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The Need for Stakeholders' Consensus on Decommissioning Option(S): An Examination of Ghana's Petroleum Policy Framework

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Abstract:

The environment and economic development have been viewed as inseparable challenges in current times. The petroleum industry can be categorized into three energy markets- the upstream, midstream and downstream sectors. At all the stages, the marine environment stands at risk of pollution. Pollution from offshore petroleum installations at the end of its productive and economic years cannot be underestimated. The global community is approaching a decommissioning crisis since the world's offshore petroleum installations are ageing. There are various decommissioning options which lie between 'the extremes of complete removal and leave in place'. Undeniably, Ghana is at its infancy when it comes to decommissioning. The main aim of this paper is to advocate the need for stakeholders' consensus on sustainable decommissioning option(s) by analysing Ghana's legal and environmental regime on decommissioning. The research in Ghana concerning petroleum industry has been focused on government revenues, local employment opportunities in a growing sector, stimulated demand for local goods etc. The consensus of stakeholders on decommissioning option has become more prominent in the face of the current discourse on decommissioning the Saltpond Oil field, the premier oil producing field in Ghana which was discovered in 1970. There is the need for policymakers to analyse the current legal and environmental regime in light of environmentally friendly decommissioning option(s) practiced in other selected jurisdictions.

Keywords: Sustainable, decommissioning, stakeholders, consensus, Ghana

1. Introduction

The marine environment is at risk of pollution due to the sensitive nature of petroleum activities (Gao, 1998). The international community has responded to marine pollution by concluding a number of global and regional conventions and these documents acknowledge that petroleum activities have the potential to be highly lucrative, but also extremely fraught with potential marine pollution if not handled properly (Esmaeili, 2001). For this reason, the environment and economic development have been regarded as inseparable challenges (World Commission on Environment and Development, 1987). Article 1(1) (4) of the United Nations Convention of the Law of the Sea (UNCLOS) defines 'pollution of the marine environment as the introduction directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities'. Media coverage of oil spills such as the Torrey Canyon in 1967, the Amoco Cadiz in 1978, Piper Alpha 1988 disaster in the North Sea, the Exxon Valdez in 1989, the Prestige oil spill in 2002 in the Bay of Biscay, the Montara incident in 2009 and BP Macondo in 2010 highlight the devastating impacts of oil pollution on the marine environment. In West Africa, pollution caused by Shell between 1969 and 1996 resulted in the spillage of at least 2.4 million barrels of oil in the Niger Delta (Ogoniland) and the effect still lingers on as it is difficult to clean up (UNEP, 2011). The petroleum industry can be categorized into three energy markets. The upstream sector encompasses exploration and production up to decommissioning; the midstream generally involves shipping, transportation, processing and storing the oil and the downstream generally deals with refining of crude oil and gas products, their distribution and marketing (UNEP, 1997). The upstream oil and gas industry are internationally recognised as one of the polluters to the environments with diverse impacts (UNEP, 1997). In the first stage of offshore operations, risk is mostly related to seismic exploration activities which may affect the lives of marine mammals (Kashubsky, 2006). Fish, birds, marine bacteria, phytoplankton and invertebrates of the sea are affected by marine pollution specifically oil pollution (Esmaeili, 2001). Physical, biological and chemical changes to the sea can be caused by such oil pollution (Dzidzornu and Tsamenyi, 1991). The midstream and downstream sectors on the other hand have been viewed as supplements of the upstream sector and their activity is mainly focused on delivering the petroleum products to consumers (Mojarad et. al. 2018). The main activity in the midstream sector comprise transportation of crude oil from wells to processing facilities to refineries. The environmental risk associated with the midstream sector is mainly marine pollution caused by tanker vessels/ships transporting crude oil from production wells to consumers. There is risk of leaks,

oil spills and explosions from these transporting vessels (Donev, et. al. 2020). The Torey Canyon oil spill in 1967 is one major instance of marine pollution from a supertanker which hit a reef off the coast of Cornwall (UK). It spilled about 25-26 million gallons (94-164 million liters) of crude oil causing massive coastal pollution around Cornwall, the Channel Islands and Brittany (Vaughan, 2017). At the downstream sector, the main activity is the refining of crude oil, processing of natural gas and delivery of end products to the consumer and there is a risk of explosion (Mojarad et. al., 2018). It may be noted that the marine environment stands at risk of pollution at all these three sectors and thus makes relevant environmental concerns more significant.

The focus of this paper is the decommissioning component of the upstream sector. The main aim of this paper is to advocate the need for consensus on sustainable decommissioning option by reviewing Ghana's existing legal and environmental regime on decommissioning options and assess the need for stakeholders' consensus. The paper is designed in the context of promoting an environmentally sustainable framework for decommissioning offshore petroleum installations in Ghana. It has been argued that the global community is approaching a decommissioning crisis since the world's offshore petroleum installations are ageing. (Doyle et. al., 2008). Advancement in engineering has led to the installation of more offshore infrastructure on the continental shelves of 53 countries over the last seven decades and there are implications for decommissioning when these installations are no longer economically viable (Parente et al., 2006). Offshore installation means 'any man-made structure, plant or vessel or parts thereof, whether floating or fixed to the seabed, placed within the maritime area for the purpose of offshore activities' (OSPAR Convention, article 1). Offshore activities under the OSPAR Convention means activities carried out in the maritime area for the purposes of the exploration, appraisal or exploitation of liquid and gaseous hydrocarbons. The end phase of offshore oil and gas exploration and production has been described as decommissioning (Ayoade, 2003). It has been argued that at the end of the economic life of these offshore oil and gas wells, companies operating same must safely decommission their facilities including associated equipment (Shaw, Seares and Newman, 2018; Bureau of Safety and Environmental Enforcement, 2020; Bull & Love, 2019). The decommissioning process is costly, takes longer time and it requires more specialized equipment (Kaiser and Liu, 2014).

2. Theoretical and Conceptual Framework Underpinning This Paper

The theories underpinning this paper are stakeholder identification and salience and sustainable development. The theory of Stakeholder identification and salience takes into consideration a category of persons who can affect '(that means has power to affect)' and also those who are affected by the exercise of that power '(that have claims of legitimacy)' (Donaldson, 1995; Gomes 2004). Urgency as a third attribute is posited in addition to these two already mentioned attributes (Mitchell et. al., 1997). The theory of stakeholder identification and salience was proposed by Mitchell et al. Urgency according to Mitchell et al., is immediate attention to claims of the stakeholders. They proposed a new normative theory based on three variables. These are power, legitimacy and urgency as main attributes of stakeholder identification and salience. This theory aids in gaining a better understanding of the extent of stakeholders' knowledge of decommissioning and their extent of interactions and how such interactions align with conditions conducive to sustainable decommissioning in Ghana.

Second, Sustainable development is development that meets the needs of current generation without compromising the ability of future generation to meet their own needs (Brundtland Report, 1987). Sustainable development according to Taylor (2016) has three main issues which are economic growth, environmental protection and social equality. Based on this, sustainable development rests on three conceptual pillars. These pillars are economic sustainability, social sustainability and environmental sustainability. Economic sustainability encompasses a system of production that satisfies the needs of the present generation without compromising future needs (Lobo, Pietriga&Appert, 2015). Social sustainability on the other hand includes concepts like 'equity, empowerment, accessibility, participation, cultural identity and institutional stability' (Daly, 1992). It looks at the relationship between social conditions such as poverty and environmental destruction (Farazmand, 2016). Therefore, the process of reducing poverty must not lead to environmental destruction or economic instability. The natural environment must be utilised in such a way that it will continue to be productive and resilient to support human life (Brodhag&Taliere, 2006). Figure 1 below shows the relationship/interconnection among social, environmental and economic sustainability.

Figure 1: Relationship among Social, Environmental and Economic Sustainability
Source: (Mensah, 2019)

Figure 2: Concept Underpinnings of Decommissioning Options

Source: Sommeret. al. (2019)

Figure 1 and 2 indicate the various concepts underpinning this paper vis-à-vis the various decommissioning options. It has been argued that sustainable development thrives on the commitment of people to translate the concept/agenda into action (Mensah, 2019). Public participation/ involvement should be increased to push that agenda. In obtaining that commitment and public participation, people must be aware and acknowledge 'that their survival and the survival of the future generation depend on responsible behaviour regarding consumption and production, environment and progressive social values' (Mensah, 2019). Sustainable development theory is the basis of this paper as there must be a balance of social, economic and environmental factors in the petroleum industry to protect the interest of future generation. It helps to arrive at a better understanding of the dynamics in the implementation of legal and policy frameworks governing decommissioning in Ghana's offshore industry.

3. Review of Literature

Decommissioning of facilities entail 'the complete removal of the infrastructure, partial removal of infrastructure or it can be left in place' (Shaw t. al., 2018). There are various decommissioning options which lie between 'the extremes of complete removal and 'leave in place' (Schroeder and Love, 2004). The offshore installation can be left wholly in place; a partial removal of the superstructure; towing and placing the installation in a new site and lastly toppling the structure by laying it on its side in the ocean (Schroeder and Love, 2004; Macreadie et al., 2011; Fowler et al., 2014). Support for the complete removal of offshore petroleum installations is based on the notion that 'leaving the seabed as you found it' is an environmentally sound decommissioning option (Schroeder and Love, 2004). Macreadie et al. (2011) however has argued that the complete removal of these installations could affect production lives of the marine ecosystem as these structures are capable of developing and supporting marine life. There are examples of petroleum installations in the northern Gulf of Mexico which commercially and recreationally support red snapper fishery (Gallaway et al., 2009). In the North Atlantic, offshore petroleum installations left in place provide habitat for cold water coral (Bell and Smith, 1999). The removal and disposal of these installations with associated waste to shore could also pose danger to human health, contaminate ground water, lead to 'atmospheric emissions, smell, visual and noise disturbance for the immediate community' (Ayoade, 2003). It is argued that removal of offshore petroleum installations is 'unlikely to represent best environmental practice and recognition' (Macreadie et al., 2011).

The challenges associated with removal of offshore petroleum installations has resulted in some nations leaving old and non-economic viable structures in place as artificial reefs ('rigs-to-reefs', RTR). These installations when left in place become artificial reefs supporting marine life including corals and sponges (Gass and Roberts, 2006; Friedlander et al., 2014); fish and sharks (Dugas et al., 1979; Schroeder and Love, 2002; Pradella et al., 2014) and marine megafauna (Robinson et al., 2013; Todd et al., 2016). Fauna is quickly established by these offshore platforms when they are installed and this faunal community also attracts fish and could serve as artificial reefs when these installations are left in place (Bohnsack, 1989). It may be noted that the Japanese have gone further to construct artificial reefs to attract fish 'and to increase the biological productivity in the ocean' (Aabel et al., (1996). Removal of the installations therefore will destroy the artificial reef created by these installations leading to a loss of important ecosystem services (Elden et al., 2019). It may however be noted that the Rigs-to Reefs policies are still debatable and controversial in some regions like the OSPAR nations including the United Kingdom, Norway, Spain, Portugal, Germany etc. (Jorgensen, 2012; Macreadie et al., 2012).

It may be noted that although, there is a global consensus that decommissioning means to 'take out of service' the concept has not been defined in legislation (Techera and Chandler, 2015). For instance, Ghana's Petroleum (Exploration and Production) Act, 2016, which applies to petroleum activities within the jurisdiction of the Republic of Ghana, does not define decommissioning. However, international, regional and state laws and agreements have been viewed to have influence on the legal framework for managing decommissioning in most jurisdictions (Shaw et. al, 2018). For instance, UN Convention on the Law of the Sea (UNCLOS), Geneva Convention 1958, London (Dumping) Convention 1972 and Protocol 1996, all stipulate that offshore oil and gas infrastructure must be removed after its economic and operational life. The United Kingdom (UK) has an extensive regime controlling the decommissioning of offshore oil and gas installations and the focus is on re-use, recycling or final disposal on land of oil and gas facilities/installations. The primary legislation for the UK on decommissioning is the UK's Petroleum Act 1998. At the regional level, the UK is bound by the Oslo and Paris Convention for the Protection of the Marine environment of the North East Atlantic (Ospar Convention 1992). The UK is

bound under Oskar Decision 98/3, section 2 which specifically provides for the prohibition of dumping and leaving wholly or partly disused offshore installation within the maritime area after its operational life. Regional regimes such as the OSPAR Convention 1992 do generally have influence on performance standards at national levels. The use of best available techniques (BAT) and best available practice (BEP) for instance are included as a general obligation in the OSPAR Convention (OSPAR Convention, 1992). The concept of BAT has been developed in a number of European Union Directives like the EEC Directive 76/464 on Pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and the EEC 84/360 Air framework Directive. It is argued that these regulations are aimed at minimising marine pollution. These practices may complement the national laws of member states.

Offshore decommissioning is challenging due to rising concerns such on sustainable development, the high costs involved, its complex nature and the unique technologies associated with removal of individual infrastructure (Evans, 2008; Shaw et. al., 2018). As a result, the decommissioning process in various jurisdictions differs (Evans, 2008). Diverse factors and consultations with various institutions need to be taken into account as the decommissioning process would take some years to complete (Bennie, 1998). The United Kingdom's Brent Spar case can be argued as a defining event in decommissioning at both regional and national level of regulation (Bennie, 1998). Shell Company which owned the offshore Brent Spar decided to decommission this facility but it was met with immense protest from environmental group, Greenpeace. The initial decision of Shell was to dump the installation in the deep sea. Due to this immense protest from Greenpeace, Shell had to review its initial decision of dumping the facility in the deep sea to re-use of the facility. The UK Government subsequently announced its approval of Shell's final decommissioning choice which was based on its re-use proposal. The Brent Spar Oil storage and loading facility was re-used as part of a quay extension in 1998 (Tsoukas, 1999). In view of this protest concerning Shell's 1995 proposal to dump the Brent Spar, offshore petroleum companies today are pressured by environmentalists to engage in sustainable decommissioning practices (Techera& Chandler, 2015; Roos, 2019). Currently, there are more than 7000 offshore petroleum installations in over 53 countries (Lakhal et. al., 2009; Techera& Chandler, 2015). A number of these offshore installations would reach the end of their operational life in the next few decades and would have to be decommissioned (Day & Gusmita, 2016). There are both economic and ecological concerns associated with these upcoming decommissioning projects (Roos, 2019) and Ghana is no exception. The decommissioning of petroleum facilities may have long and short-term environmental benefits and adverse impacts. The adverse impacts to water and air quality; sensitive species, commercial and recreational fishing, and other resources cannot be underestimated (Shaw et. al., 2018). The process of removing and disposing an offshore installation 'involves the potential release of residual oil, radioactive scale, heavy metals and other toxic pollutants into the marine environment with uncertain longer-term impacts' (Ayoade, 2003).

Studies around the world including Ghana have centered on some key areas including liability, compensation, contractual obligations, offshore drilling rules, revenues, waste management, offshore pollution, stakeholders' engagement (Roos, 2019; Lodungi et.al, 2016; Moller, 2007; Cameron, 1998). Brigitte et. al. (2018) focused on various decommissioning options and broadly reviewed the environmental effects of decommissioning. Bull et. al. (2019) also conducted a study on the 'history, practices, published science and available information involved when considering reefing option'. There have been studies on engaging and involving stakeholders in the decommissioning decision-making process (Laraia, 2017). Darko (2014) in her studies focused on timelines and actors in the oil and gas industry, factors influencing the timing of oil and gas exploration and production, how and when revenues from the oil and gas industry flow to host governments. Others have focused on aqueous waste from exploration and production including produced water, drilling fluids, mud, well treatment chemicals, oil spills, leakages from pipelines etc. (Achaw and Danso Boateng, 2013). There has also been an analysis of the potential impacts of oil and gas exploration and production on the coastal zone of Ghana (Amoasah, 2010). Samuel Marfau-Sau also reviewed the negative impact of the oil and gas production on the environment in Ghana and comments on Ghana's past record in managing environmental problems in the extractive industry (Marful-Sau: CAR Volume 13). Amorin and Broni-Bediako (2013) have also argued that Ghana has most of the regulations and institutions already in place and that it should ensure their implementation.

Globally, there are numerous ad-hoc and fragmented rules governing petroleum activities including decommissioning, and thus making it difficult to steer the complex regulatory terrain (Techera& Chandler, 2015). Decommissioning is addressed to a limited extent in international conventions and laws apparently due to the absence of attention paid to decommissioning in the past (Roos, 2019). The international legal regime concerning decommissioning is 'ambiguous, incomprehensive and outdated' leaving its governance in the hands of individual states (Hamzah, 2003; Lyons, 2014; Techera& Chandler, 2015). This therefore implies that there are varied approaches to decommissioning internationally (Lyons, 2014). For instance, there is example of strict removal policy of offshore installations in the European Countries bordering the North Sea and those like the United States who have adopted the 'Rigs-to-reefs' approach (Roos, 2019). Studies on decommissioning in the North Sea and the United States have been extensively carried out (e.g., Schroeder and Love, 2004; Kaiser and Pulsipher, 2005; Jørgensen, 2012; Claisse et al., 2015). In recent times, studies on decommissioning policy in emerging oil and gas producing regions, such as south-east Asia (Zawawi et al., 2012; Fam et al., 2018; Laister and Jagerroos, 2018), Australia (Fowler et al., 2015; Techera and Chandler, 2015; Chandler et al., 2017), and Brazil (Barros et al., 2017; Mimmi et al., 2017) have also been carried out. Currently there are two comprehensive assessments of the literature which provide information on the decommissioning process, options, and regulations around the world conducted by Bull and Love, 2019; Sommer et al., 2019. These two reviews are complementary although each focus on different aspects of decommissioning. Sommer et al. (2019) focuses on the functions and services these petroleum platforms play in the ecosystem and suggests a 'more ecosystems-based approach to decommissioning'. Bull and Love (2019) on the other hand focused on reviewing literature on offshore petroleum

installations, decommissioning, relevant legislation, and ecology of these platforms. However, it may be noted that these two reviews failed to discuss the need for states to build a stakeholders' consensus on decommissioning options. Stakeholders for purposes of this paper is defined as 'any person or entity that has a stake in the outcome of the project' (Freeman, 1984). The three main categories of stakeholders in the oil and gas life cycle are the State (i.e. National government, local government and national oil companies), Oil industry (i.e. contractor, operator, national oil companies, international oil companies, oil and gas industry associations), and Community (i.e. local community, service providers, international NGOs, watchdogs and development agencies) (Darko, 2014; Al-Fattah, 2013).

In West Africa, there has been no major decommissioning projects having been carried out (Reed, 2019). Nigeria has laws that do provide for decommissioning but the specifics are not provided (Reed, 2019). The United Kingdom's focus is on re-use, recycling or final disposal on land of oil and gas facilities/installations. Ghana other hand has no specific consensus as to which option of decommissioning is to be carried out by operators. Under section 43 (5) of the Petroleum (Exploration and Production) Act, 2016, the licensee or contractor operating a petroleum facility must submit a decommissioning plan detailing a proposal for either a shutdown of operations and disposal of petroleum facilities (which includes removal of petroleum facilities for use elsewhere, uses other than for petroleum activities or complete or partial removal or abandonment of the facilities) and further use in petroleum activities of the facilities in place. This section makes provision for blanket regulation of decommissioning and the choice is left to the licensee or operator to make and it is argued that this may lead to environmental, social and economic deficits.

Undoubtedly, Ghana is in its infancy when it comes to decommissioning and it is unclear if the current legal and environmental regime is extensive to meet local and international standards. The research in Ghana concerning petroleum industry has been focused on government revenues, foreign exchange production, local employment opportunities in a growing sector, stimulated demand for local goods and services and future gas project (International Finance Corporation, 2020). In Ghana, there is no regulatory regime on decommissioning (Songi, 2014) unlike Angola that passed Presidential Decree 91/18 covering decommissioning wells and facilities in 2018 (Reed, 2019). The primary legislation on petroleum activities in general is the Petroleum (Exploration and Production Act 2016), (Act 919) which governs exploration and production of petroleum within Ghana. Decommissioning is not defined in this Act and what decommissioning constitutes in Ghana may be problematic when the time is due for these offshore platforms to be abandoned. Act 919 only provides for a decommissioning Fund and Plan. The decommissioning plan to be submitted by oil companies must however be in compliance with the laws of Ghana. The regulatory framework for the oil and gas operations (upstream) in Ghana are Petroleum exploration and Production Act 2016, Ghana National Petroleum Corporation Law, 1983 (PNDCL 64), Petroleum Income Tax Law 1987 PNDCL 188), Petroleum Agreements, Petroleum Commission Act 2011, Internal Revenue Act 2000, Act 592 and the Petroleum Revenue Management Act, 2011. The focus of these legislations has been the exploration, development, production of petroleum in Ghana and revenue accumulating therefrom. Within the last decade, Ghana has experienced considerable strides in its offshore petroleum industry. In 1970, the first oil field off the coast of Ghana was drilled in Saltpond and since then, more areas have been awarded and explored (GNPC, 2019). The Saltpond Oil Field has reached the end of its economic and operational life and must be decommissioned (Aklorbortu, 2017). Operation of the Saltpond Oil Field was halted in 2010 when it started incurring operational costs and was no longer viable (GNA, 2020). The field is located 13km off the coast of Saltpond. Crude oil was discovered in commercial quantities in June 2007 in the Jubilee Field located in Ghana's Continental shelf and it was announced by GNPC and her partners Tullow Oil and Kosmos Energy (Allotey, 2010). The Jubilee field is located 60km off the Ghanaian border in the Gulf of Guinea (Kastning, 2011) and it straddles across the Deepwater Tano and West Cape Three Points blocks (Offshore Technology, 2016). Twenty-five additional offshore findings have been made after the Jubilee Field discovery in 2007 (Petroleum Commission, 2020). For instance, the Tweneboa-Enyenra-Ntomme Field and Sankofa - GyeNyame Fields form part of the additional discoveries and they are in production. Currently, there are 16 Operators in over 18 Contract Areas and in varying stages of their respective agreements ranging from Exploration to Production (Petroleum Commission, 2020). From January 2018 to September 2018, three fields in the Gulf of Guinea namely the Greater Jubilee Field, Tweneboa-Enyenra-Ntomme Field and Sankofa-GyeNyame Project have produced total crude oil of 39.33 million barrels which translates into an average daily oil production of 161,836 barrels (Ministry of Finance, 2018). In November 2019, Springfield Exploration and Production Limited (SEP), an independent Ghanaian energy company, also made an offshore discovery of more than 1.2 billion barrels of oil off the coast in the Western Region of Ghana (Oilfield Technology, 2019). More wells have been discovered in the western Ghanaian territorial sea. The map in figure 3 below shows Ghana's offshore activity.

Figure 3: Ghana's Offshore Activity Map

Source: Petroleum Commission, 2019

Over the next 15-20 years, a number of offshore oil and gas facilities in Ghana specifically the Jubilee Field will cease producing hydrocarbons and will require decommissioning. The contract term in the Model Agreement is for a period of 30 years from the effective date. Article 23 of the Petroleum Agreement with Ghana National Petroleum Corporation and Tullow Ghana Limited, Sabre Oil and Gas Limited and Kosmos Energy Ghana HC in respect of the Deepwater Tano Contract Area dated 10 March 2006) is for a period of 30 years. Again the Petroleum Agreement among The Republic of Ghana, Ghana National Petroleum Corporation, Kosmos Energy Ghana HC and the E.O. Group in respect of the West Cape Three Points Offshore Ghana dated 22nd July 2004 is also for 30 years as stated in article 23 of the said agreement. It becomes imperative for stakeholders to build a consensus on sustainable decommissioning option, review the current legal and environmental regime and examine the stakeholders' knowledge of decommissioning options and best practice. It has been submitted that it is important to have accepted knowledge about decommissioning options and its associated environmental effects among stakeholders (Roos, 2019). Decisions by the state, operators and regulators on decommissioning may be ad-hoc without broadly accepted knowledge on decommissioning options (Roos, 2019). The studies indicate that although many people are acquainted with what offshore platforms look like above the waters, many do not also have knowledge about the ecosystem beneath the surface which evolve around these platforms during the operational life. (Roos, 2019). It has been argued that a high level of coordination and consensus among key stakeholders including the state operators, and contractors is required in decommissioning (Oudepot, Whittaker and Vazquez, 2018).

4. Conclusion

Ghana has now managed to position itself as the hub of oil and gas in the Gulf of Guinea after the discovery of the Jubilee oilfield by Kosmos Energy in 2007. These facilities would in the future be decommissioned at the end of their life cycle. The consensus of stakeholders about decommissioning options has become more prominent in the face of the current discourse on decommissioning the Saltpond Oil field, the premier oil producing field in Ghana which was discovered in 1970. The Saltpond Oil Field would be a test case for Ghana similar to the Brent Spar which was seen as such for the United Kingdom. Having viewed the discourse on decommissioning options, it may be argued that building a stakeholders' consensus on same, has been relegated to the background in Ghana and thus has necessitated this current paper. There is the need for policymakers to analyse the current legal and environmental regime in light of environmentally friendly decommissioning option(s) practiced in other selected jurisdictions. There is a need for a consensus among stakeholders in the petroleum industry in Ghana as to the best decommissioning option. Ghana's legislation is not comprehensive to tackle the environmental issues associated with decommissioning. The gap in Ghana's current legislation has the potential to undermine the formulation of policy that protect, sustain the management of hydrocarbon resources and protect the environment when these petroleum operations come to an end.

5. References

- i. Aabel, J.P., Cripps, S.J., Kjeilen, G. (1996). Offshore Petroleum Installations in the North Sea used as Fish Aggregating Devices- Potential and Suggestions for Preparation, Management and Monitoring. Society of Petroleum Engineers. Available: doi:<https://doi.org/10.2118/35919-MS>. [08/07/2020].
- ii. Achaw, O-W. & Danso-Boateng, E. (2013). Environmental Management in the Oil, Gas and related Energy Industries in Ghana. *International Journal of Chemical and Environmental Engineering*, 4(2).
- iii. Aklorbortu, M.D. (2017). The headaches of decommissioning oil installations-Is Ghana ready? Available:<https://www.graphic.com.gh/business/oil-gas/the-headaches-of-decommissioning-oil-installations-is-ghana-ready.html> [20/07/2020].
- iv. Al-Fattah, S.M. (2013). The Role of National and International Oil Companies in the Petroleum Industry. Available:http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2299878&download=yes [23/7/2020].

- v. Allotey, J. A. (2010). Environmental Management Challenges of Oil Development in Ghana. Available: https://www.google.com.gh/search?q=Jonathan+A.+Allotey,+%E2%80%98Environmental+Management+Challenges+of+Oil+Development+in+Ghana%E2%80%99,+%28Environmental+Protection+Agency+2010%29&ie=utf-8&oe=utf-8&gws_rd=cr&ei=pOWcV8HhFoK3ae_IgpAI [02/12/2019].
- vi. Amoasah, G. (2010). The Potential impacts of oil and gas exploration and production on the coastal zone of Ghana. Environmental Systems Analysis Group.
- vii. Amarin, R. and Broni-Bediako, E. (2013). Major Challenges in Ghana's Oil and Gas Discovery: Is Ghana Ready? *ARPN Journal of Science and Technology*, Vol. 3 No. 1.
- viii. Ayoade, D. (2003). Offshore Decommissioning - A Comment. *Oil, Gas and Energy Law Intelligence (OGEL)*, Volume I, Issue 02.
- ix. Barros, J. C., Fernandes, G. C., Silva, M. M., Da Silva, R. P., and Santos, B. (2017). 'Fixed platforms at ageing oil fields - feasibility study for re-use to wind farms,' in *Proceedings of the Offshore Technology Conference*, Houston, TX.
- x. Bell, N. and Smith, J. (1999). Coral growing on North Sea oil rigs. *Nature* 402.
- xi. Bennie, L.G. (1998). Brent Spar, Atlantic Oil and Greenpeace. 51 Parliamentary Affairs 297.
- xii. Bohnsack, J. A. (1989). Are high densities of fishes at artificial reefs the result of habitat limitation or behavioural preference? *Bull. Mar. Sci.* 44, 631-645.
- xiii. Brigitte, S., Fowler, A. M., Macreadie, P.I, Palandro, D. A., Aziz, A.C and Booth, D.J. (2018). Decommissioning of offshore oil and gas structures- Environmental opportunities and challenges. *Science of the Total Environment*.
- xiv. Brodhog, C. & Taliere, S. (2006). Sustainable development strategies: Tools for policy coherence. Natural Resources Forum.
- xv. Bull, A. S. and Love, M. S. (2019). Worldwide oil and gas platform decommissioning; A review of practices and reefing options. *Ocean & Coastal Management* Vol. 168 278-306.
- xvi. Bureau of Safety and Environmental Enforcement. (2020). What is decommissioning of offshore platforms? Available: <https://www.bsee.gov/faqs/what-is-decommissioning-of-offshore-platforms> on 13/04/2020 [23/07/2020].
- xvii. Cameron, P. (1998). Decommissioning of oil and gas installations: A comparative approach to the legal and contractual issues. AIPN Study, Barrows Company
- xviii. Chandler, J., White, D., Techera, E. J., Gourvenec, S., and Draper, S. (2017). Engineering and legal considerations for decommissioning of off shore oil and gas infrastructure in Australia. *Ocean Eng.* 131, 338-347. Available: doi: 10.1016/j.oceaneng.2016.12.030 [15/10/2020].
- xix. Claisse, J. T., Pondella, D. J., Love, M., Zahn, L. A., Williams, C. M., and Bull, A. S. (2015). Impacts from partial removal of decommissioned oil and gas platforms on fish biomass and production on the remaining platform structure and surrounding Shell mounds. *PLoS One* 10:e0135812. Available: doi: 10.1371/journal.pone.0135812 [08/10/2020].
- xx. Daly, H. E (1992). U.N. Conferences on Environment and Development: Retrospect on Stockholm and prospects for Rio. *Ecological Economics. The Journal of the International Society for Ecological Economics*.
- xxi. Darko, E. (2014). Short guide summarising the oil and gas industry lifecycle for a non-technical audience. EPS PEAKS.
- xxii. Day, M., & Gusmita, A. (2016). Decommissioning Offshore Oil and Gas Installations.
- xxiii. Donev, J. M.K.C et. al. (2020). Energy Education- Midstream oil and gas industry.
- xxiv. Doyle, M. W., E.H., Havlick, D.G., Kaiser, M.J., Steinbach, G., Graf, W. L., Galloway, G.E., and Riggsbee, J.A. (2008). Aging infrastructure and ecosystem restoration. *Science* 319.
- xxv. Dzidzornu, D.M. and Tsamenyi, B. M. (1991). Enhancing International Control of Vessel Source Oil Pollution under the Law of the Sea, 1982: A Reassessment. 10 *University of Tasmania Law Review* 269 at 269.
- xxvi. Dugas, R., Guillory, V., and Fischer, M. (1979). Oil Rigs and Offshore Sport Fishing in Louisiana. *Fisheries* 4, 2-10. Available: doi: 10.1577/1548-8446-21-26 [16/09/2020].
- xxvii. Elden, S., Meeuwig, J.J., Hobbs, R.J. and Hemmi, J. M. (2019). Offshore Oil and Gas Platforms as Novel Ecosystems: A Global Perspective. *Frontier in Marine Science*. Available: doi: <https://doi.org/10.3389/fmars.2019.00548>.
- xxviii. Evans, G. (2008). Decommissioning the North Sea. Available: <http://www.offshore-technology.com/features/feature2069/> [on 15/07/2020].
- xxix. Esmaeili, H. (2001). The Legal Regime of Offshore Oil Rigs in International Law. Dartmouth Publishing Company.
- xxx. Galloway, B. J., Szedlmayer, S. T. and Gazey, W. J. (2009). A life history review for red snapper in the Gulf of Mexico with an evaluation of the importance of offshore petroleum platforms and other artificial reefs. *Rev Fish Sci.* 17.
- xxxi. Gass, S. E., and Roberts, J. M. (2006). The occurrence of the cold-water coral *Lopheliapertusa* (Scleractinia) on oil and gas platforms in the North Sea: colony growth, recruitment and environmental controls on distribution. *Mar. Pollut. Bull.* 52, 549-559. doi: 10.1016/j.marpolbul.2005.10.002.
- xxxii. Gao, Z. (1998). Environmental Regulation of Oil and Gas in the twentieth Century and beyond: An Introduction and overview' in Zhiguo Gao et. al., *Environmental Regulation of Oil and Gas*. Kluwer Law International.
- xxxiii. GNA. (2020). PIAC urges GNPC to decommission Saltpond oil field. Available:

- <https://www.businessghana.com/site/news/business/217908/PIAC-urges-GNPC-to-decommission-Saltpond-oil-field> on [20/07/2020].
- xxxiv. Fam, M. L., Konovessis, D., Ong, L. S., and Tan, H. K. (2018). A review of offshore decommissioning regulations in five countries – strengths and weaknesses. *Ocean Eng.* 160, 244–263. doi: 10.1016/j.oceaneng.2018.04.001.2018.
 - xxxv. Farazmand, A. (2016). *Global encyclopaedia of public administration, public policy and governance*. Springer International Publishing.
 - xxxvi. Fowler, A. M., Macreadie, P., and Booth, D. (2015). The beauty of obsolete oil rigs. *Aust. Sci.* 36, 28–30.
 - xxxvii. Fowler, A. M., Macreadie, P. I., Jones, D. O. B., and Booth, D. J. (2014). A multi-criteria decision approach to decommissioning of offshore oil and gas infrastructure. *Ocean Coast. Manag.* 87, 20–29. DOI: 10.1016/j.ocecoaman.2013.10.019 [02/08/2020]
 - xxxviii. Freeman, R.E (ed.). (1984). *Strategic Management: A stakeholder Approach*. Pitman, Boston.
 - xxxix. Friedlander, A. M., Ballesteros, E., Fay, M., and Sala, E. (2014). Marine communities on oil platforms in Gabon, West Africa: high biodiversity oases in a low biodiversity environment. *PLoS One* 9:e0103709. doi: 10.1371/journal.pone.0103709 [02/08/2020]
 - xl. Gomes, R. (2006). Stakeholders Management in the Local Government Decision-Making Area: Evidences from a Triangulation Study with the English Local Government. *Brizilian Administration Review*, Vol. 3. No.1, art.4, pp. 46-63.
 - xli. Hamzah, B. (2003). International rules on decommissioning of offshore installations: Some observations. *Marine Policy*, 27(4), 339-348.
 - xlii. International Finance Corporation. (2020). Jubilee Oil Field, Ghana. Available: https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/jubilee+oil+field%2C+ghana [02/08/2020].
 - xlili. Joint E&P Forum/UNEP Technical Publication. (1997). Environmental management in oil and gas exploration and production: An overview of issues and management approaches.
 - xliv. Jørgensen, D. (2012). OSPAR's exclusion of rigs-to-reefs in the North. *Ocean Coast. Manag.* 58, 57–61. doi: 10.1016/j.ocecoaman.2011.12.012 [02/08/2020].
 - xlvi. Kaiser, M. J., and Liu, M. (2014). Decommissioning cost estimation in the deepwater U. S. Gulf of Mexico – Fixed platforms and compliant towers. *Mar. Struct.* 37, 1–32. doi: 10.1016/j.marstruc.2014.02.004 [02/08/2020].
 - xlvi. Kashubsky, M. (2006). Marine Pollution from the Offshore Oil and Gas Industry: Review of Major Conventions and Russian Law (Part 1). *Maritime Studies* 1, 2
Available:http://newcustomscentre.files.wordpress.com/2012/09/marine_pollution_part1.pdf [30/06/2016].
 - xlvi. Kastning, T. (2011). Basic Overview of Ghana's Emerging Oil Industry. Available:<http://library.fes.de/pdf-files/bueros/ghana/10490.pdf> on 17/07/2016[03/08/2020].
 - xlvi. Laister, S., and Jagerroos, S. (2018). 'Different routes - same destination: planning processes for decommissioning in South East Asia,' in *Proceedings of the Society of Petroleum Engineers Symposium*, (Kuala Lumpur: Society of Petroleum Engineers).
 - xlix. Lakhal, S., Khan, M., & Islam, M. (2009). An 'Olympic' framework for a green decommissioning of an offshore platform. *Ocean and Coastal Management*, 52(2), 113-123
 - l. Laraia, M. (2017). New and unexpected stakeholders in decommissioning projects. Available:https://www.researchgate.net/publication/318032324_New_and_unexpected_stakeholders_in_decommissioning_projects [15/97/2020].
 - li. Lobo, M.-J. , Pietriga, E. &Appert, C. (2015). An evaluation of interactive map comparison techniques. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems - CHI '15* (pp.3573–3582). New York, USA: ACM Press. doi:10.1145/2702123.2702130. [05/08/2020].
 - lii. Lodungi, J.F, Danial, B.A, Khirulthzam, F. M, Adnan, F.F.R.B and Tellichandran, S. (2016). A Review on Oil Exploration and Production Waste Discharges according to legislative and waste management practices perspective in Malaysia. *Internationa Journal Waste Resources* Vol.7.
 - liii. Lyon, Y. (2014). The new offshore oil and gas installation abandonment wave and the international rules on removal and dumping.
 - liv. Macreadie, P. I., Fowler, A. M., and Booth, D. J. (2011). Rigs-to-reefs: will the deep sea benefit from artificial habitat? *Front. Ecol. Environ.* 9, 455–461. DOI: 10.1890/100112. [05/09/2020].
 - lv. Marful-Sau, S. (2014). Is Ghana Prepared to manage the potential environmental challenges of an oil and gas industry? *CAR (CEPLMP Annual Review)*: CAR Volume 13. Available: <http://www.dundee.ac.uk/cepmlp/gateway/?news=30889> [13/05/ 2014]
 - lvi. Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars and implications for human action: Literature review. *Cogent Social Sciences*. Available: <https://doi.org/10.1080/23331886.2019.1653531>[15/07/2020].
 - lvii. Mimmi, F., Ralston, S., Silva, M. M., and Silva, P. M. (2017). 'Baseline for planning and cost estimation of Brazilian decommissioning,' in *Proceedings of the Offshore Technology Conference*, Houston, TX.
 - lviii. Mitchell, R.K, Angle, B. R & Wood, D. J. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What really counts. *Academy of Management Review*, Vol.22, no.4, pp. 853-886.

- lix. Mojarad, A. A., Atashbari, V., and Tantau, A. (2018). Challenges for sustainable development strategies in oil and gas industries. Proceedings of the 12th International Conference on Business Excellence.
- lx. Moller, L. (2007). Decommissioning Costs: Government and Industry attempts at addressing decommissioning liabilities. Dundee University (CEPMLP).
- lxi. NOIA. (2018). Hurricanes and the offshore oil and natural gas industry.
- lxii. Oudenot, E., Whittaker, P., and Vasquez, M. (2018). Preparing for the next wave of offshore decommissioning. Available: <https://www.bcg.com/publications/2018/preparing-for-next-wave-offshore-decommissioning.aspx> [23/07/2020].
- lxiii. Parente, V., Ferreira, D., and Moutinho, E. (2006). Offshore decommissioning issues: deductibility and transferability. *Energy Policy* 34, 1992–2001. doi: 10.1016/j.enpol.2005.02.008
- lxiv. Petroleum Commission Ghana. (2019). Maps. Available: <https://www.petrocom.gov.gh/maps/> [04/12/ 2019].
- lxv. Pradella, N., Fowler, A. M., Booth, D. J., and Macreadie, P. I. (2014). Fish assemblages associated with oil industry structures on the continental shelf of north-western Australia. *J. Fish Biol.* 84, 247–255. doi: 10.1111/jfb.12274
- lxvi. Reed, E. (2019). West African decommissioning regime still to be tested. Available: <https://www.energyvoice.com/oilandgas/africa/211564/west-african-decommissioning-regime-still-to-be-tested/> [23/07/2020]
- lxvii. Robinson, D. P., Jaidah, M. Y., Jabado, R. W., Lee-Brooks, K., Nour El-Din, N. M., Al Malki, A. A., et al. (2013). Whale sharks, rhincodontypus, aggregate around offshore platforms in Qatari waters of the arabian gulf to feed on fish spawn. *PLoS One* 8:e58255. doi: 10.1371/journal.pone.0058255 [04/07/2020].
- lxviii. Roos, P. (2019). Policy change in offshore decommissioning governance: Dealing with environmental politics and coping with ecological uncertainty. Msc Thesis Environmental Policy Group.
- lxix. Schroeder, D.M., and Love, M.S (2004). Ecological and political issues surrounding decommissioning of offshore oil facilities in the Southern California Bight. *Ocean Coast Manage* 47.
- lxx. Schroeder, D. M., and Love, M. S. (2002). Recreational fishing and marine fish populations in california. *Calif. Coop. Ocean Fish. Investig.* 43, 182–190.
- lxxi. Sommer, B., Fowler, A. M., Macreadie, P. I., Palandro, D. A., Aziz, A. C., and Booth, D. J. (2019). Decommissioning of offshore oil and gas structures – Environmental opportunities and challenges. *Sci. Total Environ.* 658, 973–981. doi: 10.1016/j.scitotenv.2018.12.193.
- lxxii. Songi, O. (2014). Offshore Petroleum Exploration and Production: Challenges and Responses. Available: <https://www.ogel.org/article.asp?key=3431> [23/07/2020].
- lxxiii. Taylor, S. J. (2016). A review of sustainable development principles: Centre for environmental studies. University of Pretoria.
- lxxiv. Techera, E. & Chandler, J. (2015). Offshore installations, decommissioning and artificial reefs: Do current legal frameworks best serve the marine environment? *Marine Policy*, 59, 53-60.
- lxxv. Todd, V. L. G., Warley, J. C., and Todd, I. B. (2016). Meals on wheels? A decade of megafaunal visual and acoustic observations from offshore Oil & Gas rigs and platforms in the North and Irish Seas. *PLoS One* 11:e0153320. Available: doi: 10.1371/journal.pone.0153320 [03/08/2020].
- lxxvi. Tsoukas, H. (1999). 'David and Goliath in the Risk Society: Making Senses of the Conflict between Shell and Greenpeace in the North Sea'. 6 Organisation 499.
- lxxvii. UNEP. (1997). Environmental management in oil and gas exploration and production: An overview of issues and management approaches. UNEP E& P Forum/UNEP Technical Publication.
- lxxviii. UNEP. (2011). Environmental Assessment of Ogoniland. Available: <http://allafrica.com/download/resource/main/main/يداتcs/00021293:deb9cb4322608e852fc03d5fbbcf25d4.pdf> [2/08/2020].
- lxxix. Vaughan, A. (2017). Torrey Canyon Disaster- the UK's worst-ever oil spill 50 years on. The Guardian
- lxxx. World Commission on Environment and Development. (1987). Our Common Future (Oxford University Press.
- lxxxi. Zawawi, N. A. W. A., Liew, M. S., and Na, K. L. (2012). 'Decommissioning of offshore platform: A sustainable framework,' in *Proceedings of the 2012 IEEE Colloquium on Humanities, Science and Engineering (CHUSER)*, Kota Kinabalu, 26–31. Available: doi: 10.1109/CHUSER.2012.6504275 [07/10/2020].