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# Analysis of the Legal Framework Governing Gas Flaring in Nigeria's Upstream Petroleum Sector and the Need for Overhauling

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**Abstract:** Nigeria is rated the number one producer of crude oil in Africa. Still, oil exploration activities have resulted in a high rate of gas flaring due to weak enforcement of the anti-gas flaring laws by the regulatory authorities. Associated natural gas is generated from oil production, and it is burnt in large volumes, thereby leading to the emission of greenhouse gases and waste of natural resources which could have generated billions of dollars for the Federal Government of Nigeria. There are concerns that if nothing is done to curtail this menace, humans and the environment will be imperiled due to its negative consequences. There is therefore a need to decrease gas flaring by replicating the strategies applied in the selected case study countries to combat the menace. It is relevant to carry out this analysis to reduce greenhouse gas emissions in the oil industry for the sustainability of the energy sector and to generate more revenues for the government. This study provides guidelines for legislatures on suitable approaches to adopt for formulating an anti-flaring legal framework. The study is a comparative analysis of national legal regimes on gas flaring in Nigeria, Canada, the United Kingdom, Saudi Arabia, and Norway. The study adopts a doctrinal legal research method, a point-by-point comparative approach with a library-based legal research method. The study finds that weak enforcement of laws is a critical factor responsible for the menace. It recommends the use of more advanced technologies, a sophisticated mixture of regulations and non-regulatory incentives such as fiscal policies and gas market restructuring, and proffers further suggestions based on the lessons learnt from the selected case study countries.

**Keywords:** gas flaring; enforcement of laws; global warming; environment; Nigeria

**JEL Classification:** K2; K42; Q4; Q5; P28; K32; K12

## 1. Introduction

Nigeria is endowed with enormous gas reserves of about 159 trillion cubic feet of natural gas, and it is ranked one of the top ten countries provided with natural gas in the world (Orlando 2006). An approximately 2.5 billion cubic feet of gas is declared as being flamed by the numerous oil facilities in Nigeria (Oyewunmi and Oyewunmi 2016). Gas flaring is the disposition of natural gas or associated gas that comes with crude oil during oil exploitation and exploration activities in the upstream petroleum sector. The aim of this study is to decrease gas flaring by replicating the strategies applied in the selected case study countries to combat gas flaring, to reduce greenhouse gas emissions in the oil industry for the sustainability of the energy sector, and to generate more revenues for the Federal Government of Nigeria (Olujobi and Olusola-Olujobi 2020).

Generally, gas flaring is an operational waste of energy resources in the petroleum sector that encourages greenhouse gas emissions. This is contrary to the 1992 United Nations Convention on

Climate Change and the 1997 Kyoto Protocol, which requires that governments reduce greenhouse gas emissions in the oil sector (Malumfashi 2007). Gas flaring occurs in the refineries, chemical plants, oil rigs, and landfills by burning off the flammable gas. It also occurs when oil companies burn off the extra gas that escapes due to oil drilling and other oil-related activities in the sector.

Studies have shown that in relatively advanced petroleum jurisdictions like the United States, petroleum companies process natural gas or re-inject the same into the field, and only 1% of the gas is flared, unlike in Nigeria where over 60% of the associated gas is flared daily. This could have generated billions of dollars to the Federal Government's treasury through the processing, distribution, and use of such gas as cooking or industrial gas (Agboola et al. 2011). This gas could also be used to generate electricity for the populace to end the incessant power outages, as the nation is currently experiencing persistent inadequate power supply and declining oil revenues due to the global oil price slump (Ojide et al. 2012). Owing to this, among other reasons, Nigeria is rated the seventh highest gas flaring nation globally by the World Bank's Global Gas Flaring Reduction Partnership (Nigeria National Petroleum Corporation 2017).

Gas flaring is an international concern and major source of air pollution with deleterious effects on climate and human health, which has prompted various studies which revealed that approximately 150 billion cubic meters or 5.3 trillion cubic feet of natural gas are burnt yearly with 400 million tons of emissions discharged annually. In Nigeria, nearly 800 million standard cubic feet (mmscf) of gas is flared regularly in 144 gas flare locations. Studies have also revealed that oil companies flared an aggregate of 301.69 billion standard cubic feet of gas in November 2016–November 2017 at the exchange rate of ₦360 to a dollar and the Domestic Supply Obligation rate of \$1.50 per 1000 standard cubic feet of gas—this means the forfeiture of ₦162.912 billion revenues which could have accrued to the Nigeria's Federation Account (Nigerian National Petroleum Corporation 2017).

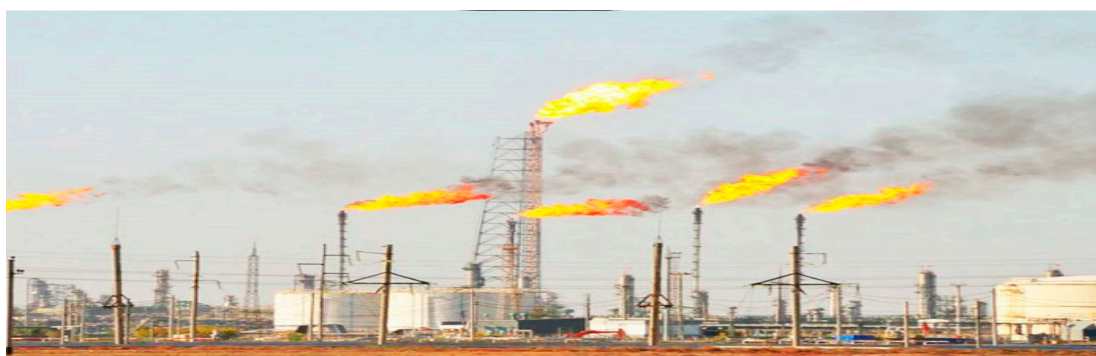
Additionally, the existing legal framework on gas flaring in Nigeria has remained ineffective due to poor enforcement and insignificant monetary penalties of ₦10 per thousand standard cubic feet imposed on defaulters, and this has given room for non-compliance and inefficiency of the law in combating gas flaring. One report has shown that the Federal Government loses approximately \$1 billion worth of revenues to gas flaring every year due to the lack of adequate infrastructure to commercialize flared gas in the sector (Fluenta 2019). In addition to the need to regulate gas flaring, there is a need to protect the environment from degradation, especially acute damage to the ecosystem as well as human health. This would generate more revenues to the Federal Government of Nigeria from gas as another massive source of revenues to cushion the effects of the current decline in global oil prices (Olujobi et al. 2020).

The Petroleum Act (Amendment) of 1969 and Associated Gas Re-injection Act 1979 (as amended), enacted to combat gas flaring and other environmental pollutions by compelling petroleum companies to make available their plans for gas re-injection in Nigeria, have not been implemented vigorously by the regulatory agencies in the sector to combat gas flaring. Gas flaring occurs in the oil-producing areas of the Niger Delta, and the Federal Government has made several attempts to combat it. However, associated gases are still being flared without any significant efforts made to preserve them, as the majority of petroleum companies wrongly assumed that they would not have substantial financial profits from the utilization and commercialization of associated gas in Nigeria due to an absence of gas infrastructure. The persistence of gas flaring is also attributed to the non-existence of modern technologies to utilize gas in Nigeria (Okorie 2018).

It is assumed that the exploitation of associated gas or re-injection gas is more costly than flaring due to the lack of storage facilities for associated gas at the rig site. For these and other reasons, the petroleum companies operating in Nigeria prefer to flare gas since it is cheaper and due to low investment prospects on associated gas utilization and an absence of sufficient incentives for gas utilization. Similarly, the inadequate gas infrastructure is attributed to limited markets for gas trading in Nigeria. The regulation of gas flaring through the legal and institutional framework is a global concern

that requires national efforts to combat it at the domestic level due to its deleterious consequences on individuals' well-being and the environment (Otitolaju and Dan-Patrick 2010).

The objective of this study is to analyze the legal framework governing gas flaring in Nigeria's upstream petroleum sector and recommend practical measures to end gas flaring in Nigeria to remodel Nigeria's anti-flaring laws using the insights gained to recommend the reform of Nigeria's anti-flaring laws by providing guidelines for legislatures on suitable approaches to adopt for formulating an anti-flaring legal framework for the sustainability of the energy sector. The paper is divided into five sections, with the remainder laid out as follows: Section 2 discusses the statement of the problems, theoretical framework, and national legal regimes for combating gas flaring. Section 3 describes institutional legal framework on gas. This study carries out a comparative analysis of national legal regimes of Nigeria, Canada, the United Kingdom, Saudi Arabia, and Norway on gas flaring in Section 4. Section 5 discusses factors militating against the effectiveness of national legal regimes for combating gas flaring in Nigeria, with some practical lessons Nigeria can learn from the selected case study countries to combat gas flaring. The paper ends with a conclusion and recommendations (see Figures 1 and 2).



**Figure 1.** Gas Flaring in Nigeria's Upstream Petroleum Sector. Source: Nigeria's New Gas Flare Agenda 2019, available at: This Day online Newspaper, <https://www.thisdaylive.com/index.php/2019/04/16/nigerias-new-gas-flare-agenda/> (accessed 16 September 2019).



**Figure 2.** Gas Flaring in Nigeria's Upstream Petroleum Sector. Source: NNPC Sets 2020 Target to End Gas Flaring, available at: <http://www.epiczone.com.ng/nnpc-sets-2020-target-end-gas-flaring/amp/> (accessed 16 September 2019).

## 2. Statement of the Research Problem

Crude oil is the mainstay of Nigeria's economy, with over 90% of its foreign exchange earnings from the sector, which has made it difficult for the Federal Government to enforce its anti-flaring laws stringently and consistently against gas flaring to avoid losing the multinational oil and gas companies' patronage of its oil. This has affected the diversification of its mono-economy from oil to

other agricultural products such as cocoa, groundnut, and palm oil to boost its dwindled economy (Oyewunmi 2018).

Furthermore, there are also allegations of the connivance of multinational oil companies with government officials in the sector to truncate the efforts of the Federal Government to exterminate gas flaring in compliance with the International Conventions for Sustainability of the Ecosystem. It is on record that Nigeria flared about 12.5% of the world's aggregate of flared gas (World Bank 2006).

In Nigeria, a series of dates have been set to end gas flaring without any serious commitment to enforcing the same. In 1969, the administration of Yakubu Gowon made an effort to combat gas flaring in Nigeria by ordering oil companies to acquire resources and technologies that will facilitate the use of associated gas in five years. The petroleum companies failed to obtain such resources to gather the flared gas. Similarly, in 1983, another deadline was also fixed as the zero-flare date with stringent penalties for non-compliance in 1984; the period was also shifted via executive orders. The time was further shifted to 1 January 2008 as a zero-tolerance flare date with a severe threat to winding up any company that infringed the rule, but no oil companies have been shut down since the deadline, despite non-compliance with the laws prohibiting gas flaring.

The study will address some of the hurdles to the Federal Government's efforts to eliminate gas flaring in the sector, such as a lack of finance to install essential modern technologies and infrastructure that could prevent gas flaring and the weak enforcement of legal, institutional, and regulatory frameworks for combating gas flaring and other environmental risks, which has aggravated Nigeria's gas operators' access to international and local gas markets for gas exports (Olujobi 2017).

### 3. Methodology

The objectives of this study were to analyse the legal framework governing gas flaring in Nigeria's upstream petroleum sector, to determine its efficacy in ending gas flaring in the upstream petroleum sector, and to recommend measures for ending gas flaring in Nigeria. To achieve these objectives, we used a library-based doctrinal legal research method, supported by a contextual legal analysis, including reference to internet sources, an extensive review of the academic literature, examination of case studies, and interpretation of relevant judicial and statutory provisions with comparative analysis of the legal framework for combating gas flaring in Nigeria, Canada, the United Kingdom, Saudi Arabia, and Norway. We chose the selected case study countries based on their zero tolerance for gas flaring and due to their favorable annual rating by the World Bank among other gas flaring countries in the world. This study adopted secondary sources such as academic journals, law books, and other primary sources such as case laws and gas statutes. The study suggests the need to use the lessons learnt from the selected case study countries to reform Nigeria's anti-flaring laws to improve the efficiency in the utilization of gas in the sector and boost Nigeria's economy (Olujobi and Olujobi 2020).

Some unstructured interviews with some upstream petroleum companies and regulatory bodies in the sector were conducted. The analysis further exposes the flaws in Nigeria's national anti-flaring laws. The aim is to remodel Nigeria's anti-flaring laws by using the insights gained to recommend the reform of Nigeria's anti-flaring laws. Poor record keeping culture and operational clandestineness of some petroleum companies and regulatory authorities in the sector limit access to some required information for the research, although its findings are suitable for dealing with gas flaring and other social menaces in other sectors of Nigeria's economy.

### 4. Theoretical Framework for Combating Gas Flaring in Nigeria

#### 4.1. Sustainable Development Theory

The Sustainable Development Theory 1980, which emanated from the Stockholm Conference on Human Environment in 1972, states that the government should sustainably use their extractive resources. According to the Brundtland Report, "Sustainability" is a development that satisfies the current necessities without compromising the ability and needs of forthcoming generations (Brundtland

Report 1987). It is a development where the utilization of extractive resources, the course of financings, the thrust of technological advancement, and institutional, legal framework are in conformity with the international best practices to enhance the current and future potential in the mid-stream gas sector to satisfy mortal needs with the aim of promoting harmony among human beings (humanity) and nature.

The theory is relevant to this study because it emphasizes that the use of natural resources should not jeopardize the value of a life of the present-day and upcoming generations and should not damage the ecosystem (United Nations Development Programme, United Nations Department of Economic and Social Affairs and the World Energy Council 2000). The theory emphasizes that human beings must be cautious of the way they manage natural resources to aid sustainable development in the sector through the proper management of petroleum resources to combat gas flaring by oil companies.

#### 4.2. Resources Curse Theory

Another theory that is pertinent to this research is the Resources Curse Theory, which is traced to 1970–1990. It emphasizes that natural-resource-abundant countries frequently suffer from weak economic growth. It puts forth that resource-wealthy countries lack economic prosperity and developments that are commensurate with their abundant petroleum resources due to corruption, failure to diversify their economies and natural resources to other natural endowments such as agriculture, solid minerals, among others, and failure to enhance their industrial developments to combat gas flaring and other environmental degradations. There is therefore a need for stringent enforcement of anti-flaring and other environmental laws in Nigeria to protect social, economic, and other environmental interests in the sector and to improve the welfare of Nigerians.

### 5. National Legal Regime for Combating Gas Flaring in Nigeria

In Nigeria, several legislative efforts have been made to combat gas flaring, particularly the provisions of sections 33(1) and 34(1) of the 1999 Constitution that guarantees the right to life and right to dignity of human persons. These rights can only be sustained through a clean and healthy environment, but section 3(2) (a) (b) of the Associated Gas Rejection Act (Amendment) 2004 and the Associated Gas Re-injection Bill, 2010, which allows gas to be flared with the consent of the Minister of Petroleum, is in contravention of the 1999 Constitution that guarantees right to life and right to dignity of human person. Therefore, the Act became null and void for being inconsistent with the provisions of the Constitution. Furthermore, sections 13 and 20 of Chapter two of the same 1999 Constitution of Nigeria (as amended) fail to make the breach of the duty of the Federal Government to protect Nigeria's environment from degradations enforceable. The Constitution fails to provide direct legal remedies for the aggrieved parties on environmental degradations. Additionally, the Associated Gas Re-injection Act was enacted to prohibit gas flaring on 1 January 1984, the gas flaring ultimatum date was later changed to December 2003, and it was subsequently moved to 2006, and was moved again from January 2008 to December 2008.

On 2 July 2009, the National Assembly enacted the Gas Flaring (Prohibition and Punishment) Act, 2009, with a gas flaring time limit fixed for 31 December 2010. The deserted Petroleum Industry Bill also set a gas flaring deadline for 2012 while the new Petroleum Industry Governance Bill, 2017, outlawed gas flaring. The Gas Flaring Prohibition and Punishment Bill, 2016, set the ultimatum for gas flaring to December 2016. Several deadlines with meagre sanctions were fixed by the Federal Government, which has not deterred gas flaring in Nigeria (Kachikwu 2016). It is quite unfortunate that the Gas Flaring Prohibition and Punishment Bill and Associated Gas Re-Injection (Amendment) Bill, which could have combated this challenge in Nigeria and minimized other ecological consequences of gas flaring, are pending at the National Assembly without any urgency of national importance attached to the bill by the Legislatures.

In addition, the Flare Gas Regulations (Prevention of Waste and Pollution 2018), are intended to combat greenhouse gas emissions via the flaring and venting of natural gas in Nigeria. The regulation adopts that the polluter pays principle with a carbon tax (Nnona 2003). It increased the penalty from

₦10 per thousand standard cubic feet for gas flaring (especially where the company produced more than 10,000 barrels of crude oil or more) to \$2.0 USD per thousand standard cubic feet of gas, and where the company produced less than 10,000 barrels of crude oil per day \$0.50 USD per thousand standard cubic square feet of gas. It sanctions failure to make available precise flare figures and denial to offer access to flare sites with suspension or termination of the company's operating license. It enforces the provisions of the Nigerian Gas Flare Commercialisation Programme, 2018. Still, it has not combated gas flaring due to weak enforcement and the poor monitoring scheme of the regulatory agencies given such responsibilities under the applicable anti-gas flaring and other relevant environmental laws in the sector (Olujobi 2017).

Furthermore, in an attempt to combat gas flaring and to transform flared gas to commercial benefits, the Federal Government initiated the Nigerian Gas Flare Commercialisation Programme (NGFCP) to transform the mid-stream sector with the penalty of \$2.50 per 28.317 standard cubic meter of gas flared each day for non-compliance with the reporting standard, with additional punishments such as revocation of oil license or lease by the Petroleum Minister in the case of willful disobedience by any oil company. The law will only achieve its objective if implemented stringently and consistently against gas flaring in the sector (Olujobi et al. 2018).

It is imperative to note that section 44 (3) of the 1999 Constitution of the Federal Republic of Nigeria (as amended) and section 1 (1) of the Petroleum Act 1969 (as amended) confers title to petroleum and other extractive resources on the Federal Government, but this does not impede the right to compensation from damage suffered or that occurred from petroleum exploration activities in the sector such as gas flaring, as emphasized in the relevant court cases on gas flaring (Oke 2012).

As part of the efforts of the Federal Government to combat gas flaring, the Department of Petroleum Resources is statutorily assigned to manage the oil sector as well as the national oil company (NNPC) through its subsidiary, the Nigeria Gas Company, which is assigned to regulate gas transmission and distribution in Nigeria with a monopoly of gas pipelines (a major concern for potential investors in the sector). Therefore, there is a need for explicit statutory guidelines on the roles of the agency, and there is a need for adequate gas pipelines for the efficient utilization of Nigeria's vast gas resources to boost the Federal Government's foreign exchange earnings from gas and to mitigate other oil and gas business risks in the sector.

In addition to these efforts, the Federal Government set April–October 1980 for oil companies operating in Nigeria to remodel gas application projects and to combat gas flaring. Similarly, in 1984, a fine was introduced into the Associated Gas Re-Injection (Continued Flaring of Gas) Regulations, which gave room for limited indemnities to flare gas in certain circumstances. It was also amended in 1985 with a fine of 2 kobo for non-compliance for each 1000 standard cubic feet of gas flared. The penalty appears to be insufficient, as evidenced by the constant and flagrant disregard for the rule. The Federal Government increased the fine again in January 1998 to \$11 USD for every 1000 standard cubic feet of gas flared by an oil operator, yet still gas flaring persists in the sector.

This prompted the enactment of the Associated Gas Re-Injection (Amendment) Act, 2004, which required detailed plans for gas utilization with zero tolerance for gas flaring by oil and gas companies except in the instances where exemption is granted by the Petroleum Minister. The sanctions prescribed by the Associated Gas Re-injection Act for the flaring of gas are inadequate, since the Act has not achieved its aims as companies prefer to pay the prescribed fines rather than commercialize the flared gas due to the low gas market in Nigeria. The gas flaring menace has been made worse by the decision of the Tax Appeal Tribunal in the case of *Mobil Producing Unlimited v. Federal Inland Revenues Services* (2015), where the court held that the prescribed punishments for gas flaring as enshrined in the Associated Gas Reinjection Act are tax-deductible. This erroneous decision implies that oil companies can flare gas as much as they desire, as much as the prescribed penalties are subtracted from their taxable incomes. This verdict appears to have aggravated gas flaring by oil companies in the sector.

Similarly, the National Policy on the Environment and Nigeria's National Agenda 21 was initiated by the Federal Ministry of Environment to enhance healthy air quality, standard and natural gas

preservation, with the aim of combating gas flaring and other environmental risks in the sector. Additionally, the Policy for Natural Gas Conservation and Development requires that production sharing contracts executed by oil companies must contain gas application clauses to combat gas flaring and to guarantee a healthy and sustainable environment. Gas companies are obliged to perform gas field optimization reports on their gas concessions to prevent gas flaring. Non-compliance with this policy has not attracted any severe sanction, as many oil and gas companies have not performed their gas field optimization, and none have been sanctioned for non-compliance with this regulation in the sector.

The Gas Flaring (Prohibition) Bill, 2017, is still undergoing legislative scrutiny at the National Assembly. Therefore, there is the need for a thorough review of the various notable gaps in the bill, especially the provisions on taxes and other fiscal policies to avoid double taxations and other avoidable legislative *lacunas* if the bill is finally crystallized into law for combating gas flaring. Similarly, the Downstream Gas Act aims to combat institutional policy restrictions on investments in the downstream petroleum sector. This Act may impede potential investments in the industry, especially where the government appears not to have enough political will to enforce its anti-flaring laws.

The National Environmental Standard Regulation Enforcement Agency (Establishment) Act (NESREA) 2007 expressly annulled the Federal Environmental Protection Agency Act (FEPA), 1988. NESREA aims to protect and develop the Nigerian environment, protect biodiversity, and ensure the sustainability of its extractive resources. Sections 7(g),(h),(j),(k),(i) and 8(g),(k),(l),(m),(n),(s) of the Act set up mobile courts for the speedy trial of those that violate its provisions, but the Act expressly prohibits the petroleum industry from its operations. The penalties for violations of its rules are penal without any requirements for civil remedies for victims of environmental laws infringements; this is another major flaw of the Act. It is pertinent to note that oil companies are excluded from environmental audits and from establishing a repository for the implementation of mechanisms on environmental standards. The justification for the exclusion of oil and gas companies from the Act by the legislature cannot be easily unraveled. The agency's power of investigations of oil pollution is limited to oil spillage, as stated under section 8(g) of the Act. The exclusion of oil and gas companies' environmental degradation and pollution from the scope of the agency appear to be a serious legislative setback in combating gas flaring in Nigeria's mid-stream and upstream petroleum sector. Therefore, it needs to be overhauled in order to deter gas flaring in the oil sector (Olujobi et al. 2018).

The Act made provision for combating gas flaring by oil companies being a legal entity and by its employees, who are individually prone to incarceration for a term not more than (ten) 10 years, respectively, but this sanction appears to be inadequate considering the damaging effects of gas flaring in Nigeria. Section 20(4)(5) of the Act allows the Minister of Petroleum to combat gas flaring, and in certain situations the Minister may award a special license to flare for a short period. Failure to conform to the Act attracts punishment not above the sum of ₦500,000,000.00. Section 27(2) of the Act prohibits the release of deleterious substances into the air, land, and water in Nigeria with a fine not above ₦100,000 or one year incarceration if committed by a legal entity upon conviction, and the agency can impose a supplementary fine of ₦50,000 on defaulters for each day that the infringement continues. These penalties appear too meager to combat the environmental degradations in the sector. An additional remedy such as restoration should be added to the remedies to discourage environmental abuses and gas flaring by oil companies.

The Petroleum Drilling and Production Regulation Act, 1969, was enacted in conformity with the Petroleum Act to oversee the petroleum exploration and production in Nigeria. Regulation 42 requires that oil companies submit a scheme for the application of natural and associated gas discovered in the course of oil exploration and for the companies to make use of advanced technologies or equipment for oil exploration activities. Still, most of the materials being utilized by these oil companies are obsolete and in poor shape, thereby making enforcement of this Act impracticable. Another flaw of the Act is the failure to define "Good oil field practice" or set the yardstick for estimating the oil field. The oil

companies in Nigeria have not complied with the Act; neither has the Act been implemented efficiently by the regulatory agencies in the sector to deter gas flaring (Jamilu Ibn 2016).

The Harmful Waste (Special Criminal Provisions) Act Vol. 7, Cap H1, LFN, 2004, section 6 prohibits the acquisition, trade, deposit, and storage of toxic waste with penalty of life imprisonment if found culpable of the offence, and where the offence was committed by legal entity, the officer of the company shall be liable except if the offence was committed with his knowledge. The major weakness of the Act is the failure to extend the Act to all forms of harmful wastes generated in the sector, including gas flaring. Multinational oil and gas companies have also failed to comply with the above provisions, and it has also not been strictly enforced by the regulatory authorities in the sector due to the absence of stringent sanctions under the regulation for non-compliance with its provisions. The laws appear not to conform with the current legal reality in the gas sector and the anticipated legal challenges in Nigeria. Therefore, there is a need for reform of the Act in conformity with the present-day developments in the international mid-stream sector. The improvement must inculcate zero tolerance for gas flaring and all forms of environmental degradation. Environmental protections for sustainability should be in place, and there is a need for active corporate social responsibilities by oil and gas companies in the sector to promote sustainable developments in Nigeria.

The Petroleum Industry Governance Bill, 2017, which replaced the Petroleum Industry Bill, 2012, prohibits gas flaring without any approval from the Petroleum Minister with a penalty not less than the worth of the gas flared by such oil company. However, the bill has not been assented to by the President to commence operation and deter gas flaring in the sector.

The Flaring (Prohibition and Punishment) Bill, 2010, prescribed stiffer penalties including closing down of oil fields that fail to comply with its provisions. The Environmental Management Bill, 2010, made the Directors of oil companies liable for gas flaring with ten years' incarceration or a fine of ₦500 million on conviction, but this bill has not been passed into law.

To combat gas flaring, the Federal Government also endorsed the Paris Climate Change Agreement and signed the Global Gas Flaring Partnership's principles to end global flaring by 2030. Similarly, Nigeria is committed to ending national gas flaring in 2020. The Federal Government is empowered by Paragraph 35b of the First Schedule of the Petroleum Act, 1969 (as amended), to capture the flared gas. This prompted the introduction of Nigerian Gas Flare Commercialisation Programme (as earlier said) to promote the technical and commercial sustainability of gas utilization in Nigeria through third-party investors to combat gas flaring and to enhance market driven by commercial structure which will enable flared gas to be merchantable in Nigeria and in other developed gas markets in Africa.

The various national legal frameworks enacted to combat gas flaring and to promote sustainable development and efficiency in the utilization of gas have not been effectively implemented, monitored, and evaluated by the various regulatory agencies assigned the tasks, due to lack of political will and lack of commitment to enforce the extant anti-flaring and environmental laws in the sector to combat the continuous flaring of gas by oil companies operating in Nigeria.

## 6. Statutory Institutions Regulating Gas Flaring in Nigeria

The statutory institutions given the responsibilities of regulating gas flaring, among others, are: The Ministry of Petroleum Resources and Energy, which is headed by the Petroleum Minister who is statutorily empowered to formulate policies regulating the oil industry via the Department of Petroleum Resources (DPR) to enact regulations for oil exploration and production in Nigeria. To reduce gas flaring, the DPR must efficiently perform its statutory function of regulating the oil sector by promoting transparent practices in the sector (Abisoye 2017). There is a need for the Federal Government to approve and release the ministries' budgets or allocations on time in order to motivate them to perform their statutory mandates or oversight functions efficiently in the sector.

Another institution regulating the sector is the Nigeria Gas Company (NGC). It governs the mid-stream sector to commercialize gas through the development of a fully integrated gas supply system. It has not lived up to expectations by fully optimizing the economic potential of Nigerian gas



for the economic benefits of Nigerians and potential foreign investors to end gas flaring and other environmental hazards in the sector (Ofuhie 2006). The Nigerian National Petroleum Corporation (NNPC) exercises both the fiscal and regulatory functions in the industry; it has twelve subsidiaries, encompassing the whole oil industry operations. The corporation should be allowed to compete commercially with other oil companies in the sector via its upstream petroleum subsidiary, the Nigeria Petroleum Development Company. NNPC should be given full autonomy devoid of governmental interference to enhance its full operation capacities like other legal entities operating in the sector. There is a need to restructure the corporation by separating its commercial roles from its regulatory functions in order to enhance its efficiency in the industry (Olujobi Olusola 2020).

A further statutory agency regulating the sector is the Federal Ministry of Environment, which was set up in 1992 to monitor the environment and to prevent environmental hazards in Nigeria, especially in the oil and gas sector. There is also the Niger Delta Development Commission (NDDC), which was created under the Niger-Delta Development Commission Act, 2000, as a result of the Federal Government's desire to end ecological problems in the oil-producing communities and to combat environmental and ecological problems associated with the petroleum sector's operations in the Niger Delta areas, as stated under sections 3,7 of the Act. The agency is challenged by mismanagement, corruption, and poor funding due to the failure of some oil companies to comply with section 14(3) (b) of the Act, which requires payment of 3% of the oil companies' budgets to the agency. There is also the problem of the persistent refusal of the Federal Government to fulfill its legal obligations by paying a 15% subvention annually to the agency. This has hampered the efficiency of the agency in performing its statutory functions in the sector (Krane 2019).

The activities of the regulatory authorities in the sector regarding gas flaring over the years appear to be uncoordinated and insufficiently proactive to combat the menace in the sector; therefore, there is the need for a total overhaul of the legal framework establishing the agencies for efficiencies in the discharge of their statutory responsibilities against gas flaring and other environmental hazards in Nigeria.

## **7. Comparative Analysis of National Legal Frameworks of Nigeria, Canada, the United Kingdom, Saudi Arabia and Norway for Combating Gas Flaring**

The choice of the selected case study countries was based on the transparent and proper management of their gas resources, which have eliminated gas flaring and other environmental degradation activities in their oil sectors. Furthermore, the selected countries are nations like Nigeria with vast oil and gas deposits that are relatively advanced mid-stream jurisdictions, with stringent anti-gas flaring legal frameworks. Nigeria can use the lessons learned to reform Nigeria's anti-flaring laws by replicating the strategies or legal templates of the selected case study countries' legal frameworks and efforts towards combating gas flaring.

The right to explore petroleum resources in Nigeria is vested exclusively on the Federal Government by the provision section of 44 (3) of the 1999 Constitution (as amended) and section 1 Petroleum Act, 1969 (as amended). However, in the United Kingdom, title to oil is conferred on the Crown as specified under the Petroleum Act 1998. The United Kingdom's Government does not take part in petroleum activities, but only collects corporate taxes, while in Canada, ownership of natural resources is divided between the Federal government, the provincial governments, first nations groups (Aboriginal rights), and private freehold ownership (Manning and Tamura-O'Connor 2019). To avoid regulatory conflicts in the sector, the Canadian Energy Strategy was established to promote transparency and efficiency in the administration of their oil sector. Canada is the fourth major exporter of natural gas and nineteenth significant proven natural gas reserves in the world (Olujobi and Oyewunmi 2017).

The Energy Utilities Board regulates the petroleum industry in Canada, while in the United Kingdom, the Department of Trade and Industry regulates the sector under the Petroleum Act. Similarly, the Nigeria Gas Company governs the industry in Nigeria. In the United Kingdom, the Energy Act,

1976, the fiat of the Secretary of State for Trade and Industry regulates the removal of natural gas by flaring or releasing unprocessed gas into the atmosphere in the sector.

It is vital to note that gas flaring is regulated stringently in Canada; flare licensing and records of flared and vented gas are the responsibility of the National Energy Board, a Federal energy regulatory body in Canada established by the National Energy Board Act. In Nigeria, the Nigerian Gas Company under the Ministry of Petroleum Resources regulates gas flaring and grants permits to flare gas, while in the United Kingdom, the UK's Oil and Gas Authority issues licenses, and the Hazardous Installations Directorate regulates gas supply and gas pipelines in the sector. Additionally, the Alberta Energy Regulator in Canada enforces its laws stringently against gas flaring. Consequently, many oil rigs have been shut down due to gas flaring, and many oil companies are going bankrupt. There are abandoned oil rigs that are no longer producing crude but which require hundreds of millions of dollars to remediate the gas flared in the sector.

In the United Kingdom, the primary legislation regulating oil and gas are the Energy Act, 1976, and the Petroleum Act, 1998 (as amended). These are the environmental statutes governing onshore hydrocarbon companies. In Nigeria, the Petroleum Act, 1969, Petroleum Regulations enacted according to the Act, the Associated Gas Re-injection Act, 1979, Associated Gas Re-injection (Continued Flaring of Gas) Regulation, 1985, Environmental Impact Assessment Guidelines, and the Effluent Limitation Regulations, 1991 (among others), comprise the legal framework regulating the sector.

The United Kingdom's Petroleum Act, 1998, requires each production facility to preserve gas and to avoid needless depletion of the ozone layer during oil exploration activities. The license to flare gas is for a long term of three years and flaring of less than forty tons per day ([Scottish Carbon Capture and Storage 2014](#)). The Flare Transfer Pilot Trading Scheme is another mechanism put in place to combat gas flaring in the United Kingdom through the trading of gas flaring volumes. Oil companies are allowed to sell unused flare gas volumes. This has declined gas flaring to 11% in the United Kingdom ([World Bank 2006](#)).

Similarly, the Federal Government of Nigeria also initiated a similar scheme called the Nigerian Gas Flare Commercialization Programme to transform flared gas to commercial benefits for the nation. Equally, the European Emission Trading Scheme was introduced to eradicate emissions by the European oil companies through payment for additional CO<sub>2</sub> grants; this has declined gas flaring in the sector ([Amaza 2018](#)). In Nigeria, the Department of Petroleum Resources authorized the flaring of gases that cannot be marketed, which are beyond oil companies' operational obligations, by assigning an Associated Gas Flaring License to combat gas flaring. At the same time, in Nigeria there is the need for Environmental Impact Assessment (EIA) which stipulates the procedures that must be followed in the planning process before the procurement of oil rigs. Section 62 of the same Act provides for a penalty of ₦100,000 for an individual or five years' incarceration or ₦50,000 for legal entities but not exceeding ₦100,000.

In the selected countries, gas may be flared for uninterrupted 48 h but not exceeding 144 h in a month, which may be due to equipment malfunctions. Every more extended period of flaring requires the Minerals Management Service's consent. It may permit oil companies to flare appropriate quantities of gas for one year as may be necessary to set up the equipment that would prevent gas flaring. However, oil companies are required to maintain comprehensive flaring data that are subject to regular inspection by the Minerals Management Service and other agencies statutorily empowered to do so. Generally, there is a standard mode of granting permission to flare and vent gas in the selected jurisdictions. Still, the Canadian province of Alberta has the most inclusive and transparent gas flaring and venting legal regime.

Nigeria has the highest level of natural gas emission for upstream petroleum company operation, which is fixed at 5000 µg/m<sup>3</sup>, with a flaring emission limit of 5 mg/m<sup>3</sup> hydrocarbons; other operational limitations are comprised in the guidelines. A fee is charged in consonance with the terms of the Associated Gas Reinjection Act. Nigeria imposes the paltry sum of ₦10 per mcf on gas flared; this is encouraging gas flaring in the sector instead of discouraging it. However, a country like

Canada (Alberta) should be emulated for putting in place comprehensive and transparent regulatory procedures. The successes achieved by the selected case study countries are attributed to their strong legal, regulatory regime, and the strong political will of their government to combat the menace in the sector.

Another selected case study country is Saudi Arabia, whose natural gas reserve is about 8.04 trillion cubic meters (284 trillion cubic feet). It was ranked 6th among the countries that have natural gas deposits globally, after Iran, Russia, Qatar, Turkmenistan, and the United States (BP). Saudi Arabia's national oil company (Aramco) outputs 109.4 billion cubic meters of gas annually. The country is a sovereign and independent nation-state with an absolute monarchical system of government, unlike Nigeria, which operates a Federal system of government. In contrast, Canada operates a Federal Parliamentary system of democracy. The United Kingdom operates a parliamentary system of government. Saudi Arabia is governed by the Holy Quran and some other existing laws such as the kingdom's Basic Law of Governance that govern its energy sector as provided under Articles 14 and 15 of the law. Written Constitutions govern Nigeria and Canada, unlike the United Kingdom which operates by an unwritten Constitution.

The Ministry of Petroleum and Mineral Resources regulates Saudi Arabia's oil sector, similar to Nigeria. It implements a strictly Saudi Aramco Master Gas System, while the Nigerian Gas Company implements Nigeria's Gas Master Plan, but inefficiencies and corruption have been an issue in the sector. Saudi Arabia's national oil company Aramco ensures the installation of flare gas recovery systems in every oil company facility with zero gas discharge technologies. Currently, unlike the selected case study countries, Saudi Arabia does not import or export natural gas to satisfy its citizens' domestic gas production and consumption needs.

However, some rhetorical questions demand attention: Why do countries like Canada and the United Kingdom have low levels of gas flaring? In contrast, Nigeria has excessive gas flaring rates. Further, why is it that many of the significant oil gas companies that operate in Nigeria and also operate in other advanced countries still flare in Nigeria but would not dare to do the same in Canada, the United Kingdom, or Saudi Arabia? The challenge in Nigeria has been poor enforcement of Nigeria's anti-flaring laws and an institutional framework that plays key roles in combating gas flaring in the sector. Further challenges are due to low human capacity, poor funding, and incoherent policy implementation by the regulatory agencies, among others, unlike in the selected case study countries which operate highly transparent legal regimes with stringent sanctions for non-compliance with their anti-gas flaring laws. Norway flared less than 2 cubic meters for every barrel of oil produced (Gerner et al. 2004). It has substantially reduced gas flaring through zero tolerance for gas flaring policy and efficient legal, regulatory, and non-regulatory measures with access to both domestic and international gas markets to enhance gas utilization. The Norwegian Petroleum Directorate and Ministry of Petroleum and Energy regulate the Norwegian mid-stream sector. It involves all stakeholders in the sector before taking regulatory decisions against gas flaring violation. This lies in contrast to Nigeria, where there is a poor legal framework for flaring management. The enforcement of anti-flaring laws needs more human, regulatory, and statutory authorities' efficiency to combat the menace in the sector.

We therefore opine that prescriptive approaches should be adopted to end gas flaring in Nigeria by compelling oil and gas companies to comply with gas flaring and venting regulations with stringent sanctions for non-compliance. Appropriate incentives for compliance with the gas flaring legal regime will enhance suitable governance structures, and it will also combat gas flaring efficiently in the sector.

## **8. The World Bank Ranking of the Selected Case Study Countries among Other Gas Flaring Countries in the World**

Billions of cubic meters of natural gas is flared yearly at oil exploration sites across the globe. Flaring gas squanders a significant energy resource that could be utilized to boost economic development and growth. It also aids climate change by emitting millions of tons of CO<sub>2</sub> to the atmosphere. The

World Bank Group has a role to play in combating gas flaring reduction via the Global Gas Flaring Reduction Partnership, a public-private initiative comprising international and national oil companies, national and regional governments, and international institutions to intensify the usage of natural gas associated with oil production by facilitating remove technical and regulatory hurdles to flaring decline via research and development (see Tables 1 and 2).

**Table 1.** The 2018 World Bank Ranking of the Selected Case Study Countries among Other Gas Flaring Countries in the World.

Serial/Number	Countries	Gas Flared in 2018 (billion cubic meters)	Position
1.	Nigeria	7.4	7th
2.	Saudi Arabia	2.3	12th
3.	Canada	1.3	22nd
4.	United Kingdom	1.2	23rd
5.	Norway	Less than 2 cubic meters for every barrel of oil.	The country has substantially reduced gas flaring through efficient regulatory and non-regulatory measures.

Source: World Bank: Gas flaring volumes 2014–2018 (billion cubic meters) Available at: <http://pubdocs.worldbank.org/en/603281560185748682/pdf/Gas-flaring-volumes-Top-30-countries-2014-2018.pdf> (accessed 16 September 2019).

**Table 2.** Comparison of Gas Flared in Nigeria, Canada, the United Kingdom, Saudi Arabia, and Norway with the Approved Penalties.

Countries	Gas Produced	Gas Flared	Penalties	Quantity of Gas Utilized	Remarks
Nigeria	Two billion standard cubic feet of gas is produced per day.	About 324 billion standard cubic feet (bscf) of gas is flared (as much as 40% of the natural gas is produced. (Nigeria National Petroleum Company 2018).	A penalty of ₦612.80 per thousand standard cubic feet of gas. A penalty of ₦50,000 or (six) 6 months incarceration or both, for anyone who provided inaccurate flare data. (Prevention of Waste and Pollution 2018).	About 22% of the gas produced is used commercially, and approximately 12% is re-injected. (Nigeria National Petroleum Company 2018).	Gas sales volume is approximately 350 million standard cubic feet per day (mmscf/d).
Canada	In 2016 the gas production was 431,106 m <sup>3</sup> /d (15.2 bcf/d). (National Energy Board 2017).	Approximately 3% of the gas produced is flared with permit or license and sanction for infringement.	Can \$100,000 per day for infringement by oil companies.	Almost 95% of the gas produced is utilized.	Gas market is fully liberalized and deregulated and about 95% of its gas is utilized.
United Kingdom	2.735 trillion cubic feet (tcf) of gas per day.	In offshore installations, 3.82 million cubic meters of gas are flared per day. Gas flared is about 3% of oil produced. (Department of Business, Energy and Industrial Strategies 2018).	The penalties are unlimited fines, imprisonment, and revocation of the operating license.	About 95% of the gas produced is utilized annually.	The “Polluter Pays”—the court strictly applies the principle in all flaring and environmental law provisions infringement cases in the sector.
Saudi Arabia	Saudi Arabia’s gas production has risen by nearly 60% over the decade from 71 to 110 billion cubic meters (bcm). (BP).	Less than 0.6 billion cubic meters (bcm) of gas is flared per year. This is an excellent reduction in the quantity of gas flared.	The government enacted a policy that makes it mandatory for industrial usage of gas to generate electricity, water, and for the production of chemicals for export. A uniform gas price of \$0.50 USD per MMB was introduced.	Approximately 50 billion cubic meters per year. It is expected to increase over time.	Other economic benefits such as the extraction of ethane and natural gas liquids from the associated gases were derived from the mid-stream sector to raise revenues for the government, which Nigeria can replicate in the industry.
Norway	Norwegian net gas produced is 123 bcm.	Flaring is not allowed under any economic conditions, but one may secure a waiver in exceptional cases.	CO <sub>2</sub> tax of \$120 USD per ‘000m <sup>3</sup> gas flared at production facility and reduction of production volumes.	About 45% of Norwegian gas is exported.	Zero tolerance for gas flaring through strict enforcement of their anti-flaring laws to prevent environmental degradations in the sector.

The authors prepared the table but the contents were sourced from other literatures which are properly referenced.

## 9. Some Selected Dates Previously Fixed to End Gas Flaring in Nigeria by the Federal Government

Several efforts have been made by various administrations in Nigeria to combat gas flaring but lack of political will and poor enforcement of the anti-flaring laws have been the challenge against successful combat of gas flaring in Nigeria. Some selected dates previously fixed to end gas flaring in Nigeria by the Federal Government are listed in Table 3:

**Table 3.** Some Selected Dates Previously Fixed to End Gas Flaring in Nigeria by the Federal Government.

S/N	Dates	Government/ Administration in Power	Reasons Given for Non-Compliance by Oil Companies	Remarks
1.	1969	Yakubu Gowon	Lack of finance to construct a gas re-injection plant (technologies) within the stipulated time.	The Federal Government set new deadlines every year due to lack of commitment and political will to enforce its anti-flaring laws.
2.	1983	Muhammadu Buhari	High cost of re-injecting gas in Nigeria.	Lack of commitment and absence of the political will of the Federal Government to enforce its anti-flaring laws stringently.
3.	1984	Same as above	Due to the flaw in the Act which requires a license to flare from the Minister for a fee.	Weak enforcement of Nigeria's anti-flaring laws by the regulatory authorities in the sector.
4.	2003	Olusegun Obasanjo	The alleged failure of the government to engage the oil companies before fixing the deadline date.	The non-compliance with the deadline exhibits a lack of commitment and absence of the political will of the Federal Government to enforce its anti-flaring laws.
5.	2004	Same as above	The claim that the deadline date was not expressly spelled out in the legislation or regulation.	Same as above.
6.	2008	Umaru Musa Yar'Adua	Same as above.	Same as above.
7.	2009	Same as above	Same as above.	Same as above.
8.	2011	Goodluck Jonathan	Lack of finance to install gas infrastructure to end gas flaring.	Absence of commitment and political will of the Federal Government to enforce its anti-flaring and other environmental laws in the sector.
9.	2012	Same as above	Same as above.	The excuses given by oil companies are not tenable. The government must wake up to its responsibility of preserving the environment, health and wellbeing of its citizens.
10.	2020	Muhammadu Buhari	It is anticipated that they will comply in 2020.	Gas flaring will be a thing of the past through stringent enforcement of Nigeria's anti-flaring laws and regulations with incentives for gas utilization in the sector through the implementation of the Nigeria Gas Flare Commercialisation Programme (NGFCP) to monetize flared gas fields. Except where oil companies are issued with a Certificate of Continue Flaring by the Petroleum Minister in accordance with the provisions of the Associated Gas Re-injection (Continued Gas Flaring) Act.

The table was prepared by the author but the contents were sourced from other literatures which are properly referenced.

## 10. Solutions for Combating Gas Flaring in Nigeria's Oil and Gas Sector Based on the Lessons Learnt from the Selected Case Study Countries

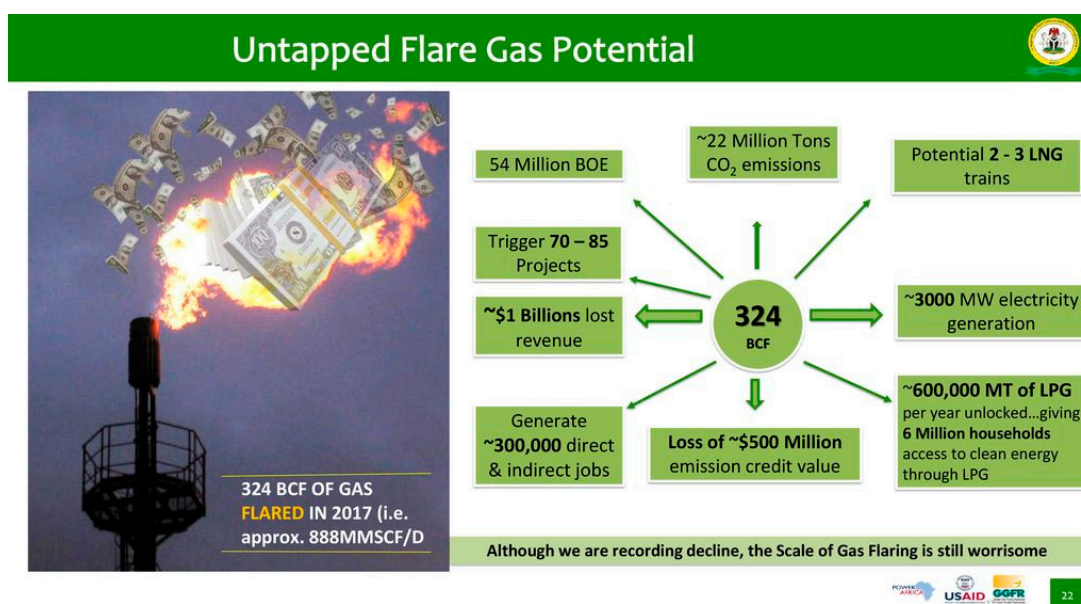
There is a need to enhance gas network equipment to reduce gas flaring in Nigeria's upstream petroleum sector and to encourage gas export as it is practiced in the United Kingdom, Canada, and Saudi Arabia. There is a need to improve gas network infrastructure in order to improve the domestic gas market and to encourage optimal usage of liquefied petroleum gas and to reform the current gas pricing structures to encourage investments in Nigeria as in the selected case study countries. The countries made it mandatory for big oil companies to make use of gas for the production of electricity and other usages in the sector. The Federal Government must encourage the domestic usage of cooking gas and other industrial gases in Nigeria. This will promote the commercial utilization of gas, and it will reduce gas flaring. Gas flaring is a global threat; there is a need for robust regulatory and financial incentives for gas utilization. The selected case study countries encourage gas utilization through gas incentivized legislations.

The Federal Government needs to encourage the optimal usage of gas to generate electricity by electricity production or generation companies through legislations with enticing incentives for compliance with the laws. The selected case study countries have mechanisms in place for tracking flared gas by oil and gas companies with consistent flare monitoring and evaluation schemes by government agencies. Regulatory authorities also have adequate monitoring and enforcement powers to enforce anti-flaring laws. This can be replicated in Nigeria to combat gas flaring in the sector. The selected case study countries stipulate expressly in their laws when petroleum companies or gas operators can flare associated gas without prior approval of regulatory authorities similar to what obtains under the Nigerian legal provisions but this is done in the selected countries with effective gas flaring measurements instruments. To prevent abuse of this procedure in Nigeria, there is a need to put in place control mechanisms to benchmark the circumstances in which gas operators can flare without prior approval. This must be clearly defined in the law with effective gas flaring measurement instruments, such as Fluenta's FGM 160 Flare Gas Meter, which uses ultrasonic technology for accurate gas flaring measurement and accurate reporting procedure. This will ensure compliance with the existing anti-flaring legal regime and it will prevent corruption and other sharp practices in the sector.

The regulatory agencies in the selected case study countries have developed clear and efficient operational procedures or processes for combating gas flaring in the sector. There is a need for strict enforcement of Nigeria's gas master plan to entrench zero tolerance of gas flaring in the sector. Transparent gas flaring application and approval procedures must be established in the mid-stream sector. There are strict anti-flaring legislations in the selected jurisdictions which empower their regulatory agencies to combat gas flaring effectively in the sector. Regulatory agencies' responsibilities are clearly defined to avoid overlapping of functions. They are independent from oil and gas operators. This prevents conflict of interest. Regulatory agencies in Nigeria's oil and gas sector must be properly staffed, incentivized, and funded to ensure strict enforcement of the existing anti-flaring laws in Nigeria.

The laws regulating petroleum activities and the contractual agreements between the Federal Government and the oil companies should be detailed on the management and elimination of gas flaring. Licenses should be issued to new oil companies, and license renewals, production sharing arrangements, and joint venture agreements should contain anti-flaring clauses and gas utilization clauses in all the projects. This would eliminate gas flaring with stringent penalties such as the revocation of oil licenses or leases and the payment of monetary damages for non-compliance, as is practiced in the selected case study countries to discourage gas flaring.

The legal regimes for combating gas flaring must not be ambiguous; they must entail proactive monitoring, reporting, and enforcement mechanisms. Fixing a deadline to end gas flaring must be done *consensus ad idem* by all stakeholders in the sector for a feasible date to exterminate gas flaring with stringent penalties for non-compliance after the agreed dates by all stakeholders in the sector. To combat gas flaring as in the selected case study countries, it is necessary to benchmark oil production with the capacities for gas utilization by the prospective oil and gas companies operating in Nigeria before issuance of relevant operating oil license(s) by the Department of Petroleum Resources (DPR) so as to end the gas flaring menace in the sector (see Figure 3).



**Figure 3.** Untapped Flared Gas Resources in Nigeria. Sources: Nigerian Gas Flare Commercialization Programme, available at: <http://www.ngfcp.gov.ng/about-us/our-mandate/our-strategy/> (accessed 16 September 2019). Define BOE.

## 11. Discussion of Findings

- In view of the legal instruments discussed above, it is observed that there is currently no efficient legal framework for gas flare management in Nigeria. The enforcement of laws need more efficiency on the part of human, regulatory, and statutory authorities. We also observed the absence of advanced technologies to capture flared gas for electricity generation and to eliminate gas flaring in the sector.
- Poor enforcement of anti-flaring laws due to low human capacity and poor funding makes greater private sector participation in gas distribution networks necessary to ensure gas availability, development, increased gas utilization, and to increase its economical storage to reduce gas flaring.
- There is also no efficient regulatory legal framework with techniques for computing, monitoring, appraising, and enforcing anti-flaring laws' provisions with compulsory installation of advanced modern operational equipment for measuring flared gas and for eliminating gas flaring and venting in many developing countries. Oil companies operating in this domain tend to abide by their discretionary operational practices that often contravene national environmental protection laws and international best practices, which has resulted to various environmental risks in the sector.
- It is the view of the writers that, for there to be an effective regulation of gas flaring, the Acts must be comprehensive and provide for the computation and reporting of volumes of gas flared and vented, which would in turn provide for precise data about gas flaring and venting volumes to the regulatory authorities for combating the menace in the sector.
- This study found that flaring rates have declined in the selected case study countries, while in Nigeria flaring is still at its highest level despite the existence of numerous anti-flaring laws. Strict regulatory measures were put in place in the selected case study countries making it compulsory for oil companies to submit their environmental impact assessments on expected emissions and discharges from gas flaring and to state detailed precautionary measures put in place for mitigating the environmental impacts of their activities in the sector. Nigeria can replicate this to combat gas flaring in the sector.
- The limitations of the study include the absence of accurate data on the quantity of gas produced and the volume of gas flared in the oil fields by oil companies in Nigeria. This would have

enhanced insight into the levels of gas flared and vented in the sector and enhanced the solutions for combating gas flaring.

## 12. Recommendations

- Environmental protection laws must have adequate provisions for combating oil and gas pollution, degradation, and gas flaring. The National Environmental Standard Regulation Enforcement Agency (Establishment) Act (NESREA), 2007, should be amended to extend its purview to oil and gas sector pollution and other environmental degradation in the sector to combat gas flaring.
- Section 20 of the 1999 Constitution (as amended) on the enforcement of environmental objectives should be overhauled and move to the Fundamental Human Rights in chapter four of the 1999 Constitution, thereby making environmental infringements justiciable. This would thus protect and guarantee a healthy and sustainable environment. The right to a healthy environment would deter gas flaring by oil companies through the payment of monetary damages to the Federal Government and the victims of their environmental degradation, thereby promoting stringent compliance with the anti-flaring policies and other enabling environmental laws in the sector.
- Enactment of the detailed, fiscal, legal and regulatory framework governing gas utilization and development would unbundle the gas pipeline networks, with effective gas distribution to all zones in Nigeria. There is also the need for a review of the regulatory framework with a satisfactory operational mechanism to ensure proper implementation of anti-flaring and other environmental laws and regulatory policies in the sector. Nigeria is referred to as a gas province because of the tremendous economic benefits the sector will offer the nation if gas flaring is combated. This would enhance gas distribution networks in Nigeria.
- Oil companies should update their drilling tools in conformity with international standards to end gas flaring through the utilization of modern technologies. This would guarantee environmental protection and natural resources management. Regulatory policies should be transparent, with incentives for gas development. Again, there is the need for oil companies to implement environmental management systems that will determine the possible environmental impacts of their activities and to put in place appropriate measures to combat gas flaring.
- The Federal Government should increase electricity generation in Nigeria through the use of gas to earn more revenues for the Federal Government through the local utilization and exportation of gas. The installation of gas flare meters with data and gas recovery mechanisms, independent reporting, and scrutiny by the Nigerian Gas Company are essential in the sector. Stringent financial sanctions for non-compliance with Nigeria's anti-flaring laws would combat gas flaring. Regulatory bodies assigned the tasks of regulating the mid-stream sector in Nigeria should be overhauled due to the poor enforcement mechanisms of the existing anti-flaring laws.
- The requirement under the Nigeria Gas Flare Commercialisation Programme (NGFCP) that investors or licensees are to execute, deliver, or pay the oil company for the agreements to flare gas is bound to give room for the utilization of large-scale gas, and the Programme will be legally responsible for reimbursing the gas investor if the agreed quantity of gas is not produced. However, petroleum companies may not be eager to accept this commitment because flared gas is based on the production of crude oil, which is also based on their upstream petroleum activities and economic assessments of their operations by their management. Any legal framework that requires oil companies to provide an absolute magnitude of flared gas—especially at a time when the demands and production of crude oil have dropped globally—may be favorable, but it might dampen investments in the gas sector.
- The standard Production Sharing Contracts clauses 3.3 made provision for reward for obtaining finances at interest and assuming operational risks such as exploration and production risks by petroleum companies, which are commercial concerns in the growth of petroleum and gas markets. This may hinder the Federal Government's powers to issue permits to petroleum financiers to capture flare gas from oil fields, which was exploited under a production sharing



contract, except such petroleum companies offer to share in the incomes accruing to the Federal Government from the agreement.

- There is a need for more gas pipeline networks to be created to enhance the domestic usage of gas and to reduce its flaring. Gas prices should be reasonable and competitive with other forms of energy, which are dictated by the market forces. This will encourage investors to invest in the sector, deter the waste of gas resources, and reduce environmental risks. An explicit master plan is needed for the construction and networking of a national gas transmission and distribution network, since this is *sine qua non* for the national development and sustainability of gas resources in the sector.

### 13. Conclusions

This research examined the various approaches adopted by the selected case study countries and lessons Nigeria can learn from the selected case study countries in combating gas flaring. The research also evaluated several efforts made by the Federal Government of Nigeria to tackle gas flaring in 2020. The flaws of the various laws examined were brought to the fore. Suggestions were made, where suitable, for addressing the flaws. Regulatory authorities should generate practical and reasonable ways of monitoring compliance in relation to the volume of gas flared or vented, vis-à-vis the permissible levels of gas utilization. Strict implementation, monitoring, and enforcement of the Nigeria Gas Flare Commercialisation Programme will save the huge revenues lost to gas flaring for the Federal Government, which could have been utilized for infrastructure development and to enhance power supply in the country. The strict implementation of environmental protection laws would enhance ecological development and the financial viability of oil-producing communities in Nigeria, in addition to combating unfriendly practices in the sector through the stringent implementation of strategic environmental protection measures to combat gas flaring.

A national gas transmission grid is needed for easy access to gas by potential users in Nigeria to enhance gas utilization and development through private sector participation projects with detailed and practicable gas policy for the nation to encourage gas investors and to end over-reliance on impromptu policy statements by public officials as governing policies in the sector.

To make the regulation efficient, the regulatory authorities must enforce anti-flaring laws without fear or favor to ensure total compliance with the anti-flaring and other environmental laws to combat gas flaring in Nigeria's mid-stream sector. The optimal development of gas reserves with more advanced technologies will provide enormous economic benefits to Nigeria and the African continent if executed adequately by the regulatory authorities assigned the responsibilities of enforcing the laws for combating gas flaring and other environmental degradations in the sector.

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