2017). Several studies have also demonstrated the negative effects of gas flaring on agriculture, which is a key source of livelihood in the Niger Delta (Ologunorisa, 2001; Environmental Rights Action et al., 2005; UNDP, 2006; Gboyega et al., 2011; Nduka et al., 2016). Farmers in the Niger Delta communities regularly experience acid-like damage to their crops. Fayiga et al. (2017) attribute the damage to the acid rain from the dissolution of high ozone (O3) levels and sulfur dioxide. A more serious accusation against IOCs is underreporting of flare statistics. Ibe Kachikwu, Nigeria's former Minister of State for Petroleum Resources estimated that Nigeria is losing between US$500 million and US$1 billion in revenues that would have accrued as flare penalties due to the falsification of gas flare data by the IOCs (Umoru et al., 2016). Gas flaring in Nigeria has wider implications in Africa. Gas flaring has been recognized as a major driver of air pollution. It is estimated that Nigeria accounts for 40 percent of all gas flared in Africa (Budgit, 2018). A 2016 study implicated air pollution in health complications leading to premature deaths in Africa. According to Roy (2016), household air pollution and ambient particulate matter pollution led to the death of approximately 712,482 people in 2013 in Africa. The cost of pollution to African economies was estimated at US$215 billion a year for outdoor air pollution and US$232 billion for indoor pollution (Roy, 2016). To deal with the challenge of gas flaring, Nigeria has, in recent times, subscribed to global efforts to enthrone a flare-free environment.

Nigeria is a party to both the "global gas flaring reduction" partnership (GGFR) and "zero routine flaring by 2030" initiative. Both initiatives target different angles of how to deal with gas flaring. The GGFR partnership is a World Bank-led public-private initiative that comprises national and international oil companies, national governments and international

institutions with the objective of eliminating associated gas flaring by sharing best practices and implementing country specific programs. The zero routine flaring by 2030 initiative has the singular aim of mobilizing all stakeholders towards ending routine gas flaring by 2030. Thus, the zero routine flaring by 2030 initiative represents a common platform for all stakeholders such as governments, oil companies, and development institutions to cooperate and work together towards the elimination of routine gas flaring not later than 2030 (Okafor & Aniche, 2016).

A key answer to flaring in Nigeria is more productive utilization of gas through the development of wider markets. It would boost industrialization through an expansion in the electric power consumption (KWh per capita) which is abysmally too low at 144 KWh vis-à-vis the global average of 3,127 KWh. Additionally, it would save the country from needless human loss through gas flare-related fatalities in the Niger Delta region, which has been put at 200 persons monthly (Umoru, 2017). Thus, the general implication of the high gas flaring in Nigeria is its tendency to contribute to the country's continued underdevelopment as well as jeopardize its prospects of meeting the sustainable development goals (SDGs).

The Architecture of Legal and Regulatory Framework to Stem Gas Flaring in Nigeria

The complex nature of gas flare question in Nigeria is not a result of the dearth of legal instruments for its stoppage or reduction to a globally acceptable benchmark. It is essentially connected to the intricate systemic hurdles that make enforcement politically and economically challenging. Since 1969, the Nigerian government has been on the issue of gas flaring without achieving zero flaring yet. The lesson learnt from the Nigerian situation is that economic considerations command ascendance over political directives. Jaillet and Laurent (2017) have pointed out that the decision by oil companies to flare gas is mainly a question of economics. Scholars have identified two major scenarios that ordinarily discourage oil companies from investing in gas-gathering infrastructure. The first scenario is where gas exists in small and variable quantities, which might make investments more difficult to amortize. The second scenario is where it is economically costly to transport gas due to low gas pressure at the wellhead or remoteness of sites (Soltanieh et al., 2016; Jaillet & Laurent, 2017).

From an economic perspective, what motivates or demotivates oil companies from investing in gas-gathering infrastructure is the permutation of the profitability of compliance vis-à-vis noncompliance. However, a combination of stringent legal and political conditions, stiff penalties and the political courage to implement state policies would most likely induce compliance. Thus, what made economic calculations the sole basis for compliance or noncompliance by IOCs in Nigeria could be linked to the seeming inefficiency of the relevant regulatory agencies. As Anejionu, Ahiarammunnah et al. (2015) have argued, the relevance of law lies in its capacity to impose responsible attitudes and behaviors.

Several pieces of legislation with flare-out deadlines have been enacted in Nigeria since 1969 (see Table 3). The first directive in 1969, which was more like an executive order, envisaged gas flaring to end within five years. Based on this directive, gas flaring would have stopped by 1974. However, gas flaring continued unabatedly. The non-realization of the 1974 date led to the enactment of a new legislative instrument, the *Associated Gas Reinjection Act of 1979*. The major objective of this Act was to ensure responsible utilization of associated gas by IOCs. Thus, the Act compelled IOCs to submit both preliminary and comprehensive plans for the implementation of gas reinjection. It also criminalized gas flaring by stipulating penalties for noncompliance. The Act set the cutoff date for compliance as 1st January 1984. Notwithstanding the cutoff date, section 3 provided an exclusionary caveat that gas could only be flared with the written permission and authorization of the Minister of Petroleum based on certain conditions. The conditions listed must satisfy the Minister that gas utilization or reinjection was either inappropriate or infeasible. The

punishment prescribed by the Act was the forfeiture of the concession granted for the field in question as well as fines. As a result of the complaints by the IOCs, the government shifted the deadline from 1st January 1984 and to 1st January 1985. Yet, no progress was made in abating gas flaring.

In 1984, the Nigerian Government amended the regulations through the Associated Gas Re-injection (Continued Flaring of Gas) Regulations. The regulations appeared to be a step backward in the quest for zero flaring (Hassan & Kouhy, 2013; Onyi-Ogelle, 2017). The regulations took the wind off the sail of the ship for zero flaring by expanding conditions for the issuance of certificates for continued flaring of gas. These conditions provided a wide legal latitude that made it easy for the IOCs to continue to flare gas. For instance, the IOCs could flare gas if they could demonstrate: one, gas utilization rate of more than 75 percent; two, the presence of more than 15 percent impurities in gas produced; and three, interruption due to equipment failure among others. The IOCs could also flare gas where the gas-to-oil ratio of the field was less than 3,500 SCF /bbl, hence not technically advisable to re-inject the gas in that field or where the Minister deemed fit. The direct implication of the 1984 regulations which commenced on 1st January 1985 was that 55 percent or 86 of the then 155 oil fields were exempted from the anti-flaring provision (Orji, 2012; Hassan & Kouhy, 2013; Onyi-Ogelle, 2017). The regulations also reviewed the penalty for contravention, which made it so insignificant that IOCs were prepared to flare and pay the penalty rather than utilize or re-inject gas (Hassan & Kouhy, 2013; Ejiogu, 2013; Onyi-Ogelle, 2017).

Table 3: Key Legislations and Regulations towards Zero-Gas Flaring

Legislation/Regulations	Year	
Petroleum (Drilling and Production) Regulation Decree	1969	
Associated Gas Reinjection Regulation Act	1979	
Associated Gas Reinjection (Continued Flaring of Gas) Regulation)	1984	
The Nigeria LNG (Fiscal Incentive Guarantee and Assurances) Decree (FIGAD), Decree no 30	1990	
Sections 11 & 12 of Petroleum Profit Tax Act (PPTA), Cap. 354 L.F.N. 1990/Cap. P13 L.F.N. 2004. Section 28(9), Finance (Miscellaneous Taxation Provisions) Decree No. 18 1998	1990	
West African Gas Pipeline Project (Ratification and Enforcement) Act.	2004	
Nigerian Gas Master Plan	2008	
Nigerian Oil and Gas Industry Content Development Act	2010	
Flare Gas (Prevention of Waste and Pollution) Regulations,	2018	

Source: Compiled from various sources by the authors

The subsequent dates fixed by the Nigerian government to end gas flaring such as 2004, 2006, 2010, and 2012 all failed to materialize. An important lesson that the country apparently learnt from these failures was that ending gas flaring would require more than laws. The IOCs demonstrated more willingness to pay penalties than invest in gas-gathering infrastructure necessary to kick-start the reduction of gas flaring. The important lessons learnt from the serial failures to realize flare-out dates led to a shift in emphasis. This shift consisted of moving from passing legislation to making policies towards infrastructural development to facilitate the utilization of flared gas. The twin strategies of the government included the evolvement of domestic gas utilization policy anchored on creating new

investment opportunities in the domestic gas sector and export-oriented gas policy aimed at the West African sub-region and the world at large.

Table 4: Key Regulatory Agencies for Gas Flare Regulation

Regulatory Agency	Major Operational Instrument
Ministry of Petroleum Resources	The major government organ with powers to articulate and implement policies relating to petroleum and other mineral resources, with the exception of solid minerals.
Federal Ministry of Environment	The EIA Act No. 86 of 1992; the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2001
Department of Petroleum Resources (DPR)	Formerly the Petroleum Inspectorate and renamed the DPR in 1985. EGASPIN 2001
National Environmental Standards and Regulations Enforcement Agency (NESREA)	NESREA (Establishment) Act of 2007. (NESREA Act, published in FRN Official Gazette No. 92 Vol. 94 of July 31, 2007, repealed the FEPA Act Cap F. 10 LFN 2004.)

Source: Compiled from various legislations by the authors

The domestic gas utilization policy led to the enactment of projects such as the Nigerian Liquefied Natural Gas (NLNG) Project of 1990, Associated Gas Framework Agreement of 1990, Nigerian Gas Master Plan of 2008, Nigerian Oil and Gas Industry Content Development Act 2010, and more recently**,** Flare Gas (Prevention of Waste and Pollution) Regulations, 2018, which spearheads the Nigerian Gas Flare Commercialization Programme (NGFCP). The quest to find export markets for Nigeria's associated and non-associated gas birthed three key export-oriented gas projects; namely, the West African Gas Pipeline (WAGP) Project which connects Benin, Togo and Ghana; the proposed Trans-Sahara pipeline project (to transport gas to Europe through Algeria); and the proposed gas network to supply gas to Equatorial Guinea (Agbonifo, 2016; Jaillet & Laurent, 2017).

The Quest for Zero Gas Flaring: Appraising Abatement Efforts

Nigeria has been on the quest to stop gas flaring since 1969. Undoubtedly, the country has made significant progress in reducing gas flaring. However, if it is juxtaposed to the country's overall aspiration to stop gas flaring as captured in its various legislations and policies, there is still a large room for progress. Orji (2012) has attributed the modest achievement in the area of gas flaring and oil-related pollution to factors such as inadequate funding of regulatory bodies, inadequate human and institutional capacity, corruption, and regulatory chaos due to conflicting and overlapping functions of regulatory agencies. Other factors that have militate against the realization of zero gas flaring are absence of constitutional guarantee of the right to a clean environment, weak judicial system and the unwillingness of regulatory agencies to enforce court rulings (Orji, 2012).

The failure of Nigeria to stop gas flaring up to this time is characteristic of policy failures in other spheres of national development. There are technological, economic and institutional obstacles against Nigeria's quest for a flare-free environment. However, the greatest obstacle is the lack of political will to follow through with regulations. Nigeria's oil sector is filled with several government-backed regulatory agencies (see Table 4). But these regulatory institutions generally lack the necessary operational independence as a result of undue political interference. They are routinely manipulated by political leaders whose interests are often at variance with national goals. A number of examples will buttress the preceding argument.

The Associated Gas Re-Injection (Continued Flaring of Gas) Regulations of 1984 liberalized and monetized gas flaring, which made it economically viable for oil companies to flare gas rather than harness or conserve it through utilization or re-injection schemes. Thus, despite the illegality of gas flaring, a stamp of legality was affixed to it. Therefore, when a Federal High Court in *Jonah Gbemre v Shell Petroleum Development Company (SPDC) & Ors* made a ruling declaring gas flaring illegal and ordered its stoppage, no official effort was made to enforce the ruling (Orji, 2012).

From all indications, the trend of the penalty regime for gas flaring has been too mild to induce investment in gas-gathering infrastructure. For instance, between 1985 and 1992, the fine was 20 kobo (US$0.22) per 1,000 scf of gas flared. This was slightly increased to 50 kobo (US$0.029) between 1992 and 1997. The fine was increased to ₦10.00 (US$ 0.0276) and was supposed to apply for a ten-year period from 1998 to 2008. However, N10 is still being charged despite the enactment of a more realistic fine of US$3.50 per 1,000 scf. The total loss suffered by Nigeria based on US$3.50 and cumulative flared gas of 4.085 trillion scf between April 2008 and October 2016 was put at US$14.298 billion (Eboh, 2017b).

Another demonstration of lack of political will is institutional incapacity as a result of poor funding of regulatory agencies. On paper, the Department of Petroleum Resources (DPR) has the authority to suspend or remove licenses and permits of IOCs in the event of non-compliance with gas flaring and venting regulations. However, in practice, lack of operational resources at the DPR makes it difficult for the agency to conduct regular inspections on facilities especially those in remote and insecure locations. As a result, they rely on feedback from IOCs to generate working data (Orji, 2012).

Technological barriers, especially the absence of modern production and processing infrastructure, are contributory to the intractability of gas flaring in Nigeria. This is mainly because the IOCs have been unwilling to invest in such infrastructure. The unwillingness of IOCs to commit resources towards ending gas flaring is not unconnected with the weak market for gas, ineffective implementation of laws on gas flaring by relevant regulatory agencies, poor incentives and continued attractiveness of flaring as a result of poor penalty regime (UNDP, 2006; Hassan & Kouhy, 2013). Table 5 presents the key impediments to realizing zero gas flaring so far.

Table 5: Key Barriers to Realizing Zero Flaring

Technological factors	Market/Economic factors	Institutional factors
Infrastructural incapacity: absence of infrastructure for production and processing	Low domestic price regime for gas	Inefficient judicial system. Weak enforcement of environmental laws
Deficiencies in gas metering	Long distances between production and potential markets	Conflict of interest resulting from Joint venture partnerships between NNPC and IOCs
Underdeveloped oil–gas processing complex	Limited and insufficient market for gas and its related products	Inefficient system for state control and monitoring of flaring/ Inter-agency competition among government agencies
High cost of constructing needed gas pipelines	Inadequacy of penalties for gas flaring	Regulatory/legal base deficiencies
Non-availability of high-performance equipment for	Doubts about commercial viability of natural gas; Poor	Security concerns Corruption

fractional separation of associated gas	payment records in downstream markets.	

Sources: Loe & Ladehaug, 2012; Orji, 2012; Hassan & Kouhy, 2013

Although Nigeria has not realized zero gas flaring, it has made modest progress as attested by the steady downward trend in the volume of flared gas since 2010. For instance, while the percentage of gas flared as opposed to gas produced was 19.32 percent in 2010, the figure consistently reduced year-on-year to 10.65 percent in 2016 before going up in 2017 to 11.05 percent and down to 11.04 percent in 2018 (DPR, 2018). Table 6 below shows the trend. It is important to note that the flare data by Nigeria's Department of Petroleum Resources contrasted with the data presented by the World Bank's Global Gas Flaring Reduction Partnership (GGFR) on Nigeria (DPR 2018; World Bank, 2020). The most likely explanation for the seeming discrepancies in the data could be linked to the methods adopted by both institutions to generate them. However, the most important point to note is that the data by both institutions showed a steady reduction in the percentage of flared gas in Nigeria.

Table 6: Data of Gas Produced vis-à-vis Gas Flared, 2010-2016

Year	Gas Produced (mscf)* (million)	Gas Flared (mscf) (million)	Percentage of Gas flared
2010	2,819.68	544.72	19.32
2011	2,966.65	503.94	16.99
2012	2,996.03	465.25	15.53
2013	2,811.98	427.97	15.22
2014	3,048.54	393.83	12.92
2015	3,003.17	330.93	11.02
2016	2,711.80	288.91	10.65
2017	2,937.93	324.19	11.05
2018	2,909.14	321.29	11.04

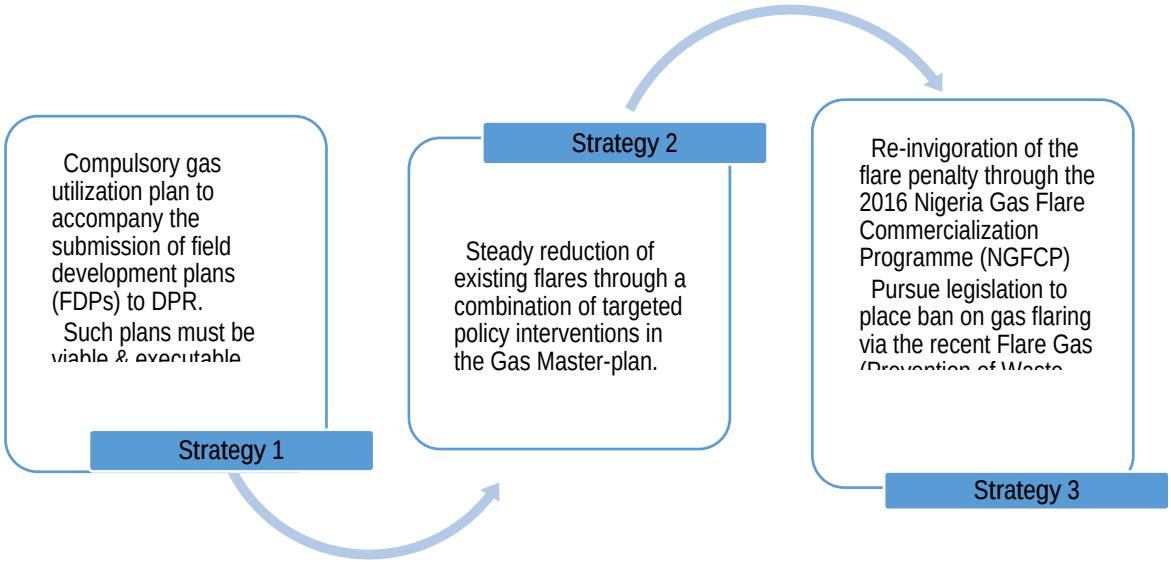
*mscf: million standard cubic feet. Source: DPR 2018, p. 57.

From available evidence, two interrelated factors appeared to have been majorly instrumental in the downward trend of the volume of flared gas in Nigeria. The first is the reduction in the number of flare sites. Using the Moderate Resolution Imaging Spectroradiometer (MODIS) flare detection technique in their study of the Niger Delta region between 2000 and 2014, Anejionu, Blackburn et al. (2015) detected 271 flare sites (190 onshore and 81 offshore). There were variations in the volume of flared gas during the period. Flaring activities peaked at 36 bcm in 2005 before declining between 2006 and 2009 with a brief increase from 2010 to 2011, followed by steady decline to the present levels (Anejionu, Blackburn et al., 2015). The reduction in the number of flare sites is attributed to three factors. The first is a decrease in the number of active flare sites through decommissioning and insecurity orchestrated by the Niger Delta militants. The second is a reduction in the rate of gas combustion as a result of reduced production from the wells contributing to flow stations. The third is the implementation of alternative strategies for dealing with associated gas by IOCs.

The last factor needs a little elaboration. The development of critical gas-gathering infrastructure by both the Nigerian government and IOCs is undoubtedly instrumental to the reduction in the volume of flared gas. This development expanded Nigeria's gas utilization profile. Apart from installing associated gas-gathering infrastructure at various oilfields in the Niger Delta by IOCs, several liquefaction facilities were established. For instance, in 1999, the Nigerian Liquefied Natural Gas facility at Bonny Island came on stream. This was

subsequently followed by the commissioning of additional gas plants at Kwale/Okpai in 2006, Okoloma in 2006 and Escravos in 2014 by Agip Oil Company, Shell Petroleum Development Company (SPDC) and Chevron respectively (Anejionu, Blackburn et al., 2015; Agbonifo, 2016; Jaillet & Laurent, 2017). Additionally, investments were made in the expansion of pipelines. Networks of pipelines to supply gas to various end-users in the electricity and industrial sectors were commissioned thereby deepening the domestic gas market

Figure 1: Nigeria's Strategic Plan to Stop Gas Flaring



Source: Designed by the authors from various policy documents.

Currently, Nigeria is working on consolidating the downward trend in the volume of flared gas. To actualize it, the government has evolved a strategic plan aimed at stopping gas flaring by 2020 as depicted in Figure 1 above. Although laudable, the plan has been criticized by experts as unattainable due to a combination of reasons, especially the absence of a clear-cut roadmap to its realization. But it remains to be seen in the years ahead whether the downward trend in flared gas has been institutionalized or a fortuitous occurrence.

Conclusion

This paper appraised the legal and regulatory frameworks enacted to drive the abatement of gas flaring in Nigeria. Since 1969, Nigeria never lacked the necessary legal instruments to combat gas flaring as it consistently evolved a plethora of laws to deal with the gas flare menace. However, none of the laws and the accompanying flare-out deadlines ever materialized in stopping gas flaring. The reasons for the non-realization of the flare-out targets are many. The major ones include initial unwillingness of IOCs to invest in gas-gathering infrastructure, systemic and institutional lapses, and the general inefficiency of regulatory agencies due to underfunding and political interference. As a result, for decades Nigeria was the second biggest gas-flaring state in the world after the Russian Federation. The lax system that characterized the implementation of relevant flare-out laws aligns with

the pollution haven hypothesis, especially within the context of the double standards in the operational modalities of IOCs.

Since 2010, Nigeria has made some remarkable progress by sliding down from second to seventh position among the biggest gas-flaring states in the world. The progress recorded did not stem from new stringent laws. It was also not because the regulatory agencies reinvented themselves and became dedicated to their mandates. Rather, the progress is correlated to the reconfiguration of the economic arena manifesting in the expansion of domestic and external gas markets. Therefore, an important lesson is the primacy of economics over legalism in inducing compliance among IOCs.

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