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Oil and Gas Management: Issues and Prospects

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Abstract*:Oil and gas management has recently become complex due to the demands from stakeholders especially during different price regime. The study examined the tensions created by the international oil companies and the national oil companies in determining the tax regime to be adopted. More so, the study examined the risk assessment and management in the oil and gas as well as reviewed the global energy demand with respect to future energy mix and climate change. In the course of the research, it was revealed that during low price era the tensions were access to and control of hydrocarbons while during crude oil price boom the state struggles for permanent ownership, the rate and extent of exploration. Furthermore, the study showed the various tax regime used in the upstream oil and gas sector, which are Concessionary system and the Contractual system. Procedures for risk assessment and management in the petroleum industry was evaluated to include the identification of risk factors, selection of risk management, etc. Finally, Global energy demand was assessed to be related to factors like population, changes in end users demand, etc. The study concludes that to effectively manage the oil and gas assets, prospective petroleum countries need a holistic approach.*

Key Words: *Oil and Gas, International Oil Companies, government, Tax regime, Global energy demand, Risk Management.*

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I. Introduction

An effective oil and gas management requires a holistic approach. The management becomes imperative as it affects a developing country with a stable democratic environment, having limited external capital and hydrocarbons during low price era and during crude oil price boom with a significant oil reserves.
The study focused majorly on four areas comprising of; tension between Foreign Oil Companies (FOC) and the National Oil Companies(NOC)/government, tax regime to adopt during the crude oil price change, risk evaluation and management, global energy demand and the role of hydrocarbons and climate change.The paper is segmented into three (3) parts, introductory aspect, literature review and conclusion.

2.1 Areas of Tension between Oil Majors and Other Stakeholders during Low Price Era and Limited Hydrocarbons

A developing country with a stable democratic government, limited access to external capital and hydrocarbons during low price period may invite foreign oil companies to exploit its mineral resources. Considering the low price regime and other factors, the host country/NOC may not give strict demands to the FOC due to the unattractive state of the country's hydrocarbon deposit. In designing an agreement, the two parties have areas of interest that they may like to protect.

First, access and control of hydrocarbons becomes the top priority of the party involved (Inkpen and Moffett 2011). Since the state lack sufficient resources, technical capacity and managerial skills to explore, the FOC may enjoy little or no restrictions on the state's acreage. The concession given by the government sometimes covers the entire nation. For example, before the Second World War, countries like Nigeria, Iraq, Kuwait and Saudi Arabia gave a Concession to cover over 80% of the nation's land (Amuzegar 1998). Secondly, conflict may arise when the state negotiates for a higher proportion of the hydrocarbons if drilling becomes successful. Vivoda (2011) observed that the government/NOC lack technical negotiation skill so, may not understand the intricacies involved in the system. Therefore, the NOC usually loses the bid.

Thirdly, another tension point is the inclusion of local labours in the workforce of the FOC. The NOC may demand local content as part of the agreement. For example, the Afghan Amu Darya Basin Contract and the Ghana Petroleum Agreement (Openoil 2014), both contracts made a provision for employment and training of locals by the IOC. However, considering the nation's challenge in developing an asset, the IOC may not accept the position (Stevens 2008). Finally, health, safety and environmental issues are areas of interest to the parties involved. For instance, Ghana-Tullow Agreement (Openoil 2014).

2.2 Areas of Tension between FOCs and Other Stakeholders during Oil Price Boom and Significant Oil Reserves

In a situation where the host-country discovered a significant reserve, has adequate capital and petroleum price booms, bargaining power changes to its favour (Vivoda 2011). The NOC dominates the contract because of the advantages it has. Similarly, other stakeholders like the legislatures, Civil Society Organisation (CSO) and local service firms will make different demands (Openoil 2014, Stevens 2008).

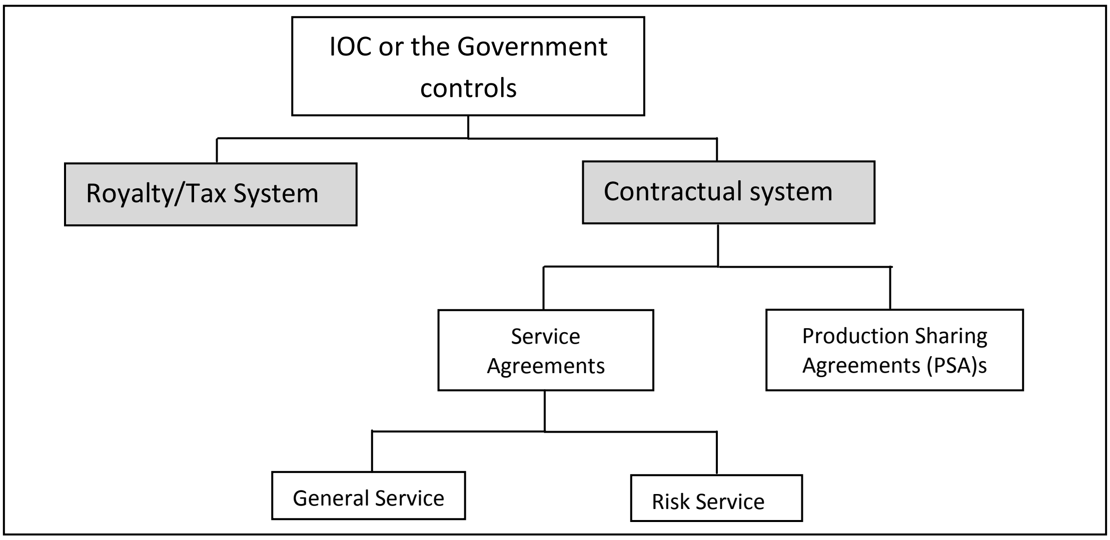
In connection with the above scenario, the first area of tension remains a struggle for permanent ownership and control of the resources by the state. The IOC at this point will show great interest in possessing the contract.However, the NOC may desire a Joint Venture Arrangement (JVA) or Joint Management Committee (JMC) to exercise some degree of control(Openoil 2014). If the state has the resources, it will prefer to hold up to 51% of the share in the contract (Vivoda 2011). Examples of NOC into JVA or JMC with IOC include Nigeria and Iraq. Such type of arrangement gives the state the opportunity to transfer skills to local professionals in the industry. Secondly, if the IOC holds a favourable contract, the government legislature may change the existing one to favour the state/NOC. For instance, the state adds more restrictions on the existing contract or changes it completely (Amuzegar 1998). The NOC increases bargain for the transfer of skills, technology and training, and sharing of financial returns and pricing (Nwokolo 2003). More so, most governments begin with a concession agreement, which favours IOC then later change to contractual system in favour of the government. Countries such as Canada, Norway, U.K. and U.S. still practice modern concession that has restrictions unlike the traditional one (Vivoda 2011; Hornby and Robert Gordon's Institute of Technology Business School 1985).

The third conflict area is revealed by host government'sinterest in the rate and extent of exploration and development, and level of output. The study noted that the country/NOC may negotiate for an increase in the production so that more income will accrue to the country. Other stakeholders like the Civil Society Organisation (CSO) will demand local contents policy to be implemented (Openoil 2014). CSO may also seek compensation for damages caused by the exploration and production activities. Finally, the host-country/NOC may further negotiate the use of local service firms to execute some specified jobs within the industry (Inkpen and Moffett 2011). Furthermore, the government may negotiate the use of local products available within the country. An example is the Brazil model contract (Openoil 2014).

3.1 An Analysis of Royalty/Tax Regime and Production Sharing Contracts Regime

The discovery of hydrocarbons in a state makes the government sign a contract with major oil companies on terms of operation. The agreement reveals the share of government (government-take) and the proportion of the group (investor-take or contractors-take) in the event of successful exploration and production. The state's interest is to generate maximum income from the activities through stable tax measures (Tordo 2007). These measures include bonuses, royalties, income taxes, special petroleum taxes, production sharing and infrastructure development (Wright and Gallun 2008).There are two fiscal systems used to regulate upstream sector include Concessionary systems or Contractual system. Choosing a system to administer depends solely on the state. Government should design a flexible fiscal regime to encourage the participating contractors in the deal (Tordo 2007).

Figure 1: Flow Chart of the Petroleum Fiscal System.



Petroleum fiscal system (Inkpen and Moffet 2011; Zhao and Liu 2008)

The Contractual system is subdivided into Service Agreements and Production Service Agreements (PSAs).

3.1.1 Royalty/Tax Regime

Royalty/Tax system also called Concessionary arrangement. Government uses the fiscal tool to generate revenue for the state through royalties and taxes (Wright and Gallun 2008). The system grants exclusive rights to the International Oil Companies (IOCs) to develop minerals with few restrictions. It allows IOCs to explore a large area over a long period sometimes up to seventy-five years. For example, Standard Oil of California entered into a concession agreement with King of Saudi Arabia 1933 (Inkpen and Moffett 2011). However, with the modern form of concession, known as Royalty/Tax system, the state has more restrictions in terms of period of licence and development of assets. More than half of the oil industries in the world use tax system. For example, countries like the United States, Norway, United Kingdom, Canada and France practice royalty/tax regime (Dongkun and Na 2010; Zhao and Liu 2008).

In Royalty/Tax (RT) system, the whole risks and costs of exploration and production are borne by the IOCs. If the company succeeds in exploration, pays royalty, taxes and fees to the government. In this regime, oil and gas exploration and production rights are contracted to the IOCs with the associated risks (Humphreys, Sachs and Stiglitz 2007). On economic discovery, the IOCs have the right to development and production. The host country receives royalty (mostly 10% of the gross revenue) and relevant taxes like special oil tax and the income tax (Zhao and Liu 2008). The contractor’s share is at the wellhead. This right means that the contractor controls the balance in crude oil that is later subjected to market demands while government share is based on posted price. Equipment used for exploration and production belong to the IOCs under this arrangement (Inkpen and Moffett 2011).

Furthermore, the government can participate in the contract through the national oil company as a working interest in the operation after initial discovery of hydrocarbons. In this arrangement, subsequent drilling costs may be shared by the participants (Wright and Gallun 2008). Researchers argued that partnership business sometimes may not give the needed result because of partners’ interests (Pongsiri 2004).

An example of a share of revenue under Royalty/Tax system

		Contractors Share	**Government Share**
Gross revenue		$65	
Royalty 10%		$6.5	$6.5
Net revenue		$58.5	
Operating expenses		($8.5)	
Operating profits	$50		
Special oil tax 60%		($30)	$30
Income Taxes 30%		($6)	$6
Net to IOC/Government		**$14**	**$42.5**
Percentage of net cash flow		25%	75%

The above statement shows how the stakeholders share proceeds from the oil. Government seems to have the highest share of 75% based on the posted price, but will not benefit from an increase in the market price. Royalty/Tax system encourages oil companies to invest due to the flexibility and high control on production at wellhead. Under Royalty/Tax system, government can exploit its resource without having the financial and technical capacity (Gaspar-Ravagnani et al. 2012). The ability to change or renegotiate contracts are stated in the law establishing the contract. Similarly, the state can maximize its share by adjusting the fiscal policy affecting the industry (Pongsiri 2004).

RT system does not favour the government considering the worth of holding the right to resources and production compared to the reward of royalty and tax (Bindemann 1999). Studies revealed that the disadvantage could be as a result of insufficient knowledge in the industry (Inkpen and Moffett 2011).

3.1.2 Production Sharing Agreement

Production Sharing Agreement (PSA), unlike the tax regime, gives the state power to own the resources and retain the title. International oil companies are contracted to develop the well as its sole responsibility. If the exploration activities succeed, the production will be distributed between the NOC and the operators (Gaspar-Ravagnani et al. 2012). Under PSA regime, the government through its agency (NOC) approves the company’s work plan and estimates before the IOC embarks on the production(Humphreys, Sachs and Stiglitz 2007). More so, the contractors bear the risk and costs of exploration while equipment used for the drilling becomes the property of the state at the end of the asset’s life.

In PSA, oil product becomes the primary focus of the contract based on the posted price. Crude produced are accounted for by deducting royalty and cost oil. The net crude (profit oil) will be shared between the contractors and the government in 40/60 ratios in favour of the government. Income taxes are charged on the revenue of the IOC. The main parameters in PSA are recovery cost limit and company share (Costa-Lima, et al.

2010). An increase in cost recovery limit will reduce the government-take and increase the contractors' (Gaspar-Ravagnani et al. 2012). Examples include; Indonesia, Russia, Algeria, Libya, Iraq, India, Turkmenistan and Ecuador (Dongkun and Na 2010).

An example of a share of revenue under PSA

	Contractors Share	Government Share
Gross revenue	$65	
Royalty 10%	$6.5	$6.5
Net revenue	$58.5	
Cost Recovery (40% Limit)	($9.5)	
Operating profits $49.00		
Profit oil split 60%	($29)	$29
Income Taxes 40%	($8)	$8
Net to IOC/Government	**$12**	**$44.5**
Percentage of net cash flow	21%	79%

Government-take of 79% reveals the extent to which government benefits more than the contractors in this system that depends on the production. Government need to give more incentives to the company to encourage the enterprise (Pongsiri 2004). Incentives such as capital uplifts, ringfencing, domestic market obligations and royalty and tax holidays are available to the company under PSA (Wright and Gallun 2008).

3.1.3 Differences between Royalty/Tax System and Production Sharing Contract

Firstly, difference in ownership of hydrocarbons. In Royalty/Tax system, title of the asset for a specified period is transferred to the oil company at wellhead, while in the production sharing agreement, the state transfers at the point of delivery(Humphreys, Sachs and Stiglitz 2007; Bindemann 1999). Secondly, PSA has a cost recovery limit while, in the RT regime, it is not permitted. The C/R limit aimed to allow for profitability, and it is one of the major element of negotiation (Inkpen and Moffett 2011; Costa Lima, et al. 2010).

Table 1: Comparison of the Two Fiscal Regimes

Feature	Royalty/Tax	Production Sharing Agreement
Ownership of hydrocarbons	Transferred to IOC at wellhead	Transferred to IOC at delivery point
IOC control	High	Moderate to low
Government Control	Low	Moderate to high
IOC lifting entitlement	Typically around 90%	usually 50% to 60%
Cost recovery limit	None	Frequently
Ownership of production facilities	IOC	Typically state/NOC
Limits to IOC profitability	Few	Significant

(Inkpen and Moffett 2011)

Furthermore, PSA is used by countries with limited discovery risk and large reserves of hydrocarbons while, RT system are used country with limited knowledge of the sector. However, tax regimeis used by countries with high tax system (Costa-Lima et al. 2010). Government can change from one system to another depending on the macroeconomic policy. For example, Brazilian fiscal system for pre-salt projects was being considered for change from RT system to PSA regime. The analysis conducted by Costa-Lima et al. (2010) revealed that the Brazilian government will benefit more in the PSA regime especially when oil price is low and recovery cost limit less than 50%.

In conclusion, the host country may accept the suggested system because the country does not have the capacity. In tax regime, revenue accrues to the government without spending its resources. The system will also encourage the investing company due to some level of control. Nevertheless, the government has the option to change the contract if there is a need.

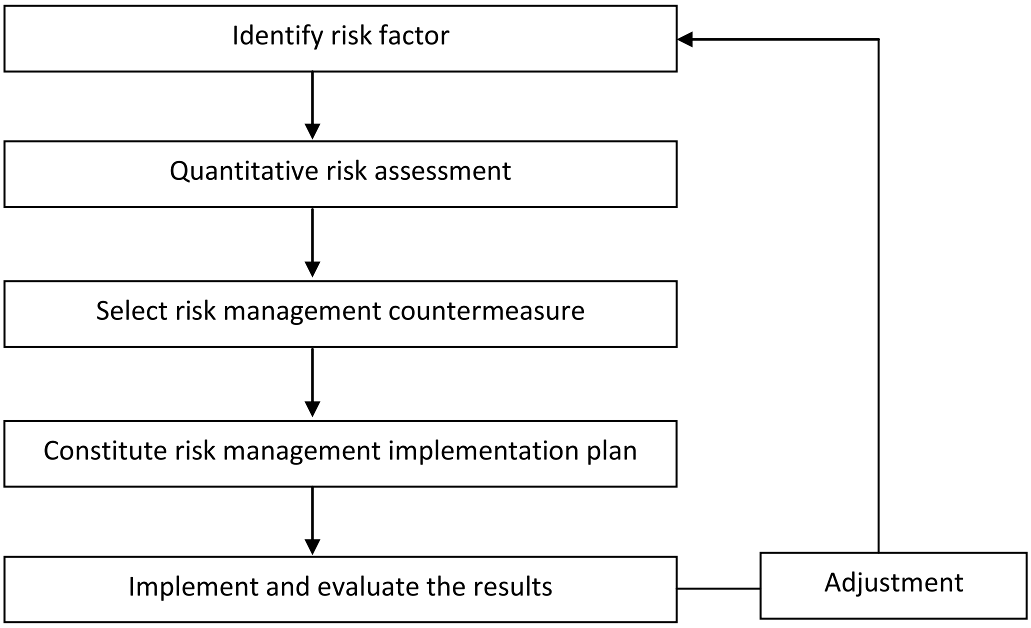
4.0 Risk Evaluation and Management in Oil and Gas Industry

Oil industry in the recent times has become a major sector of every economy. Discovering petroleum deposit in the state gives the host government a boost in the economy. Venturing into oil and gas exploration and development business by a country or corporation has been the greatest risk ever taken. Unlike other business ventures, oil and gas are extracted not manufactured. The amount of the deposit may be difficult to ascertain even with the improved technology. Exploration and development activities sometimes take place offshore (Inkpen and Moffett 2011). Experts described Oil and gas offshore business as hazardous (Aven and Vinnem 2007). Petroleum industry has several interfaces that are both internal and external (Schroeder and Jackson 2007). Managing the industry risk require a multifaceted approach.

Risk connotes an event with the ability to impact the purpose, policy, projects, routine operations, objectives, core processes, critical dependencies and the delivery of stakeholder expectations (Hopkin

2012).Again, risk is described as a combination of probability and consequence (Aven and Vinnem 2007). The impact of risk could be positive or negative. Therefore, requires concentration on managing the threat. Risk management has been considered to involve a process by which participants in a project choose different system configurations based on the risk assessment report (Minassian and Jergeas 2003). Simply put effective risk management identifies threat and apportions the risks between the parties involved (Sprague 1993).

Figure 2: Risk Management Flow Chart



Oil industry project risk management system diagram (Weidong and Qingfen 2012)

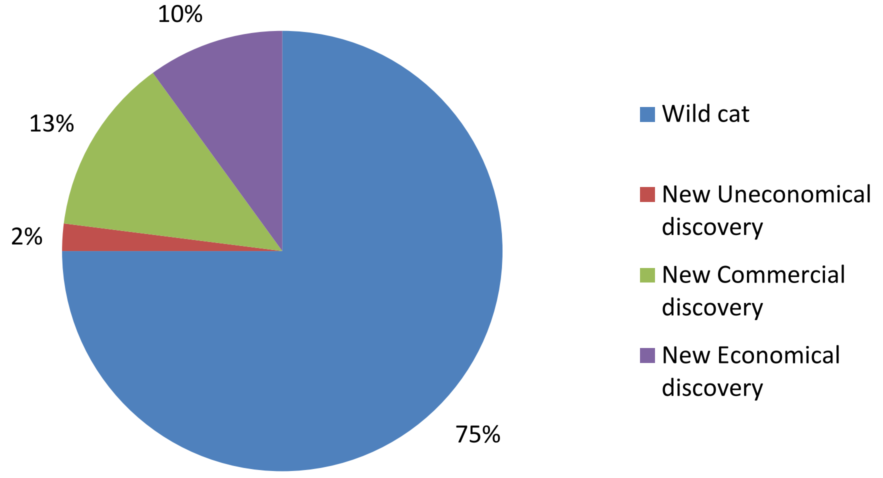
The above diagram described a standard risk management system for petroleum industry participants. The phases involved in risk management include; risk identification phase, risk assessment phase, strategy developing phase and implementation and evaluation phase(Minassian and Jergeas 2003; Weidong and Qingfen 2012).

4.1 Risk Identification

Risk identification has been discussed in many literary works as the first phase of risk management process. Effective risk management systemstarts with correct risk identification in a broader way. The following techniques are used to identify risk; SWOT method, flow chart or brainstorming. The basic risk identification factors include sources of the risks, hazard factors, and exposure(Tchankova 2002). Petroleum investment risk sources include geological risk, technology risk, economic risk and political risk.

Geological risk constitutes the possibility of discovering hydrocarbons in economic quantity. Determination of the success of exploration activities becomes difficult despite the high scientific method and economic investment made. It is established globally that success rate for extracting oil is 10% (Weidong and Qingfen 2012; Suslick and Schiozer 2004). New technology has increased the chances to between 20% and 25%. Another risk source is technology risks. It can be traced to construction, technical design and other relevant parts of business operations.

Figure 3: Success rate of exploration activities



(Weidong and Qingfen 2012)

Furthermore, economic risk involves economic factors like price, costs demand, supply, tax policies and budget plan. Changes in the world politics and economy could affect the value of the project. For example, the 2008 global economic meltdown affected several projects. Finally, political instability could make an investment highly risky. Political risks include unstable legislation such as nationalisation of oil companies and other factors like war, civil unrest, and transfer risk (Weidong and Qingfen 2012).

In order to identify risk, a continuous investigation of organisational activities from all directions including the managerial level, external and internal surrounding. The information collected should be comprehensive, complete and precise. However, other researchers criticised that it is not possible for a manager to gather complete and accurate information within the time frame for effective risk analysis (Tchankova 2002).

4.2 Risk Assessment

Risk assessment forms the basis for decision-making. It quantifies the extent of risk probability, consequence and incidence. Risk assessments refer to the total risk analysis and risk evaluations. Five steps to analyse risks include identification of hazards and threats, appraise the costs of those hazards should they occur. Also, approximate the predicted occurrence of the hazards and determine the effectiveness of the system safeguards, and the results evaluated (Aven and Vinnem 2007; Sutton2013). There exists a range of tools used to assess risk in the E&P business. Some of the tools include Comprehensive Analysis, CAPM Model, Monte Carlo simulation, ALARP approach, Decision Tree and Exercise Model (Aven and Vinnem 2007; Weidong and Qingfen 2012). Each of the risk assessment tool also have shortcomings. ALARP approach has received wide acceptance in the industry. However, risk manager should evaluate a model before using it.

4.3 Risk Management Developing Strategy

This stage represents the phase where different countermeasures established to deal with unforeseen situations that might arise during project execution. Different strategies generated to respond to the risks: reduce, avoid, transfer, control or accept the risk (Minassian and Jergeas 2003). The measures developed should be reviewed and applied accordingly. These measures will mitigate different risk factors identified (geological risk, political risks and economic risks).

4.4 Implementation and Evaluation Stage

The final step in risk analysis after identifying, assessing and measuring the risks is the implementation. Managers develop a plan on how the risk assessment report will be implemented. Successful risk management requires a comprehensive approach based on the various risk factors. A risk manager is expected to ensure that the risk management plan is supervised through comparing the standard and actual performance (Weidong and Qingfen 2012). Furthermore, sound and consistent reporting system should be established as the implementation of the plan is done.

II. Global Energy Demand, Role of Hydrocarbons and Climate Change

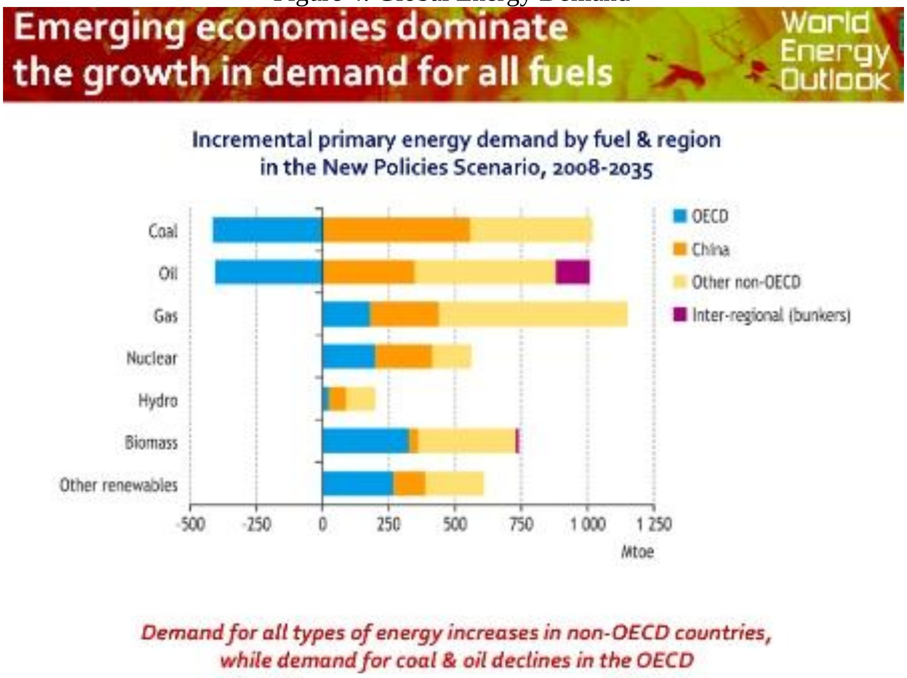
5.1 Global Energy Demand

Growth in global energy need will likely to be steady for some decades given the current policies (Birol 2006; Rooke, Fells and Horlock 1995). Energy usage has a correlation with economic growth and development (Hook et al. 2012). Statistics has shown that energy demand has increased over the decade. The demand for energy will base on some factors of the world's economy (Rooke, Fells and Horlock 1995). The economic factors responsible for the world's energy demand include first Population Distribution and Growth. Population growth rate has soared over the years to 7billion as at 2013(Rooke, Fells and Horlock 1995; Höök et al. 2012). Shell predicted that in 2050, the world will record 9 billion people on earth with 90% of the growth most likely from the developing countries(Shell Plc 2014). Kerr (2014) contributed that increase in population will result to increase in the consumption of energy.

The second factor responsible for energy demand is Gross Domestic Product (GDP). IEA and OECD (2011) assumed that in all aspects of the economy between 2009 and 2035, GDP per year will averagely be 3.6%. The study suggested that developing countries may have the highest output of about 70% out of the total world's output. It implies that by 2035, global GDP will improve from 45% to 60% and in this case; China and India may account for 31% and 15% respectively by 2035.

Thirdly, Changes in end users demand: this driver takes into consideration the energy demand by sector of the economy. Petrecca (2014) identified transport, residential and non-residential buildings, agriculture, and non-energy users as the various users of energy. The study revealed that industrial energy consumption and transportation were the primary users of fossil in the world. Finally, Rooke, Fells and Horlock (1995) argued that energy intensity caused by marginal change in energy consumed could affect economic activities. The study further revealed that the more knowledge increase in the use of energy (energy efficiency), in the long-run energy intensity may reduce.

Figure 4: Global Energy Demand

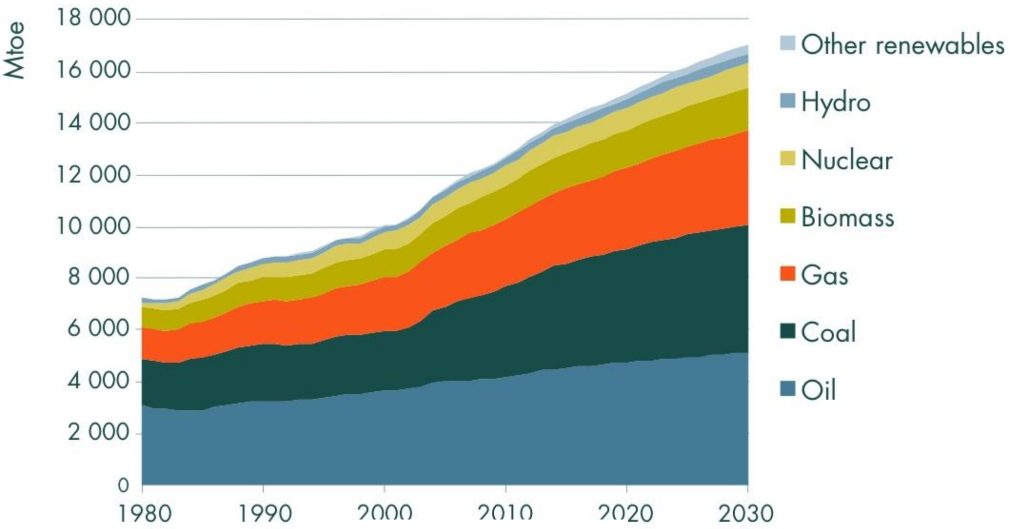


(IEA and OECD 2011)

5.2 Role of hydrocarbon in future energy mix and Climate Change

Future energy mix is described as the various allocation of the use of energy per source from different regions in the globe (Openoil 2014). Hook et al. (2012) identified different energy mix globally to include oil, coal gas, renewable and waste, nuclear power and hydroelectric dams. Others include geothermal, solar, wind and tidal energy. In the study, analysis shows that the world's primary supply of energy in 2008 was 12,267 million tons of oil equivalents (Mtoe). According to the research, hydrocarbons, that is oil, Coal and gas accounted for 4073, 3312, 2588 Mtoe respectively. Renewable and waste contributed 1,227 Mtoe; 712 Mtoe nuclear power and hydroelectric dams generated 270 Mtoe. In another study by BP Statistical Review in 2010 revealed that oil consumption accounted for 34%, coal 30% and gas 24% of the global energy. Hydropower accounted for 6.5% and non-hydro renewables 1.8%. Energy Outlook report predicted industrialisation; urbanisation and motorisation as the factors to dictate the modern energy economy (BP 2014).

Figure 6: Distribution of Future Energy Mix



(IEA and OECD 2010)

The continuous growth in global energy demand suggests that exploitation of hydrocarbons will continue. Researchers considered the sources of energy needed to meet this growing demand. However, they concluded that oil, coal and gas remain the only primary sources of power to meet the ever increasing demand. Rooke, Fells and Horlock(1995) contributed that world attempt to meet the growing demand for energy through supply of fossil fuel may impose a significant challenge to global warming. Nevertheless, the appropriate mix of the future energy may reduce the case of environmental challenges. Massachusetts Institute of Technology (2007)identified two major roles of coal in the future energy mix. First it is the lowest cause of fossil for electricity generation and secondly, coals are distributed around the world. However, has the disadvantage of harmful environmental challenges. Moss, R. H., et al. (2014) revealed that gas demand will improve in the future following policies aimed at reducing the effect of climate change. Policies imposing higher taxes on fuel will result to high prices of oil and coal which will discourage consumers from using them. The policy will encourage the use of gas, which has a relative lower price.

III. Conclusion

This study examined the various issues in the oil and gas industry beginning with the relationship between major oil companies and host government. It X-ray the fiscal systems used in the petroleum sector and the way risk could be managed in the industry. Finally, the prospect of the industry was reviewed vis-à-vis environmental challenges. The study concludes that oil and gas stakeholders' relationship could be improved if a balanced fiscal system is implemented as well as considering an environmental friendly policy.

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