

Oil and a gas exploration and production economics essay

[Economics](#)



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In recent years, quite a number of lower and middle-income countries have massively put in much effort to attract foreign investors especially in natural resources projects like mining, petroleum and other commodities like rubber. [1]Economic liberation and the rapid demand for energy have encouraged investment in the natural resource sector even ‘ parts of the world that were previously of less interest to international investors’[2]. Foreign investment flow in Sub-Sahara Africa alone was about US\$ 64 billion in 2008 with natural resources sector recording the highest share (UNCTAD, 2009)[3]. Investment flow in 2005 was US\$ 17 billion. It increased to about US \$22billion in 2006 and sharply moved to the level of over US\$ 30 billion in 2007.[4]Mostly, increased investments, to some extent stimulates opportunities to promote development and improving living standards in recipient countries through economic growth and increased government revenues.[5]Many investments in the past with regards to natural resources contributed abysmally to sustainable development and created a situation captured as ‘ resource curse’[6]. Those challenges emerged because a lot of the investment plans then were improperly implemented and mismanagement of government revenues was the order of the day[7]. In order for government to achieve sustainable development especially in countries where their major source of export happened to be natural resources, one of the key areas to consider is their investment contracts. This is because investment contracts ‘ define the terms of an investment project and constitute a key instrument of governance’[8]. In addition, the determination and distribution of risks, cost and benefits are all captured in investment contracts hence ought to be critically examined and be understood by both parties before

commencement or implementation of any petroleum project[9]. Instances whereby investors feel the host government has breached its contractual obligation mostly results in disputes which sometimes are transferred to international arbitration for settlement[10]. However, many of the petroleum exporting countries have opened up their upstream sector to investment by International Oil Companies (IOCs) through petroleum contracts such as royalty tax system, production sharing and or service contracts[11]. Many of the challenges that have emerged from petroleum contracts have been as a result of inaccuracies or ambiguities in negotiation of the petroleum contracts and failure of one party for not fulfilling its contractual obligations. The purpose of this article is to evaluate the various types of petroleum agreements with the aim of finding appropriate petroleum agreement that in distinction best fits into a country's legal frame work (on petroleum) , taking into account the cost of E&P by investors. In this article, statistical data from experts in the oil industry were collated and then grouped into three sections; low E&P cost countries which were countries with E&P cost of \$ 4. 65/b or below, medium E&P cost countries, thus countries with E&P cost ranging between \$ 4. 65/b and \$ 8. 50/b and high E&P cost countries, i. e. cost exceeding \$ 8. 50/b. This paper is grouped into five prospective sections. Section 2 highlights on the energy investments agreement; section 3 provides an overview of service contract; section 4 evaluates the upstream petroleum investment to find out whether there will be a definite or appropriate petroleum contract for a country to adopt and section 5 presents the conclusion of the paper.

Chapter two

2. Energy investment and agreements

2. 1 Oil and a Gas exploration and production

The oil and gas industry is classified into upstream sector and downstream sector. The downstream sector is into the exploration and production whereas downstream, deals with the refining and processing of the crude and gas products, their distribution and marketing[12]. The upstream sector of the industry heavily rely on the contractors or the investors who provide technical services ranging from geological and geophysical surveys, drilling, etc in support of the operation.[13] Many of the oil or gas project undergoes several stages and the following however give an overview of the various stages; Licensing: Mostly, it is the initial stage of the project and here, the government grants a licence or enters into a contractual agreement with an oil company or joint companies without transferring the ownership of the mineral resources.[14] The exploration stage: The oil company or group of companies proceeds with the exploration of the hydrocarbons after they have been granted the licence to explore at this stage. The exploration involves geological and geophysical surveys such as seismic surveys and core borings. Here the data obtained from the various surveys will determine whether the discovery is of commercial quantity or promising[15]. Appraisal: At this stage, more wildcats will be drilled if hydrocarbons are however discovered to establish the amount of recoverable oil, production mechanism and structure type. In addition, development planning and feasibility studies are carried out to be able to estimate the development cost of the project[16]. Development stage: Once the appraisal wells prove favourable,

then the next stage of development planning begins using the geological and environmental data that had already been obtained.[17] Production: At this stage, extraction of hydrocarbons begins and then transported to the processing site[18]. Abandonment: At the end of successful oil and gas exploration a decision is then made to abandon the oil field. Here, the equipments are either left for the host government or is totally removed by the contractor. Mostly, contractors or operators begin planning in about one or two years before the planned date of decommissioning[19]. There are three major kinds of petroleum agreements between foreign investors and/or domestic investors and host states. They are production sharing, tax royalty (sometimes called modern concession or licence) and service contract (sometimes referred to as risk service contract). The individual type of agreement establishes quite a distinct regime of governance sanction by the host states.

2. 2 Production Sharing Contracts/ Agreements (PSA/PSC)

In the late 1950s and 1960s, countries like Iran and Indonesia registered their displeasure against the use of traditional concession in favour of the production sharing agreement[20]. Indonesia was the first country to use PSA in the petroleum industry in the 1960s and is the standard of comparison for all PSAs[21]. The model agreement was signed between the IOC and Pertamina, the state oil company. Later, the agreement became popular in the developing countries and is now practiced in more than fifty-five countries worldwide[22]. The main driving force of the PSA was the rise of national hostility against the classic concession granted to the IOC in the petroleum industry[23]. Production contracts are signed between host states

which sometimes are represented by their NOCs and IOC for a specified period[24]. In addition, PSAs are largely practised in countries with high reserves and medium cost of exploration[25]. The contractual structure of production sharing agreement has evolved to synchronise with the changing trend in the relationships between host states and the IOCs. The key features that have characterised PSA are as follows; 1. The host state, mostly represented by NOC or the energy ministry appoints the IOC as the main contractor to engage in the exploration and development in a certain area within a stipulated time period[26]. 2. Under PSA the IOC bears the sole risks in the exploration and development of the petroleum resources but under the control of the host state[27]. 3. The oil produced, thus, belongs to the HC with the exception of the cost oil and that of the profit oil[28]. 4. The profit oil obtained, after the deduction of cost oil from the overall production is therefore shared between the IOC and the host state based on a predetermined percentage which mostly is in favour of the host state[29]. 5. Also, under the PSA, the net income of the contractor which in this case, the IOC is taxable unless the provision in the agreement proves otherwise[30]. 6. In addition, equipment for the exploration and production of the petroleum resource however becomes the host state property after the expiration of the agreement in accordance with the cost recovery schedules[31]. 7. And once the PSA is negotiated or agreed upon and signed, often becomes part of the national legislation[32]. The diagram in the figure below shows the oil distribution under PSA. Figure1. Oil distribution under PSAs

2.3 Overview of fiscal system

Exploration for natural resources especially petroleum occurs based on concessions, leases, or contracts granted by governments[33]. Usually, the terms and conditions of the agreements are well define by law or negotiated for by cases. One of the pivotal aspects of the agreement is the fiscal terms which include royalties, bonuses, rentals, production sharing arrangement, carried interest provisions, corporate income taxes and special taxes. Payments made to government required under the agreement can however be termed as ‘fiscal system’[34]. The term fiscal system therefore highlights the dynamics of virtually all taxes, levies, legislative and that of contractual aspects of petroleum operations practiced within a sovereign state[35]. In other words, the fiscal system is the determinant of profit and revenue between the IOC and the host country in the event of commercial discovery of oil. A country’s fiscal system establishes a mechanism by which a sovereign state massages the economic rent to its advantage and also providing a potential return for the oil companies[36]. And for an effective fiscal system to be achieved, the political, geological risks and potential rewards ought to be taken into consideration[37]. There are two main classifications of fiscal systems and they are concessionary and the contractual system[38]. The distinction that exists between the categories is evident hugely in the ownership of the natural resources. Under the concessionary system, all rights and title to the international company are not denied but subject to all applicable taxes[39].

Figure 2. Classification of Petroleum Fiscal System[40]

Petroleum Fiscal Agreements
Concessionary System
Contractual System
Service Contract
Production Sharing Contract
Pure Service Contract
Risk Service Contract

Under the contractual system the host government, retains title and the ownership of the natural resources and all production while the international company operates under the control of the government[41]. The contractual system can further be subdivided in to service and production contract. The establishment of a dichotomy between production sharing and risk service contract will profoundly be dependent on whether contractor's compensations are either received in kind (crude) or in cash.[42]But in both situations, bearing of risks is virtually inevitable whenever exploration is unsuccessful. The next section that follows highlights on the advantages and the disadvantages of PSA.

2. 4 The advantages of production sharing contract

In the international petroleum industry, PSA has registered more prominence as far as petroleum agreement is concerned and as a result, it's practiced in a lot of countries around the world[43]. In view of this, it is not insignificant to review the merits associated with the PSA. The petroleum agreement holds high advantages to both parties to the contract, thus the host government and the investor or the IOC in varied sense. And they are as follows; Under the PSA, all financial and operational risks are borne by the IOC leaving the host government virtually contributing nothing to the entire project[44]. The agreement also provides legal security for international oil companies if it is passed into law[45]. The PSA has for the several years proved to demonstrate in the event of volatile oil prices.[46]The PSA also

grants title and that of ownership of the petroleum resources to the host government[47]. The PSA appears to be subjected to less public scrutiny than the remaining petroleum agreements[48]. It's for these significant reasons that many countries have opened up for this type of agreement.

2. 5 Disadvantages of Production Sharing Contracts

Mostly, the petroleum industries are characterised by the involvement of knowledge intensive workers, hence discharge of professional duties are of high standard while on the other hand, in some cases, the host countries are inexperienced or lacked the skills and expertise in executing the oil and gas project under the PSA thereby thwarting the primary objectives of the exploration of the petroleum resources. In furtherance of this, poorly supervised cost recovery provisions sometimes create an expensive challenge, thus resulting in gold plating[49]. And also, high cost fields are sometimes not properly accounted for by a well calibrated volumetric sliding scale[50]. The PSA is less appropriate a model to be considered when engaging IOCs in areas with already high productivity and low risks. In addition, challenges have emerged under PSA with its capacity to provide for decommissioning[51].

Chapter Three

3. Overview of Service Contract
Service contract is another form of petroleum contract and under this contract, the IOC agrees for a fee or a share of production where it provides the host government and its state oil company with services and information to assist the country explore and to develop its own natural resources[52]. Under service contract, three basic types of

arrangements have been designed to making an effective use of the IOCs technological and managerial expertise and that of their capital resources whereas ownership and control rest with the host government[53]. Under listed are the basic types of the arrangement; The pure service contractThe technical assistance agreement andThe risk service contract[54]. Concerning pure service contract, the host government or the state oil company enter into an agreement or contract with an IOC to undertake a specified service for an agreed fee[55]. The next agreement under discussion is the technical assistance agreement which to some extent is seen as the complex version of the service contract[56]. Under this agreement, the contractor agrees to provide technical assistance in the exploration, development and at times in the refining of the oil. Here, the technical assistance provisions include equipment and training of employees to handle the petroleum facilities[57]. On the other hand, in fulfilling the other part of the agreement, reimbursement is therefore made by the host government to the company for cost incurred plus a fee which is based upon the production obtained[58].

3. 1 Overview of Risk service Contract

This is another form of agreement under service contract designed to guide the development of petroleum resources[59]. In this contract, the IOC gives an affirmative response to explore a specific area and to carefully assess its potential for discoveries. The contractor herein under this contract is however denied property rights in the reservoir but bears all financial risks and other expenses with no expectation for payment unless commercial production is attained. The major dissimilarity between the RSA and PSA is the modus operandi by which payment of contractual services and awarding

of profit share is done[60]. In addition, with regards to booking of reserves, under RSA the IOCs are disallowed to book any reserves because reimbursements and the payment of service fees made in cash only[61]. But in a situation where buy-back clause is applicable under RSA contract where payment of service fees are made in kind (as in contractor receives oil as payment) the IOC is however granted economic interest which therefore entitles it to book portion of field production and the corresponding reserves[62]. The advantages and the disadvantages under this contract are heightened in the section that follows.

3. 2 The advantages of RSA

Risk Service, which is widely practiced in Latin America, has limited advantage compared to other forms of petroleum agreement[63]. Herein, under this contract, the host government reimburse the contractor once commercial quantity of oil results plus a compensation for undertaking risks in the exploration and development of the petroleum resources[64].

3. 3 Disadvantages of RSA

One of the major challenges most IOCs face with regards to RSA is the mode of reward allocation. Mostly, the IOCs prefer reimbursement of cost in kind (thus, crude oil) to cash rewards by host states[65]. Secondly, countries whereby RSA is prominently practised are unable to render payment in American dollars, the globally recognised standard by which oil is sold[66]. This challenge is often experienced in situations where development cost and the exploration cost recovered are tied to the US prime rate[67].

4. 0 Chapter Four

4. 1 Evaluation of upstream petroleum agreement and the determination of an appropriate petroleum contract

The exploration and production cost of oil significantly plays a key role in designing a fiscal system of an upstream petroleum agreement. In the case where E&P cost of oil is low, host states grant inflexible fiscal system whilst the opposite is experienced, thus an oilfield registering high E&P cost (i. e. flexible fiscal system).[68] There are two reasons that account for high E&P cost. One is high demand of technology such as IOR in situations where production capacity is low owing to the maturing nature of major oilfields[69]. In circumstances like of this, there are always huge capital outlay thereby shooting up the E&P cost of the oilfield. Secondly, the probability of finding huge oil reserves onshore mostly is low relative to deep water offshore. And exploring and developing oil in deep water offshore come with a high E&P cost and risks which therefore requires huge investment to be able to develop, sustain or to increase oil production[70]. However, governments in considering the high risk nature of the venture refuse or are reluctant in undertaking any investment in that regard thereby opening up their upstream petroleum sector to IOC investment with the intension of obtaining capital or oil production and spreading of the technical risks. In iteration, E&P cost are highly considered as key element for host states in determining the fiscal system, legal frame work for upstream petroleum agreements and that of the type of agreement to enter with IOCs[71]. The Table below provides various countries with their E&P costs and the type of petroleum agreement they have with the IOCs. Table1. Some

countries' upstream costs[72]The table groups countries into three, in accordance with total cost of exploration and production. Thus, low, medium and high total costs, and these are based on a statistical approach. It is however observed from Table 1 that high E&P cost connotes a technical risk from the investor's point of view and in addition establishes that, the stage of investment in the upstream sector to some extent correlates with the size of the risk borne by the IOC[73]. For instance, high risks are recorded during exploration phase and later starts to decline as it reaches the development level[74]. One other thing is that, some of the risks at the production phase or reasons being that the IOCs are selected on a discount rate, base on a certain assigned risk factor and whenever this discount rate are high, it reduces the uncertainties and risks involved in making poor investment. In addition, it has however been noticed that in cases whereby E&P cost is low, host states ceases more control over operation and production and this development reflects in the type of agreement negotiated for. On the other hand, the RSA in theory grants more control to the host states over production, operation and also management followed by the RSA and R/T systems respectively. There are some countries, even with their low E&P cost; they have managed to enter into different types of agreement such as PSA or R/T system but mostly with NOC equity partnership. This equity partnership by NOCs results in host counties to having control over operation and production. Furthermore, equity participation by host states is dependent on the level of E&P costs and that of the country's prospective petroleum area. This therefore means that a high E&P cost results low NOC equity participation and vice versa. In cases where medium costs are

prominent, there's a high level of partnership and participation by the NOCs with the IOCs. This however is more profound in UAE and Nigeria (60%).

4.2 An effect of the E&P cost in countries with varied petroleum agreement

From table 1, the low E&P cost countries are Kuwait, Iran and Algeria. These are countries with exploration and production cost of \$4.65/b or below. The dominant petroleum agreement found in these countries is RSA. The reason for the adoption of this type of agreement is to increase production from existing oilfield that calls for high technology but with low operating cost. However, the adoption of RSA poses some disadvantages for the host state, thus the host state bears all the risks in the event of price fluctuations since reimbursement are mostly made in cash[75]. For instance, if prices of oil drop, the host country has no other option than to sell more oil to compensate the IOCs for their cost. This is to state that oil price has huge impact on the country's revenue as far as RSA is concerned. And from financial point of view, the practicing of RSA is accompanied by some complication than in PSA and R/T systems. From table 1, Kuwait recorded the second lowest E&P cost of \$3.55/b. On the other hand, Kuwait has a significant number of oilfields that have mature which however require huge capital outlay and technology such as IOR to maximise or sustain oil production. Considering the low cost of E&P the Kuwaitians entered into an agreement with the IOC to develop the upstream sector for duration of 20 years under OSA, a type of RSA[76]. The Kuwaitian government had a lot of control under this agreement. Iran's exploration and development cost onshore was low but its continental shelf E&P cost were much higher owing

to huge investment and high operational and maintenance costs. The Iranian constitution however prevents the awarding of petroleum rights on a concessionary basis or by direct equity[77]. But in 1987, the buy-back type of contract was adopted by the country whose features were of no difference from RSA[78]. The buy-back contract is usually between 5 years to 7 years with a fixed rate of return of 15 to 20 percent. ConocoPhillips was the IOC to enter a buy-back agreement with Iran but later withdrew. The figure below shows buy-back agreement with National Iranian Oil Company (NIOC)[79]. Figure 1[80] as at 2005. Venezuela, on the other hand, presently holds 24.8% of OPEC proven oil reserves as of 2011, thus making it the highest shareholder in OPEC member countries[81]. The country's upstream activity is both onshore and offshore and is one of the countries that enjoy low E&P cost. Venezuela, in 1990 introduced RSA in its petroleum upstream sector under different names such as OSA, risk/project sharing agreements and strategic association for extra-heavy crude. The extra-heavy crude recorded a low E&P cost compared to other countries. In 2005, Venezuela had four strategic association agreements for extra-heavy oilfields with the inclusion of exploration and development and with several IOCs participation along with the NOC as seen in figure (1).[82] The strategic association agreement however had a royalty rate between zero and one percent. Figure 2. Strategic association agreement in Venezuela[83] In addition, Venezuela had different RSA mechanisms for conventional oil exploration and production development and the country's conventional oil recorded the lowest cost of \$1.20/b. Algeria, similarly, from table 1 had a low E&P cost and as a result adopted several types of upstream petroleum agreements with the aim of

increasing E&P by the IOCs. The action by Algeria led to an upward trend in the country's production from 673, 900 b/d in 1986 to 1. 33 million b/d in 2005[84]. Although, Algerian Law No 86-14 and its amendments makes room for four types of upstream contracts, thus commercial company contracts, joint ventures, PSA, and RSA. However, the one commonly practised is the RSA[85]. Furthermore, the agreements adopted by the Algerians were signed between the NOC, Sonotrach and the IOC and Sonotrach participation was no less than 51% at the point of discovery irrespective of the type agreement. It was a provision found in the Algerian petroleum legislation. But since 1989, NOC participation ranged between 25-35% under some PSAs[86]. Mostly, it is the Algerian model that determines the level of royalties and taxes in accordance with the area and stage of production. The countries under the medium E&P cost in Table 1 are United Emirates, Kazakhstan, Nigeria, Oman and Indonesia. United Arab Emirate practised the R/T system and that of the JV agreement but has up to 60% participation of the Abu Dhabi National Oil Company (ADNOC) and 40% participation of international oil companies, thus, Exxon Mobil, BP shell, Total and Partox. Despite the country's NOC's participation, royalties under R/T system are between 12. 5% and 20% whereas taxes range between 55% and 85%.[87]Kazakhstan on the other hand adopted almost all the three types of petroleum agreement. Under Kazakhstan's R/T system, participation of NOC was allowed up to 50%. Early in 2004, there was amendment of law that made provisions for taxes to be increased whenever oil prices shot up. Also, government is entitled to 85% of profit oil in Kazakhstan. In the case of Nigeria, it however felt in love with the R/T system in the form of JV and that of the PSA. The country has two fiscal

systems thus, one for onshore and the other for offshore. The flat rates under 2005 PSC mode are 20% and 10% for onshore and inland basins respectively[88].

Table 2. Profit Oil Split under the PSC1993[89]

Production

Threshold

(bbls)

Profit Share %

Government

Contractor

0-3502080351-7003565701-100045651001-150050501501-

20006040Beyond 2000NegotiableNegotiable

Table 3. Profit Oil Split under the PSC 2005[90]

R Factor

Contractor Share

Government Share

$R < 1.2P = 70\%100\% - P1.2$ $2.5P = 25\%100\% - P$ Oman is such another country with medium E&P cost. It similarly adopted the PSA system and has a consortium comprising of the government (60%), Shell (34%), Total (4%) and Padrtex (2%). The consortium is called Petroleum Development of Oman (PDO). Oman PSA fiscal system however grants government take up to 80% and sliding scale for cost recovery between 40-50%. The royalty rate is completely absent under the PSA[91]. Without notwithstanding, Indonesia on

the other hand adopted the PSA system and has four different modifications of the PSA, namely, First Tranche Petroleum agreement (FTA), Joint Operating Agreement (JOA), Technical Assistance Contracts and that of EOR contract. The fiscal system was been designed such that there was not any inclusion of royalty for the FTA agreement but allows 100% cost recovery[92]. The last group is made up of countries with E&P cost exceeding &8. 50/b and they are US Gulf of Mexico and the North Sea (UK and Norway). Under this group, the main upstream petroleum agreement that have been adopted is the R/T system. Under this agreement, all E&P cost and risks are borne by the IOC. The advantages, here are that, the IOC has the exclusive right to exploration and complete ownership of production. Norway, with adoption of R/T also had in addition NOC equity participation of up to 30% at the exploration phase. The equity participation together with R/T system grants the Norwegian government a share up to 78% of profit oil[93].

5. 0 Conclusion

It's been observed that, regions where it recorded low E&P cost, adoption of RSA was hugely profound and those countries were found to be Iran, Kuwait, Venezuela and Algeria. Other countries such as Kazakhstan, Oman and UAE opted for the R/T system in the form of NOC equity participation or that JV agreement. However, Indonesia and Nigeria decided to settle for PSA. These countries were found to be in the medium E&P cost region. Norway adopted the R/T system and was also observed to record high E&P cost in given table. The analysis in this article is that, many of the upstream petroleum agreements granted NOC equity precipitation or partnership with the aim of

allowing NOC to play a part in controlling operations. In addition, different fiscal systems were designed to favour host governments in terms of capturing greater share of economic rent. It can therefore be said that, E&P cost in the petroleum industry has a significant role in determining an upstream petroleum agreement. However, many IOCs would rather love to enter into PSA, RSA or R/T by critically examining the structure and the design of the fiscal system and if the provisions in the fiscal system provide fare share of profit and risks