

## **OPPORTUNITIES, CHALLENGES AND OBSTACLES TO ECONOMIC GROWTH AND SUSTAINABLE DEVELOPMENT THROUGH NATURAL GAS IN NIGERIA**

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### **ABSTRACT**

Nigeria is increasingly a hub centre for natural gas with sustainable economic growth and development in addition to the prospect of sustained environmental benefits. The environmentally friendly, cost effective and cleanliness aspect of natural gas makes it the first choice for energy users. Thus, this paper identified environmental, social and economic, wealth creation, employment generation and sustainable development as some fundamental benefits of natural gas development. While there are some invaluable opportunities from natural gas, however, there appear some obstacles. The paper revealed that obstacles are deeply rooted in dearth of gas gathering and distribution infrastructure, fiscal and regulatory policy, funding, and more importantly, the prevailing security situation in the main gas supply source, the Niger Delta region. It concludes that the absence of enabling environment for private participation on gas development, lack of energy intensive plants across Nigeria to utilise vast proportion of natural gas and the imposition of price control mechanism are serious threat to gas development.

**Keywords:** Natural Gas; Joint Ventures (JV); Domestic Gas Market; Sustainable Development; Gas Pipelines; Gas Development; Gas Utilisation

## INTRODUCTION

Natural gas is a key source of energy, and supplies around one-fifth of the global energy needs, compared with one-third from crude oil and one-quarter from coal (Jacobs 2011). It is clean burning, environmentally friendly (see table 1 below) and has a wide variety of uses, particularly for the Nigeria power generation which accounts for bulk of natural gas usage in the domestic sector of the economy. Natural gas is considered the cleanest of all fossil fuels and a source of lower cost, sustainable fuel for power generation for industrial and commercial customers alike for economic development. Nigeria earning from natural gas has increased substantially as a result of sustained growth in the Liquefied Natural Gas (LNG) project and measured by the employment and other socioeconomic benefits it creates.

*Table 1: Differences between Oil and Gas*

<b>Particular</b>	<b>Crude Oil</b>	<b>Natural Gas</b>
Energy density	High	Low
Storage	Inexpensive/easy	Expensive/difficult
Transport	Inexpensive/easy	Expensive/difficult
Infrastructure	No need for pressure vessels	All pressurized or cryogenic
Market	Fungible	Tied to dedicated infrastructure
Environment	More pollution/higher CO <sub>2</sub>	Lower CO <sub>2</sub> /cleaner burning

*Source: Global Gas Flaring Reduction (2013)*

With the world's 9<sup>th</sup> largest estimated gas reserves of 182 trillion cubic feet already discovered (BP 2012), Nigeria natural gas production with little or no sulphur constitutes a sizeable export market of the economy. With steady growth in reserves and recent discoveries in the deepwater basin, natural gas reserves potential is estimated at about 600 trillion cubic feet, which makes Nigeria the 4<sup>th</sup> largest gas reservoir after Russia, Iran and Qatar (Economides 2014). Natural gas is also destined to drive Nigeria's economic growth, environmental preservation and sustainable development because of growing global energy demand skewed in favour of natural gas.

In domestic terms, natural gas is being relied upon as the fuel to power the Nigeria's economy, and the expected growth in the power sector translates into a significant gas demand (NNPC 2006). Nigeria is now well positioned to contribute to the global gas supply needs sustainable whilst ensuring its availability in the domestic gas supply chain for social and economic development. Initial effort was focused on the international export market geared towards gas monetization and environmental sustainability. There is now a deliberate and dramatic shift in gas development in favour of integrated infrastructural development to support the domestic market and regional export of natural gas. Thus, the Nigerian gas sector is now well positioned to respond to the global energy market demand through the LNG. This is the most ambitious gas project in Nigeria, with a capacity of 22 metric tons per annum, on course to being 30% of total Atlantic LNG capacity and the second fastest growing LNG in the world (EIA 2015). Similarly, BP Statistical Review (2014) argued that Nigeria exported about 800 billion cubic feet of LNG in 2013, representing 7% of globally traded LNG and ranking Nigeria among the world's top 5 LNG exporters. The West African Gas Pipeline (WAGP) is continuing apace with the export of 21 billion cubic feet of gas in 2013 (Cedigaz 2014). There are other gas projects to stimulate economic growth, such as the natural gas liquids (NGL), liquefied petroleum gases (LPG), gas to liquids (GTL), escravos gas-to-liquid (EGTL), the OSO NGL recovery, Brass River LNG, Olokola (also known as OK) LNG and the proposed Tran-

Saharan Gas Pipelines Project (TSGP). Future residential gas market development is only feasible for cooking, as the temperature condition in Nigeria does not encourage space heating which constitute the bulk of natural gas consumption in Europe and America.

For the most part until the late 1990s, natural gas was regarded as a by-product of oil exploration and production process and did not receive any major attention compared to crude oil. This was due mainly to the need and desire of the multinational oil companies (MNOCs) whose preference and focus was crude oil, the level of industrialisation, lack of adequate regulation, lack of domestic market and government policies on subsidisation of petroleum products (Obaseki 1996; Kupolokun 2006). Thus, for many years natural gas was either flared or neglected if encountered in the course of crude oil exploration with obvious socioeconomic and environmental impact. Regulations meant to encourage gas utilisation have been poorly enforced and severely frustrated on the guise of lack of natural gas users.

Nevertheless, the Nigerian gas sector is still in its infancy, with significant opportunity for transformation to deliver economic growth and sustainable development. While the export market has assumed a modest beginning through the LNG and the WAGP, however, the domestic gas market development has been severely hampered by some obstacles. Many studies (Asikhia and Orugboh 2011; Elenwo and Akankali 2014) identified underdeveloped domestic market, poor gas infrastructure, lack of gas policy framework and fiscal incentive, remoteness of location, technical limitations, and uncertainty as fundamental and possible limitation of gas development in Nigeria.

## **OIL EXPLORATION AND GAS DEVELOPMENT IN NIGERIA**

Oil exploration in Nigeria dates back to 1908 when the Nigerian Bitumen Corporation, a German Company, pioneered the initial effort in Araromi area in the present Ondo State. This was interrupted by the outbreak of the First World War in 1914. In 1937 Shell D'Arcy (now Shell Petroleum), got the concessionary rights in the whole of Nigeria, but ended abruptly because of the Second World War. Meanwhile, oil exploration activities resumed yet again in 1947 after the war. After committing some ₦30 million financial investments for several years, crude oil was eventually discovered in commercial quantity in 1956 at Oloibiri in the present Bayelsa State of the Niger Delta region (Aigbedion and Iyayi 2007). Production for export of initial 5,100 barrels per day of crude oil from the Oloibiri field started in 1958 and Nigeria became a major player in the oil and gas industry and assumed the status of an oil producing country. By 1961 most MNOCs have made their way into the Niger Delta (onshore and offshore) territory, and production has jumped up to 2.1 million barrel per day in 1970 resulting in the so-called oil boom and unprecedented wealth creation for Nigeria.

There are over 159 oil field locations operated by MNOCs in Nigeria, producing from over 1,481 oil wells with a substantial proportion of associated gas almost exclusively in the Niger Delta region (Dule and Nwankwo 2001; Peterside 2007). More fundamental, Sonibare and Akeredolu (2006) aptly noted that the Nigerian oil and gas industry has grown very rapidly within the last decades, assuming a dominant state in the Nigeria economy, replacing agriculture which was the cornerstone of the nation's economy in the 1960s. However, the oil and gas industry has remained largely an enclave unto itself having a few forward and backward linkages to the rest of the Nigerian economy (Orubu et al 2004; Obi 2010). Within the last decades, natural gas has continued to evolve with proven potential of being a key energy in the emergent global natural gas market to foster sustainable development

Natural gas production in Nigeria is an integral part of the crude oil production process, because in many oil fields, large volumes of associated gas are produced with crude oil when it is brought to the surface (Diugwu et al 2013). This is particularly true of the oil and gas exploration activities in the Niger Delta region, (which represent 85% of total oil and gas production) where a substantial proportion of crude oil and associated gas are mixed in every oil deposit (Shell 2011). Realistically, Peterside (2007) argued that larger volumes of gas produced in Nigeria are associated gas, but considerable reserves of non-associated gas remain unexploited which demonstrates that there is no deliberate effort to explore for natural gas in Nigeria as the present crude oil sites are almost exclusively the production sites of natural gas. Commenting on the techniques to remove natural gas in an oil production process, Edino et al (2010) argued that re-injection into the reservoir to enhance oil production, harvesting for commercial uses and the burning of the associated gas, known as gas flaring are the possibilities. While the first two options are the practices in many developed countries, including the United Kingdom, North Sea oil field and Canada, Alberta oil field, however, the latter is the most common practice in Nigeria because it is economically expedient to flare than to invest in natural gas development technologies.

*Table 2: Gas production and utilisation in Nigeria (scf)*

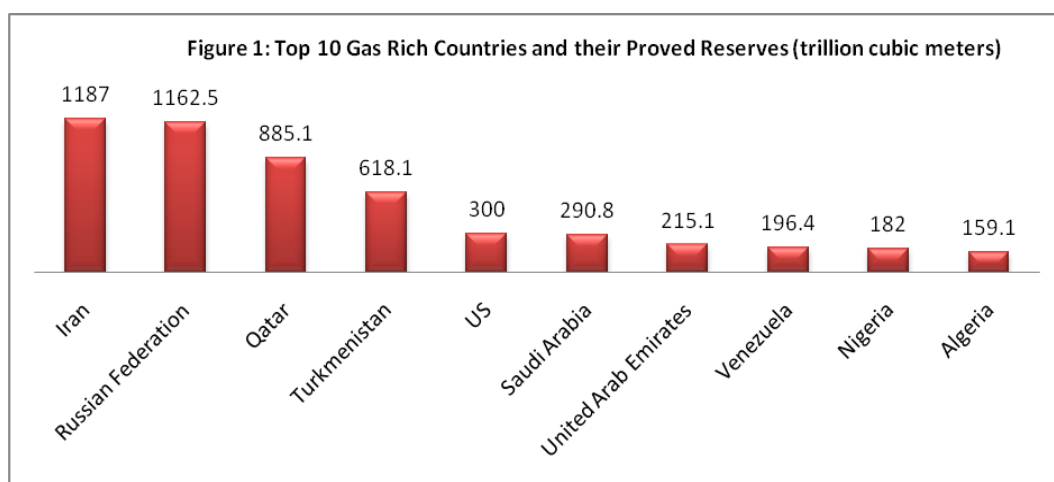
<b>Year</b>	<b>Gas Produced</b>	<b>Gas Utilised</b>	<b>% Utilised</b>
2000	1,509,066.33	652,509.09	43.24
2001	1,852,360.21	907,652.56	49.01
2002	1,701,900.30	824,840.07	48.47
2003	1,828,100.09	982,559.97	53.74
2004	2,082,280.23	1,196,520.23	57.46
2005	2,093,628.96	1,281,296.27	61.20
2006	2,182,432.08	1,378,770.25	63.18
2007	2,415,649.04	1,655,962.31	68.56
2008	2,287,547.34	1,668,148.48	72.92
2009	1,837,278.30	1,327,926.40	72.28
2010	2,392,838.89	1,811,270.54	75.70
2011	2,400,402.88	1,781,370.00	74.21
2012	2,580,165.62	1,991,498.90	77.18
2013	2,325,137.44	1,916,531.00	82.42
2014	2,524,268.44	2,234,668.43	88.52

*Source: NNPC Annual Statistical Bulletin (2015)*

Decades ago, natural gas as a by-product of the oil production process has little or no economic incentive to warrant its development. Aghalino (2009, p.226) noted that at the early stage “Nigeria lacks gas utilisation infrastructure because when most of its oil facilities were built in the 1960s and 1970s, at a time when natural gas was not a popular energy source in the world, little thought was given to gas collection facilities”. In addition, the joint ventures arrangement between MNOCs and the Nigerian government had been very successful in promoting crude oil exploration, because the oil and gas industry is dominated by the MNOCs whose preference is for crude oil (Gaius Obaseki 1996; Orubu et al

2006). Whereas, this type of initiatives has not been successful in promoting gas development because production activities are entirely in the hands of MNOCs which government has little or no capacity to monitor or regulate (Obi 2010). Consequently, in the course of oil exploration, associated gas is routinely flared because the Associated Gas Re-Injection Act 1979, 1980 and its amended provision of 1985 allows the flaring of gas provided a permission is obtained from the Minister of Petroleum Resources. Thus, gas flaring persisted because it was more economically viable for the oil exploration companies to flare than to embark on gas development and re-injection technologies.

Nigeria’s proved natural gas reserves (see figure 1 below) is the largest in Africa (BP 2012), and represents more than 5% of the world’s total, which largely described Nigeria as a gas province (Gaius-Obaseki 1996; Kupolokun 2006). Shielding more light on the importance of natural gas to the global energy consumption, Idigbe, and Onwuachi-Iheagwara (2014) argued that natural gas is the energy breakthrough to a healthier and prosperous economy in Nigeria and the fuel of the future with a projected growth rate of over 70% by 2025. Furthermore, Odumugbo (2010) argued that global natural gas demand is on the increase, and is now more embarrassing that the unwanted by-product in the earlier stage of energy utilisation, or more correctly, a co-product of crude oil production, now provides about one fifth of the entire world’s primary energy requirement.



Source: BP Statistical Review of World Energy (2012)

Based on the total gas reserves in figure 1 above, 86% are found in relatively simple geologic structures along the country’s Niger Delta while 14% from deep water offshore block (Economides et al 2014). The Benin basin, Anambra basin, Benue trough, Bida basin and Chad basin are potential hydrocarbon bearing basins that are yet to be explored. According to Stanley (2009) the estimated combined probable and possible gas reserves could be more than 300 trillion cubic feet. Odumugbo (2010) concurs with this view that Nigeria has often been referred to as a country with large reserves of stranded gas. Undoubtedly, the Nigerian gas industry is at its embryonic stage and remain largely unexploited, present production is accidental to crude oil production (associated gas), meaning that it occurs in crude oil reserves as free gas (Gaius-Obaseki 1996; Aghalino 2009).

Nigeria gas is characterised as one of the best quality in the world, and ostensibly the most important export oriented product to stimulate economy growth, environmental preservation and sustainable development. Odumugbo (2010, p.300) further averred that “the identification of natural gas as a cleaner and more environmentally friendly energy source makes it even more attractive in this age of sensitivity to the well being of the environment”. Therefore, with little or no extra exploration cost, Nigeria natural gas, which exists in much larger quantities than crude oil is potentially the energy source and industrial feedstock for satisfying the need for economic development and environmental preservation. This is consistent with Stanley (2009), that natural gas is gradually becoming the fuel of first choice as well as the preferred source of energy for industries. The safety, cleaner and environmentally friendly aspect of natural gas has led to a structural shift in the world energy consumption and demand. In the view of Stanley (2009), the radical development and a shift in the world energy market does not wholly reflect the activities in the Nigeria gas industry with little commitment to link the gas sector with the rest of the economy. Thus, for many years, the oil and gas producing communities of the Niger Delta bore the pains and the discomfort of the natural endowment being flared, which put extra pressure on their immediate environment and means of livelihood of the local people (Edino et al 2010).

## **METHODOLOGY**

The purpose of this study is to analyse the opportunities, challenges and obstacles to economic growth and sustainable development through natural gas in Nigeria. The study used scholarly articles, journals and internet to review the contributions of the oil and gas to the Nigerian economy as well as its obstacles to sustainable development.

## **DRIVING ECONOMIC GROWTH AND DEVELOPMENT THROUGH NATURAL GAS IN NIGERIA**

The quest to drive economic growth and development through natural gas has been severely enhanced by the prospect and gain in the LNG. The LNG presents a range of development option that involves gas transportation in specially designed ocean vessels over a long distance for customers in Asia, Europe and America. Drawing conclusion from the importance of the LNG, Andeobu et al (2015) argued that the Nigeria’s LNG exports account for more than 8% of globally traded LNG and is pivotal to wealth creation, employment generation, sustainable development and diversification of the economy. It is the most significant arrow-head to drive value in terms of environmental protection, gas monetisation, foreign direct investment and sustainable community development.

Fundamentally, payment to the federal government of Nigeria based on dividend on its shareholding of 49% in the LNG project from inception to date is in the region of USD14.7 billion, while payment to the Joint Ventures (JVs) for feedgas suppliers represent about USD21 billion from inception (LNG 2015). Furthermore, LNG paid corporate income tax of about N220 billion in 2014 and contributed about 4% of Nigeria’s annual Gross Domestic Product (GDP).

The environmental benefit of the LNG is also enormous, with a strong policy on environmental conservation and continuously developing a workable environmental management plan to minimise environmental consequences of its operations to the immediate communities. There is already a significant reduction in gas flaring due to increasing use and export of natural gas in the domestic, regional and international market. The LNG has continued to maintain its position as a major and reliable supplier and converted about 4.68 trillion cubic feet of previously flared gas to exports as LNG and natural gas liquids (NGLs) to deliver about 7% of global supply (Andeobu 2015). The participation of the

independent power producer (IPP) in electricity generation is mopping up substantial previously flared gas while the regional market supplies natural gas to the West Africa sub-region of Ghana, Togo and Benin Republic.

The LNG has also made notable contribution in direct and indirect employment through subcontractor in base project, foreign direct investment through plant construction and equipment. Also measurable in terms of economic development of the LNG is the community development initiative through housing, roads, hospitals, school and uninterrupted power supply to the inhabitants and businesses on Bonny Island through a rural electrification project to 11,700 households (LNG 2015).

## OVERVIEW OF THE GAS INDUSTRY IN NIGERIA

The first gas supply for power generation started in 1963, through uncoordinated attempt, leading to the establishment of facilities within producing fields for relatively small but steady off takes. The initial efforts at gas utilisation involved supply to the National Electric Power Authority (NEPA) at Afam Power Station, NEPA Delta Power Station, Ughelli, five private industries in Aba as well as the old Port Harcourt Refinery (Omiyi 2001). These aforementioned gas projects were executed by Shell between 1964 and 1966.

Apart from the uncoordinated attempts, the first major gas pipeline system did not come up until 1978 when the Nigerian National Petroleum Corporation (NNPC) and Shell implemented the gas supply to NEPA Sapele station, quickly followed with the execution of 2 gas pipeline projects: Aladja Systems and Oben-Ajaokuta in 1981 and 1983 respectively (Gaius-Obaseki 1996). These projects with a combined system capacity of 270 million standard cubic feet/day were designed to deliver gas to the Steel Complex at Ajaokuta. In 1985, a Gas Division was created in NNPC to ensure the realisation of the government objectives for gas utilization and monetisation. In furtherance with a clear vision for commercialisation, focused growth and development of the gas industry, a subsidiary company, the Nigerian Gas Company Ltd (NGC) was created out of the NNPC in 1988. The NGC is now shouldering the responsibility of the control and further development of the network of domestic gas infrastructure in Nigeria.

Table 3: Major domestic natural gas supply pipelines in the Niger Delta

Gas Pipeline Systems	Design Capacity (MMSCFD)	Line Diameter (Inches)	Pipeline Length (kilometres)
Aladja Gas Pipeline System	70	6, 8, 14 & 16	130
Oben-Ajaokuta Gas Pipeline System	200	24	198
Sapele Gas Pipeline System	200	10 & 18	44
Obigbo North/Afam Pipeline System	90	14	19
Imo River Aba Gas Pipeline System	35	12	28
Alscon Gas Pipeline System	160	14, 16, 7, 24	117
Alakiri-Onne Gas Pipeline System	138	14	17
Escravos - Lagos Gas Pipeline (ELP) System	1100	30 & 36	514
Ibafo – Ikeja City Gas System	50	24	48
Ajaokuta-Obajana Gas pipeline			90
<b>TOTAL</b>			<b>1,205</b>

Source: NNPC (2005)

Additional gas systems were constructed between 1985 and 1987 to supply gas to NEPA at Afam, IGIL and other industries at Aba, and the National Fertilizer Company of Nigeria (NAFCON) fertilizer plant at Onne. These systems,

although non-integrated, together with the Aluminium Smelting Company of Nigeria (ALSCON) constitute the backbone of the Eastern Gas supplies. The ALSCON project entails a total of about 117 kilometres of gas pipelines of various sizes traversing three Eastern States in Nigeria (Rivers, Abia and Akwa-Ibom) with a system capacity of 450 million standard cubic feet/day to form the basis of a fully integrated network in the East Delta. As at 2007, the Nigerian network included 3,071 kilometres of dry natural gas pipelines, 124 km condensates (wet gas) and 156 km of pipelines of liquefied petroleum gas - LPG (NNPC 2005).

The NGC owns and operates most of the major gas pipelines in Nigeria with a capacity of more than 2.5 billion cubic feet per day. The network includes the Alakiri-Obigbo-Ikot-Abasi Pipeline (Eastern network) and the Escravos-Lagos Pipeline System - ELP (Western network), which feeds the commercial nerve-centre of Lagos, fuels the main power station at Egbin, near Lagos as well as gas supply to the WAGP (Ghana, Togo and Benin Republic). The Escravos-Lagos Gas Pipelines (ELP) was commissioned in 1989 with a system throughput of 1100 million standard cubic feet/day. It is the biggest gas pipelines project executed to date in Nigeria, dedicated to domestic consumption in the country and also serve as the gas corridor' to Lagos and the WAGP project.

Furthermore, the ELP is the only source of supply from the Niger Delta to the industrial and utility sectors of the domestic market in Lagos. The design concept of this system has envisaged the implementation of extension projects such as the gas supplies to the West African Portland Company (WAPCO) Plants at Ewekoro and Sagamu in Ogun State, PZ Industries in Ikorodu, and City Gate in Ikeja Lagos. The WAPCO gas supply systems were commissioned in 1993 and 1994 respectively and represent a modest beginning of commercially oriented gas pipeline projects (Gaius-Obaseki 1996). The Oben - Ajaokuta - Geregu gas pipeline system forms the backbone of the Northern Pipeline gas system, supplying gas to Ajaokuta Steel Company since 1983 and more recently to the Geregu NEPA Plant and Dangote Obanana Cement Plant on the same axis. According to NGC (2009) these projects consist of 1,250 kilometres, 18 metering stations and 16 compressor stations with design capacity of more than 2.5 billion standard cubic feet of gas per day. There are other dedicated pipeline infrastructure owned and operated by the LNG and the NNPC/SPDC/Total JV.

On the domestic gas usage, Oando has been actively involved with the completion of 99 kilometre of natural gas distribution pipeline in the Lagos area, 124 kilometre of supply pipeline to the Cement plant in Calabar with over 90 industrial customers to the gas network. Another active player in the domestic gas supply chain is Shell Nigeria Gas (SNG). The company promotes gas development in Nigeria through pipelines distribution in the Lagos environs of Agbara, Ota and Igbessa (Ogun State) as well as in Aba (Abia State) with more reliable and cleaner alternative fuel for industrial processes and power generation. It operates approximately 80 kilometres of gas transmission and distribution pipeline networks (Shell 2010).

Government has a social responsibility for orderly development, growth and utilisation of natural resources. Therefore, the goal of developing the gas pipeline infrastructure is to address the socioeconomic, environmental and sustainable development needs of the people. Notwithstanding efforts to develop the Nigerian gas industry, however, serious obstacles and challenges abound.



### **Legal Policy and Fiscal Incentives to Gas Development**

The legal and policy regime as well as the fiscal incentives to promote gas development and utilisation in Nigeria has not resulted the desired outcome, but left in its wake dire social and economic consequences (Orji 2014). From inception of oil and gas exploration up to the early 1980s, regulations were written primarily for crude oil production activities, which was not flexible with gas development, and did not envisage the long term gas utilisation opportunity that is now a cornerstone of the Nigerian economy. Regulations allowed gas projects to be executed in the past on a standalone or dedicated basis with the MNOCs seeking specific concessions from government to facilitate its implementation thereby leading to an un-coordinated development of gas resources (Gaius Obaseki 1996). Projects and programmes including JV initiatives were developed on the assumption that gas is a by-product of oil production activities with little or no economic incentives (Economides et al 2014). This is regardless of the fact that the logistics and economics of the gas business are quite different from crude oil, but these arrangements suit the MNOCs that are not willing to invest in gas development technologies. Thus, there is lack of coherent energy policy and framework to articulate reform in terms of pricing, appropriate fiscal regime and regulatory change to attract investment in the gas sector (EIA 2015).

Furthermore, weak enforcement, over centralisation, inadequate capacity and lack of political will to enforce existing regulations affect the growth needed in the gas sector (UNDP 2006). The DPR which is the main watchdog in the oil and gas industry continue to struggle in key technical areas such as effective monitoring of operations of oil companies and standard setting. Thus, it is feared that “exercising the political will for defaulting MNOCs degrading the environment may spell doom for the Nigerian economy, inevitably reduce government revenue from oil and gas, put many people out of work (unemployment) and probably discourage foreign direct investment” (Ogbonnaya 2011, p.74). The oil and gas industry is dominated by the MNOCs whose interest and motive contrast with the government and the local people. This evidence paints a gloomy picture of serious failure to sustainable gas development policy in Nigeria. In addition, government is the dominant gas resource owner but there is limited control and direct involvement in the JV operations activities where NNPC which owned about 60% interest in the commercially driven JV is passive and dormant (Obi 2010).

The dual role of the government as a regulator as well as operator in the oil and gas production activities implies that it must meet its cash call obligation under the JV agreement in order to influence gas development. Furthermore, government share in the JV should reflect serious commitment to tackle environmental degradation and socioeconomic conditions. Consequently, Emoyan et al (2008) argued that the emergence of appropriate environmental laws and regulations should ideally reassure all concerned that the Niger Delta environment is being protected; however regulatory agencies are major shareholders (see table 4 below) in the JV oil operations activities in Nigeria which indicate that they are not independent of government.

Table 4: Oil Exploration Operations Joint Ventures Structure in Nigeria

Joint Ventures Operator	Shareholding Structure (%)	Quantity of Oil Production
Shell	NNPC 55 Shell 30 Elf 10 Agip 5	899,000 barrels per day
Chevron	NNPC 60 Chevron 40	400,000 barrels per day
Mobil Producing	NNPC 60 Mobil 40	632,000 barrels per day
Agip Oil Company (NAOC)	NNPC 60 Agip 20 Philips 20	150,000 barrels per day
Elf Petroleum	NNPC 60 Elf 40	90,000 barrel per day
Texaco	NNPC 60 Taxaco 20 Chevron 20	60,000 barrel per day

Source: NNPC (2015)

Similarly, the involvement and dominance of government in the JV does not give robust platform to develop the oil and gas industry because of anti competition behaviour by abuse of market power which undermined development of the gas industry. It is almost certain that there is no level playing field because third party are short-changed in a monopolised business environment particularly access to transmission, distribution and supply infrastructure because of the dominance of the NNPC/NGC in the gas supply and distribution chain (NNPC 2006).

Whereas the 1979 Associated Gas Re-injection Act and its amended provisions prescribed the forfeiture of concessions granted to any oil company in a particular field for gas flaring. However, this has never been implemented because government cannot afford to disrupt its own business where it holds majority shares. Section 3(2) of the Act also empowers the Minister of Petroleum Resources with some discretionary power to continue to permit gas flaring to any oil company where he/she is satisfied that either the utilisation or re-injection of gas is inappropriate or not feasible in any particular field. Consequently, EIA (2015) argued that the perception that associated gas is not worth the effort needs to be challenged. Successful countries like Australia and Qatar use the carrot and stick approach such as combination of penalties and incentives along with targeted infrastructural investments to drive up the opportunity cost of gas development, while simultaneously expanding end user option (Darbouche 2012). Therefore, good policies, enforcement and effective corporate governance are needed to increase investment activities necessary to drive growth in the gas sector. Drawing from the work of Idigbe and Onwuachi-Iheagwara (2014), they argued that sustainable growth and flexible fiscal mechanism such as tax holidays, low interest on loan for gas projects, free import duty and generous economic incentives for direct investment in gas-to-liquid projects is necessary for gas development in Nigeria. Tax relief such as uplift of capital expenditure is fundamental to government initiatives to encourage new players in the gas industry and stem the tide of flaring.

### **Funding Infrastructural Development to Boost Gas Utilisation**

Gas technologies to facilitate reinjection, gathering, transmission and distribution in the domestic, regional and international networks are capital intensive which hinders weak participation of private investors. Natural gas requires expensive network of integrated pipelines and flow/compressor stations to gather and collect scattered gas from marginal oil production fields within the Niger Delta region, and then distribute to end consumers/users. Significant investment is required for natural gas infrastructure to sustain increase in economic growth. For example, waterways in the creeks are too shallow to effectively use barges for shipping, and in some cases the ground is too soft to anchor gas pipelines. This indicates that developing the Nigerian gas sector requires huge capital outlay because of the topography in the Niger Delta region.

On financing capital project in the oil and gas industry, most local banks do not have the financial muscle to commit fund on a long term basis to oil and gas infrastructural projects. Even when banks obliged to provide funds, the interest rate may be too high to justify the investment. Also, the non transparent business practices in Nigeria scare investors, thereby breeding underdevelopment. Thus government needs to build capacity and engage in international bodies such as the Clean Development Mechanism (CDM) to access external financing for natural gas development.

Another threat to investment in gas development is the risk of business failure as evidenced in Ajaokuta Steel, Aladja Steel, ALSCON and NAFCON where multibillion dollar investments in gas pipeline infrastructure were at stake due to the collapse of these industries in the 1990s. As a result of mismanagement, these companies went into oblivion few years after they were connected to the national gas infrastructure network by the NGC at a huge cost to the government. These are glaring factors that militate against the development of the gas industry in Nigeria.

In addition to the above, Obi (2010) maintained that insurgency and the attendant insecurity in the Niger Delta region has continue to affect the confidence of potential investors and perception of the MNOCs whose multibillion dollar investments are at grave risk. There can be no question that financing such capital intensive infrastructure in the face of daunting security situation in the Niger Delta region is a major hurdle. Security challenge is derailing effort to make natural gas a fuel of first choice in the domestic sector due to institutional incapacity and coordination to spur investment to stimulate natural gas infrastructural development.

### **The Security Situation in the Niger Delta Region**

The perennial security situation in the Niger Delta region has also been identified as a serious obstacle to gas development. The topography of the Niger Delta comprises of swamps, marshlands, creeks, rivers and deep seas. Access to deep and shallow waters and some remote communities are hindered by the presence of various armed militias and insurgencies, notably, the Movement for the Emancipation of Niger Delta (MEND) protesting underdevelopment in the region. Incidence of violent demonstration is alarming, so also is violent crime and threat to peace. Hostage taking and kidnapping for ransom is rampant. What is at stake is the threat to gas development, investment in the gas sector and security of the oil and gas industry. This has necessitated the presence of military soldiers and armed policemen (MOPOL) in the region, not only to enforce peace, but to ensure uninterrupted oil and gas production. When oil is produced under serious security circumstance, it is extremely difficult to harness the associated gas produced with it, which in most cases give rise to flaring. Furthermore, there is also the issue of piracy, oil theft and criminal gangs taking

over oil facilities for financial reasons. This had led to some oil companies to withdraw operations activities from Nigeria or shut production and declare *force majeure* on oil shipment. At the depth of the crisis in 1999 – 2003 Nigeria oil and gas production was reduced from 2.9 million barrel per/day to about 1.7 million (Orji 2014). However, the Amnesty programme for the Niger Delta militants youth initiated in December 2009 has helped to reduce persistent and large scale attack on oil and gas facilities.

### **Problem of Economic Structure and Development on Gas Utilisation**

Obstacle is deeply rooted in economic structure and development factors such as weak energy integration, weak local content and inefficiency in the gas supply chain gauged by the amount of goods and services produced locally. The lack of cottage industries, energy intensive industries and plants across the gamut of Nigeria and within economic distance from gas sources to absorb much of the associated gas produced is a serious setback to gas development. This not only hinders gas utilisation but the entire economic development. The potential for rapid growth envisaged in the gas sector, like in most advanced countries, has been continuously hampered by the embryonic state of industrialisation and low capacity utilisation of natural gas by existing industries. Many industrial plants and factories that uses gas for operational activities are shutdown. The iron and steel factory in Aladja is performing miserably while the Ajaokuta steel did not see the light of the day. For many years, Aladja Steel was shut down, but since 2007 the Nigeria government sold off its share in the steel firm to an Indian company. The inactivity of these steel factories results in the absence of market, ultimately a colossal waste of huge investment to construct gas pipelines and other natural gas infrastructure to these facilities. Furthermore, the ALSCON at Ikot-Abasi only operated for few years before it went into oblivion, the same situation with NAFCON and Petrochemical plant in Warri and Kaduna. They were all extremely ambitious projects specifically designed to use flared associated gas for power production and industry feedstock.

The NEPA thermal power stations at Egbin, Afam, Ughelli, Sapele and other locations designed to use significant proportion of flared associated gas are operating at minimal capacity, utilising less than 40% of its installed capacity. The gas to power electricity project strategically designed to use gas to stimulate growth in the domestic economy is in shamble. Other examples of poorly performing projects envisaged to use flared associated natural gas for operations abound in various parts of Nigeria.

The power projects for which colossal sum of USD\$3-\$16 billion was invested by the government between 1999 and 2007 designed to utilise flared gas is in fiasco (Agboola 2011). According to Sambo (2008) the power sector in Nigeria is in deep crisis, only about 10% of the rural households and less than 40% of the 150 million populations have access to electricity supply on a partial basis.

### **Economics of Natural Gas Pricing**

The pricing structure of natural gas particularly in the domestic sector gave no economic incentive to invest in gas development or consider gas as an alternative source of energy and as fuel for the future. Similarly, Gaius-Obaseki (1996) argued that the price of gas in Nigeria has been very low particularly in the domestic sector, thus a disincentive to investment in the sector's growth. According to Orji (2014) gathering gas for local use is not commercially viable because of local pricing regime. Natural gas prices must be competitive with the international market rate and set at commercial levels for local industries and users to stimulate investment in gas infrastructure, while also making

concerted effort to avoid price discrimination that is symbolic to the domestic gas market in Nigeria. By international standards, gas price is extremely low and discriminatory in the domestic market to the extent that prices are sometimes below the cost of supply (Gaius Obaseki 1996). Natural gas is badly needed to boost electricity supply and industrial use in Nigeria, but the domestic cost of gas is hindering investment in the downstream sector. For example, NEPA pay ₦16.64 for a million metric British Thermal Unit (BTU) (equivalent of US\$0.12/million cubic feet) for gas supplied to their plants, and owned the NGC huge sums of outstanding bills (Gaius-Obaseki 1996), which make investment in the gas sector extremely difficult to come by.

On the state of NEPA's solvency, Christiansen and Haughland (2001) aptly noted that as an integrated monopoly with activities to generate, transmit and distribute electricity in Nigeria, NEPA is heavily subsidised by about US\$50/90 million per annum and funded by the government. For many years most end-consumers of natural gas were government owned companies such as NEPA, Aladja Steel Company Ltd, NAFCON, and ALSCON that are unwilling to pay the economic price of gas. This has undermined investments in the gas sector. This is consistent with the view expressed by Economides et al (2014) that pricing structure does not reflect economic reality to encourage serious investment in the gas sector.

In addition, there is divergent of interest between the gas producers, end consumers, regulator and the government to such that gas producer are reluctant to make the needed investment to establish the requisite supply infrastructure to deliver gas to domestic end users. However, pricing challenge in the sector is now being addressed by the National Domestic Gas Supply and Pricing Policy and Regulation. The pricing policy is meant to set a framework to address transparency related to domestic price of gas on supply and distribution chain in the domestic network.

### **Absence of Gas Gathering and Distribution Infrastructure**

The dearth of gas gathering and distribution/pipeline infrastructure in the domestic economy has lead to a short fall in capacities required to sustain gas distribution. There is no pipeline connection between the gas supply fields of the East and the growing markets of the West and North, which has led to a shortage of gas availability for some newly commissioned power plants in the Western parts of Nigeria. Nevertheless, Goodland (2005) argued that the current state of gas pipelines infrastructure is poor which has resulted in low capacity utilisation. The state owned NNPC subsidiary, the NGC has the main responsibilities to ensure gas supplies to potential consumer base projects involving power generation, cement industry, fertilizer plants, iron and steel industry, petrochemical plant, glass manufacturing industries, food and beverage manufacturing industries within the domestic context. Notwithstanding, gas pipelines in the domestic network have also increased dramatically from mere 2000 kilometres in the 1990s to about 9,265 kilometres in 2005 (Goodland 2005).

Specifically arguing, the Africa Development Bank (2014) noted that there is still a considerable mismatch between robust investments for export-oriented gas projects such as LNG, GTL, or the West African Gas Pipelines (WAGP) and weak infrastructure investment to develop natural gas required for electric power generation and gas as feedstock for the industrial sector of the local economy. Current state of gas infrastructure in terms of gathering, transmission and distribution is poor, grossly inadequate to meet local demand for the newly installed gas turbines. Associated gas requires pipelines and compression facilities to link scattered marginal fields in extremely remote locations that do not produce a

sufficient quantity of gas on their own to be commercially viable (Odumugbo 2010). Some infrastructural projects initially put in place to use natural gas are outdated.

## **CONCLUSIONS AND RECOMMENDATIONS**

Natural gas is critical to the development of the Nigeria economy. The gas market has continued to experience rapid growth over the last decade, spur by growing international demand, the quest for environmental protection and sustainable development. Nevertheless, project-specific fiscal incentives in addition to gas policy framework have spawned several gas projects that signal that the gas age has dawned in Nigeria. However, the much needed gain envisaged from natural gas have been severely limited by obstacle in domestic pricing, infrastructure, funding, regulations and security situation in the main gas supply source, the Niger Delta region.

Thus, it is recommended that necessary measures should be put in place to address the poor state of domestic gas supply infrastructure and also tackle the security challenge in the Niger Delta.

Based on the foregoing, the following recommendations are made:

- (i) There should be serious investment in the gas sectors through gas gathering, transmission and distribution infrastructure, to give appropriate attention to full gas value chain in the supply system.
- (ii) Increase participation and commitment to the various gas development projects in Nigeria which aim at reducing the impact of gas flaring and improving the socioeconomic conditions of the rural peasant communities.
- (iii) Develop robust policies to tackle the problem of pricing, strengthen the regulatory/institutional framework, funding of gas development projects across the gamut of Nigeria to enhance gas utilisation.
- (iv) Provide enabling environment for private participation in the gas development, improve social infrastructure and capacity building in the gas sector.

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