



Review of Environmental Policy and Legal Framework Governing Oil and Gas Production in South Sudan

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Abstract:

The exploitation of hydrocarbon resources in the Global South often results in a “resource curse,” marked by environmental degradation, biodiversity loss, pollution, and public health challenges. In response, many countries have developed legal and policy frameworks to address these issues. This study explores the legal and policy instruments employed by the Government of South Sudan to mitigate environmental impacts from oil and gas production. Using a qualitative exploratory design, the research draws on literature from government reports, academic publications, and civil society organizations. Findings indicate that South Sudan has adopted several key instruments, including the Transitional Constitution, the Mining Act (2012), the Petroleum Act (2012), the Petroleum Revenue Management Act (2013), the Land Act (2009), the National Environment Policy (2015–2025), and accompanying regulations. However, challenges such as political instability, corruption, low public awareness, and limited resources hinder effective implementation. The study concludes that while South Sudan has established a progressive environmental governance framework, sustained collaboration among government, civil society, international partners, and local communities is essential for advancing sustainable development in the petroleum sector.

Keywords: Oil; Gas; Production; Environment; Policy; Framework; South Sudan

1. Introduction

Modern oil and gas extraction increasingly occurs in close proximity to human settlements (Craig & Quagliaroli, 2020). Globally, around 70,000 oil and gas fields span nearly 100 countries, collectively holding over 1,600 billion barrels of crude oil reserves (Johnston et al., 2019). However, the exploitation of these hydrocarbon resources is often accompanied by significant negative effects at local, regional, and global levels—phenomena commonly described by the “resource curse” or “Dutch Disease.” The resource curse refers to the environmental, economic,

social, and political challenges that can afflict resource-rich nations as a result of extractive activities (Ross, 2015; Saâdaoui & Jbir, 2021). These impacts are especially pronounced in petroleum-producing countries of the Global South, where consequences include pollution, toxic contamination, inadequate waste management, land degradation, biodiversity loss, and widespread public health risks (Cordaid, 2014; Kuch & Bavumiragira, 2019; Johnston et al., 2019).

Establishing robust environmental governance through progressive legal and policy frameworks is considered a key remedy to the resource curse (Open Society Institute, 2005). Environmental governance encompasses the institutions, regulations, and processes through which political actors manage environmental affairs (UNEP, 2017; Muigua, 2019). When a country upholds strong rule of law, the typical manifestations of the resource curse are less likely to emerge. In such contexts, the so-called “curse” can be reframed as a manageable condition (Kopiński et al., 2013). This perspective suggests that, with effective environmental controls, oil and gas production in Africa can shift from being a liability to a development asset. Furthermore, strong enforcement mechanisms and institutional capacity to ensure compliance can yield significant benefits, including enhanced political stability (Ruei, 2018; Tiitmamer, 2019).

South Sudan is the newest substantial oil producing country in the world. It is at position three in sub-Saharan Africa coming after Angola and Nigeria (Kuch and Bavumiragira, 2019). Her economy is dependent on two sectors of oil and agriculture. Oil accounts for 98% of the country’s national budget, while 80% of the rural households depend on agriculture as the mainstay of their livelihood (GOSS, 2018). The nation has found itself between a rock and hard place because it largely depends on oil and gas production, an activity that is having serious negative ecological and human impacts to the nation.

As a recourse to the resource curse, South Sudan has used its legal and policy framework to enforce strategic actions aimed at ensuring that oil and gas production promotes ecological integrity, protects human life, and advances sustainable development (UNEP, 1997; Cordaid, 2014). Numerous scholars have attempted to study impacts of oil and gas exploration and production predicaments in relation to conflicts, democracy, ecological impacts, political economy, poverty, gender in South Sudan (Ruei, 2018; Tiitmamer, 2019; Renzi, 2021; Achot and Bill, 2021). However, none of the scholars to the best of authors’ knowledge have analysed the environmental governance in the oil and gas industry. Therefore, in this paper, the authors traverse policy and legislative landscapes used by the Government of South Sudan to streamline effective environmental management principles in the petroleum sector. The primary aim of this study is to provide an in- depth understanding of various environmental legal and policy frameworks governing oil and gas production in South Sudan. In doing so, the authors examine different clauses in these policies and laws that directly or indirectly influence the governance of health, safety and ecological conservation matters linked with oil and gas production. The rest of this paper is divided into three section including literature review where that details the environmental impacts of oil and gas production; material and methods that highlight the contours of oil and gas production in South Sudan and gives the methodology used in conducting this study; the findings, and the conclusion.

2. Literature review

Oil and gas industry comprises two parts: (a) upstream phase comprising exploration, drilling, and production (b) downstream phase of the oil lifecycle dealing with refining and processing products from crude oil and gas, their distribution and marketing (Darko, 2014). Exploration encompasses operations geared towards location of potential sites for oil and gas drilling. Earlier, explorers relied on signs such as natural oil seepage, however technological advancement has introduced use of geological surveys and use of seismic imaging in offshore exploration. When it comes to production, which is the focus of this study, the process begins once a company has identified where oil and gas is located and plans to drill begins (Craig and Quagliaroli, 2020). The production is one of the capital-intensive industries that requires high skilled labour and expensive equipment to conduct.

Oil deposits exist in the sedimentary rocks situated 2 to 4 kilometers underneath the earth's surface where there is high temperature and pressure to form liquid hydrocarbons from organic matter through a thermogenic process (Johnston et al., 2019). Oil and gas production operations have a variety of environmental impacts that differ depending on the stage of the process, complexity and size of the project, sensitivity of the surrounding ecosystems and effective plans and techniques put in place for environmental governance (UNEP, 1997). The environmental degradation associated with the production jeopardizes the livelihood of inhabitants of oil producing states. The crude oil and natural production mostly occur from long-term habitat alteration within the oil and gas fields, waste management and production activities. In this section we present some of the environmental impacts of oil and gas production.

Several studies globally have reviewed the environmental law and policy governing oil and gas exploration in different countries. Studies by Koone (2014), indicate that absence of effective policy and ineffective legal and institutional framework has severe socio-economic and ecological impacts. Analysis of oil and gas regulations in developed countries indicate such countries have established functional policy and institutional framework for effective oil exploration. In a study on environmental regulatory framework of oil and gas in Europe by Mulatu et al., (2010), identified a well elaborate environmental legislation and effective enforcement of the regulation by the relevant agencies to governing the oil and gas sector. The key legislation in European countries, include Petroleum (Production) Act, 1934, Prevention of Oil Pollution Act of 1971, Pollution Prevention and Control Act, 1992, among others. The government of Canada has an elaborate legislation for oil and gas exploration, production and distribution (Carter 2016, Mugendi et al., 2022). The country has specialized agencies for the administration. The Environmental Protection Branch of Environment Canada is the Federal Agency in charge of guaranteeing appropriate reporting, surveillance and response approaches are in place to deal effectively with environmental emergencies. UK success on exploratory and production activities of oil and gas is effective in its environmental policy and legal framework. (Ezel and Ezel, 2014). Kiern (2011) documents that the legal framework for environmental governance to prevent oil and gas pollution in the USA is anchored in; the Comprehensive

Environmental Responses, Compensation and Liability Act (CERCLA), 1980, the Water Control Act of 1972 and the Oil Pollution Act (OPA) of 1990.

As reviewed by Mugendi et al., (2022), African countries should borrow a leaf from developed countries where oil and gas exploration and production are carried out in the utmost environmentally friendly manner. Although major oil producing countries in Africa lack effective and functional environmental regulation, framework governing policy (World Bank, 2007), Angola has demonstrated the role of sound environmental laws in management of oil and gas exploration. Angola's 2010, constitution, chapter 12, states that the state shall encourage the protection and conservation of the environment during oil exploration and use of to the advantage of the community as a whole. Angola is a classic example of African country with an effective environmental regulation and framework to oil and gas exploration, while most countries in Africa still seems to depend on lead agencies to enforce anti-pollution laws (Santosa and Plisson-Saune, 2012). Countries such as Equatorial Guinea (Donwa et al., 2015), Congo Brazzaville (Meyers, 2015) have no effective laws and governing policy to regulate sustainable oil and gas exploration. In such countries, economy thrive at the expense of the environment. In the publication, a review Kenya has supposedly a robust, constitutional, policy and legal framework on matters environmental management. The country has developed the National Environmental Policy 2013, National Energy and Petroleum Policy 2015, National Land Policy 2016 and National Forest Policy 2014, with various institutions governing these policies.

Review of oil and gas legislation and legal framework, observes the presence of legal policy and institutional framework to promote sustainable exploration of oil and gas within South Sudan. The South Sudan's Petroleum Act (2012), Petroleum Revenue Management Act (2013), and Transitional Constitution (2011) are the key legislative framework administering the hydrocarbon sector. Other legislation includes Land Act (2009), National Environment Policy (2015-2025), Petroleum Health, Safety and Environmental Management System and Plans Regulations (2015), Mining (Mineral Titles) Regulations (2015). These enacted legislations have established various in institution to enforce and regulate the compliance of the various policies. The creation of the National Petroleum and Gas Council is entrenched in Article 173. The council is a policy making body in charge of management of petroleum and gas resources. It also approves all the oil and gas exploration and production contracts besides reviewing the environmental and social impacts of the existing projects (GOSS, 2016). The mining Act (2012), has led to establishment of Directorate of Mining Development, Lands Commission, Ministry of Environment and Forest, Directorate of Geological Survey, whose mandates into support mining companies in optimal and safe exploitation of gas and oil with the country. They are responsible for promoting and facilitating the exploration and production of mineral products within the sustainable development principles. The petroleum act of 2012, mandates the ministry of mining, to regulate and issue mining permits to exploration and production of oil and gas to contractors. This act takes into consideration of the application of environmental and social impact assessment on impacts and the proposed mitigation strategies for the negative environmental impacts.

3. Materials and methods

3.1. Study Area:

South Sudan became an independent nation on July 11, 2011, inheriting approximately 75% of Sudan's oil reserves, which were primarily located in the southern region. Oil and gas production remains central to South Sudan's economy, with the petroleum sector contributing around 98% of the national budget. Despite this economic reliance, the sector is largely dominated by foreign investors, particularly from India, China, and Malaysia (GOSS, 2018). Much of the oil infrastructure is situated near or straddles the border between Sudan and South Sudan, complicating production logistics.

Since independence, political instability has significantly hindered oil and gas output. Crude oil is exported via Sudan's infrastructure, specifically through the Port of Sudan, for which South Sudan pays various service fees, including for pipeline use, processing, transportation, and transit. Oversight of the petroleum sector is primarily conducted by two bodies: The Ministry of Petroleum and Mining, which manages sector operations, and the National Petroleum and Gas Corporation (NPGC), the top policy-making and supervisory institution. The NPGC reports to both the National Legislative Assembly and the President, and plays a critical role across all stages of the hydrocarbon value chain, including approving petroleum agreements on behalf of the government.

Table 1: Main Oil Companies in South Sudan

Consortium or subsidiary	Company	Company's Country of Origin	Share Capital
Greater Pioneer Operating Company (GPOC)	CNPC	China	40.00%
	Petronas	Malaysia	30.00%
	ONGC	India	25.00%
	Nile pet	South	5.00%
Dar Petroleum Operating Company (DPOC)	CNPC	China	41.00%
	Petronas	Malaysia	40.00%
	Nile pet	South Sudan	8.00%
	Sinopec	China	6.00%
	Tri-ocean Energy	Egypt	5.00%
Sudd Petroleum Operating Company (SPOC)	Petronas	Malaysia	67.80%
	ONGC	India	24.20%
	Nile pet	South Sudan	8.00%

Data source: (EIA, 2022)

3.2. Methodology

The paper adopted a qualitative approach. The approach is effective in attempting to make sense of existence and describe the social world. Moreover, it effectively provides in-depth and interpreted insight of the society using material circumstances, perspectives, experiences, and histories. The analysis is open to emerging ideas and concepts which presents a detailed description, identify patterns of relationship, or developed typologies and explanations (Moriarty, 2011). Qualitative approach is consistent with the primary purpose of this research i.e. to assess critically the environmental legal and policy frameworks that govern oil and gas production activities in the Republic of South Sudan and examine the challenges facing their implementation. The paper adopted qualitative exploratory research design in which data is collected through qualitative literature review and government reports analysis.

The study examined environmental policies and laws to determine oil and gas production codes in the country to evaluate how they affect the involved companies' and individuals' operations. The data used is all gathered from secondary sources such as published journals, legal government documents and reports, policy documents, official websites of different government and not-for-profit organizations, and review of relevant laws and regulations that are currently in force. Information from global and local organizations affiliated with the petroleum industry that periodically give environmental safety bulletin were also explored. All the data used in the study were aptly referenced and authors and publishers acknowledged.

4 Findings and Discussion

4.1. Environmental policy and regulatory framework governing oil and gas production in South Sudan

The Transitional Constitution of the Republic of South Sudan (2011)

The transnational constitution was drafted by the South Sudan Constitutional Draft Committee and ratified by the legislative assembly on 7th July 2011. It came into force after being signed by the president replacing the then existing 2005 Interim Constitution of South Sudan. Article 41 is dedicated to sound environmental management. It bestows the right to clean a healthy environment to all citizens and communities and gives the citizenry the responsibility of protecting the environmental resources for the benefit of the future generations (GOSS, 2011). The constitution assigns the legislature the role of putting in place appropriate legal actions and other measures to prevent pollution and ecological degradation; promote ecologically sensitive sustainable development that protects genetic stability and biodiversity. Article 168 (8) provides guidelines for equitable sharing of national resources including oil and gas. The section points out that revenue sharing needs to reflect commitment to devolution of powers and good governance. This implies that the net petroleum revenue should be shared proportionally between the central government, sub-national governments and the communities inhabiting the areas where the resources are extracted (Reng and Tiitmamer, 2018).

Article 172 provides the guidelines for management and development of the petroleum and gas sector (GOSS, 2011). The development and management of the resources is vested on the national government for the South Sudanese

people. The management is guided by the principles of safeguarding the interest of future generation, environmental and biodiversity protection, promotion of balance and equitable development, restoration of land affected by exploitation, accountability for degradation of environments occasioned by petroleum and gas operations and use of revenue from the sector to develop other sectors of the economy that creates a lasting benefit for the society. The creation of the National Petroleum and Gas Council is entrenched in Article 173. The council is a policy making body in charge of management of petroleum and gas resources. It also approves all the oil and gas exploration and production contracts besides reviewing the environmental and social impacts of the existing projects (GOSS, 2016).

Mining Act (2012)

The Mining Act established various institutions to support the mining companies in optimal and safe exploitation of the natural resources. These institutions include Directorate of Mining Development, Lands Commission, Ministry of Environment and Forest, Directorate of Geological Survey (Renzi, 2021). The institutions are responsible for promoting and facilitating the exploration and production of mineral products within the sustainable development principles in South Sudan. The stakeholders in the mining sector have a responsibility of ensuring that their decisions do not compromise the occupational health and safety of workers. Thus, hazards to the environment should be prevented or minimized at all costs (Cordaid, 2014).

Chapter 15 of the Mining Act highlights the needs for preservation of the natural environment and pollution prevention by title holders. Besides, the title holder has the onus of preserving the natural environment, minimizing / controlling waste and reducing undue damage or loss of biological resources. The waste should also be treated before being released into the environment (Mining Act, 2012). The legislation advocates for proper management of mining waste products by putting emphasis on re-use, recycling, reducing and recovery of the by-products. This must be done to enhance land restoration. Research on mineral extraction and production activities is also encouraged to come up with tools and techniques that will improve competitiveness, productivity and efficiency in the mining industry while ensuring minimal adverse environmental impacts. The Act mandates that GOSS purchase 15% of share capital in large-mining companies. Through the support from African Development Bank, the GOSS is in the process of reviewing mining policy, legal and regulatory frameworks under the Institutional Support Project that strengthens economic governance (ISP-SEG). The review is intended to integrate regional and international best practices into the sector.

Petroleum Act (2012)

The enactment of the Petroleum Act brought a flicker of hope for a sound environmental management in South Sudan after several years of health, safety and environmental degradation following neglect by Khartoum (Tiitmamer, 2015). The whole of Chapter xiv of the act addresses the human health and safety issues together with ecosystem protection. The legislation was enacted within one year after the attainment of hard-fought freedom, with one sole agenda: to manage the oil and gas sector ethically, efficiently, with transparency and in an accountable manner, based on socially, economically and ecologically principles (UNEP, 1997; GOSS, 2012).

The Act under Article 59 requires the contractor to undertake an environmental and social impact assessment study before initiating any operation of oil and gas exploration and production. This comprehensive baseline study is to provide an understanding of existing environmental situations with an aim of minimizing the adverse social and environmental impacts. The Environmental management plan must be availed by the contractor. The plan provides the description of the risks and hazards identified in the evaluation process and will be managed by prevention, control, and mitigation strategies. The person responsible for implementation and compliance must also be indicated. The Petroleum Act 2012 has entrenched the polluter pays principle in the oil and gas industry. This is a key principle of sustainable development that puts entities responsible for environmental pollution on notice that they will be held responsible for their action. For example, those who release pollutants into the environment must bear the cost of managing their actions to prevent ecological and human health damage. In Article 61, the Act points out that if environmental pollution damage occurs from any petroleum activity, with or without a license, the contractor will be accountable.

From the Act, the petroleum companies must establish two types of funds i.e. contingency and pollution damage fund. The latter is required for rehabilitation and cleaning- up of the site where pollution has taken place, while the former is required to meet the costs of restoring and complementing any person whose livelihood or income is damaged either permanently or temporarily (pointed out in Sub-section 54). The contingency fund is like an emergency preparedness kitty which is expected to be availed at any time. The evidence of its existence must be submitted to the Ministry in charge of petroleum and gas production.

Article 28 of the Act requires contractors to apply to the Ministry of Petroleum and Mining for a permit to engage in exploration and production of oil and gas. Part of the application is the environmental and social impact assessment that details how the activities are likely to impact on the environment and the proposed mitigation strategies for the negative environmental impacts. The operation license will only be issued by the Ministry after an evaluation of the technical competence, history of compliance, experience, ethical conduct, and financial capacity of the contractor to prevent and mitigate negative environmental safety concerns. During treatment, transportation and storage of oil and gas products must be handled in an environmentally sound manner.

Flaring and venting is restricted by the Act. This has the effect of reducing greenhouse gases and climate change impacts (GOSS, 2016). Notably, the act appears to be silent on how the oil and gas industry can adapt and mitigate climate change, especially on infrastructure vulnerability to drought and floods and how the affected community in the production regions can cope with, mitigate, prepare for, and recover from the climate shocks. The term climate change is not mentioned anywhere in the Act, forget about adaptation and mitigation. However, the Act has been criticized for not covering the downstream by not addressing matters like petroleum economics, petrol stations and depots. Moreover, it does not mention about the Environmental Management System (EMS), a mechanism for addressing the business operations' overall impacts that pose adverse consequences to the environment. The Act just provides for an Environmental Management Plan (EMP) that is adequate at the project level. The ISO's 14001 standards contain the same actions indicated in the EMP.

Petroleum Revenue Management Act (2013)

Nations endowed with environmental resources like oil and gas, wildlife and forests are increasingly adopting models of resource revenue sharing regimes between central, regional governments and local community members in the producing areas (Bauer et al., 2016). Even though the reason for this varies, it is mainly meant to prevent resource curse, where mining of natural resources with minimal gains by the local population can easily result in violence, poverty, and political instability. In line with this, Petroleum Revenue Management Act 2013 allocates 3% and 2% of the net petroleum revenue to the producing communities and states, respectively (GOSS, 2013). Environmental resource sharing has the potential of reducing poverty and raising the standard of living in resource-rich communities. It also provides additional finances for local governments in underserved areas by compensating the affected residents for the environmental and social impacts of exploitation and exhaustion of natural resources (Reng and Tiitmamer, 2018). However, poorly designed resource sharing regimes often exacerbate regional disparities. For example, in Brazil, the revenue sharing formula disproportionately favors oil and gas rich Rio de Janeiro which is the nation's third affluent state in terms of the GDP per capita (Bauer et al., 2016).

Land Act (2009)

Economists divide factors of production to four, including land, capital, labour, and entrepreneurship. Land including natural resources is the first factor used in extraction and production of goods and services. Any well-functioning economy will have to depend on land (IGAD, 2010). The Land Act protects rights and regulates land tenure in South Sudan to create an enabling environment for socioeconomic development on the land and natural resources. The Act defines public land as land owned collectively by the South Sudanese people and held in trust by the government. Chapter XI of the Act is dedicated to land use, social and environmental conservation, whereby individuals and companies are expected to protect land from degradation as stipulated in Article 44 of the Constitution. In doing this, land for investment is to be subjected to environmental and social impact assessment before decisions are made thereon. The assessment process must evaluate the project impacts on biodiversity, the environment, people's livelihood, and assets. Moreover, individuals responsible for land degradation are expected to put in place environmental restoration action plans to prevent endangering lives of people living closer to the area. The resettlement plan for communities affected by land resource economic investment must also be prepared (IGAD, 2010). The plan implementation shall be done in consultation with the affected communities subject to compensation as mentioned in section 75 of the Act. Finally, the Act stipulates that land acquisition, ownership and transfer can be conducted through leasehold, freehold and customary tenure. According to section 14 of the Act, the citizens have freehold titles while foreigners can acquire leasehold for a specific period (GOSS, 2009). Also, the government has a responsibility of managing conservation and development of natural resources including oil and gas (Section 43).

National Environment Policy (2015-2025)

An environmental policy is a course of action adopted by a state to prevent, reduce, or counteract the harm on the environment in its totality by human beings. These harms can be directly or indirectly caused by human beings` and by extension generally affects the natural ecosystem (UNEP, 1997). In 2015, the country achieved a great milestone by developing the National Environmental Policy, with the aim of ensuring protection, conservation, and sustainable utilization of natural resources in South Sudan (GOSS, 2018). Prior to the policy, the legislative mechanisms supporting environmental governance in the oil and gas industry were formulated and enacted in accordance with Articles 55 and 177 of the Republic of South Sudan constitution (GOSS, 2011; Renzi, 2021). The policy has 10 chapters addressing areas of climate change mitigation and adaptation, corporate social and environmental responsibility, management of resources and environmental planning.

Petroleum Health, Safety and Environmental Management System and Plans Regulations (2015)

The regulations came into effect on 31st March 2015 to enable the petroleum industry to operate in accordance with international standards and best practices as stipulated in the Petroleum Act (2012). This enactment came at a time when environmental conditions in South Sudan had deteriorated, reflected by oil leaks, poor handling of produced water and mud pit, contamination of aquatic ecosystems, and compromised health status of petroleum sector workers (Tiitmamer, 2016). The regulations put responsibility on companies to develop and implement environmental health safety plans that are audited on an annual basis (GOSS, 2015). An independent auditor is required to submit a report on the outcome and performance of the entities. The guidelines expect companies must comply with international standards together with the national standards set forth by the Ministry of Petroleum and Mining (GOSS, 2012). The enforcement role of the Ministry and legal requirements, process and duration of mining is also captured in the regulations (Kuch and Bavumiragira, 2019)

Mining (Mineral Titles) Regulations (2015)

The regulation was signed into law on 5th March 2015 as provided for under the Mining Act. The regulations were developed for operationalizing Article 198 of the Mining Act 2012(Renzi, 2021). It establishes guidelines for exploration and operations including application process, license terms, land use, legal requirements, rehabilitation, and mining closure process. The Mining Committee is also created to oversee the tendering process that grants large-scale and exploration licenses (Trimmer, 2019). It also formalizes artisan mining. The environmental safeguard provisions entrenched in the regulations include:

- i. Requirements to carry out environmental, social impact assessments.
- ii. Preparation and implementation of rehabilitation and mining closure plan
- iii. Establishment of community development agreements that detailing how mining activities will meet the needs of the community in the mineral production area.

4.2. Challenges of the Implementation of Environmental Legal and Policies in South Sudan

Political instability

The environmental concerns often take a backseat during political conflicts. In peacebuilding and post conflict development, ecological protection is reflected as a “soft” subject (UNEP, 1997). Severe damages to the ecosystem occurred in southern territories due to neglect by the Khartoum government. The same case continued in South Sudan, where environmental conservation has not been part of the peace process immediately after gaining independence in 2011 (Bilali, 2020). As a result, neither the oil and gas companies or the government were held accountable for environmental degradation (Ruei, 2018).

The crude oil is transported through the Port of Sudan and the Government of South Sudan pays for using North Sudan’s infrastructure such as pipeline, oil processing, transportation, and transit fee. However, the Rapid Support Forces (a paramilitary force in Sudan) in early 2023 threatened South Sudan that it will disrupt oil transportation through territories that they control unless Juba gives them transit and rental fee. Besides, the war is linked to displacement, violence and destruction that interrupted people’s livelihoods, loss of life and property. The legacy of the years of conflict and cruelty inflicted on the locals has created a society that is deeply impoverished, traumatized, broken relationships within clans, villages, and families. This has not been adequately addressed and will take a longer time. Lack of redress of the war impacts has created unconducive atmosphere for implementation of environmental governance strategies. A study Tiitmamer (2015) found that despite the existence of this progressive Act Petroleum Act (2012, implementation and enforcement is still a challenge due to the ongoing political instability, delayed establishment of institutional implementation structures and lack of environmental awareness in the communities.

Corruption

Corruption is the greatest threat to socioeconomic development in the republic of South Sudan (Acho and Bill, 2021). Absence of accountability enhanced public participation in decision making transparency and strong civil society institutions have compromised the implementation of environmental laws and policies in the petroleum industry (GOSS, 2018). Corruption has resulted in violation of environmental rights and further perpetuating resource curse. A study by Tiitmamer (2016) showed that despite the government putting in place a guideline on health, safety and environmental management for the petroleum sector, most oil and gas companies have not put in place necessary measures to ensure ecological integrity and human health and safety is not compromised. This non-compliance can be linked to political corruption where large companies like the China National Petroleum Corporation (CNPC) that started operating before South Sudan got independence still operate without a proper waste management system (Tiitmamer, 2019).

Lack of awareness

Oil and gas production operations have a variety of environmental impacts that differ depending on the stage of the process, complexity and size of the project, sensitivity of the surrounding ecosystems and effective plans and techniques put in place for environmental protection (UNEP, 1997). However, most people are not aware of the rights and responsibilities to clean and safe environments as stipulated in South Sudan's legal and policy frameworks such as the National Environment Policy (2015-2025) and the Petroleum Health, Safety and Environmental Management System and Plans Regulations (2015). Due to this lack of awareness, the country continues to face environmental degradation as the perpetrators of environmental crimes are left scot-free without any reprimand for their actions (Tiitmamer, 2016). Research by Cordaid (2014) pointed out that pollutants from oil and gas production are suspected to be responsible for eye and skin problems among other health problems based on medical reports from Koch and Melut Counties. The unfortunate bit is that the local communities are not aware of the hazards linked to the oil production and the business itself. The same research indicated that the local communities residing near the oil wells are not aware of the grievance mechanisms, compensations procedures, CSR policies and distribution plans and use of oil revenue.

Inadequate technological investments

Financial investments on improved technology are very useful in minimizing environmental impacts of oil and gas production. For example, improved reservoir management decreases volumes of produced water (Gedeon, 2018). Some of these technological innovations are too expensive and take a longer period to move from engineering concept, testing in the lab, then to field and thereafter commercialization. Only financially strong industrial players can take part in such activities (Hosseinnia et al., 2021). This may not be the case in South Sudan where the sector is controlled by foreigners, mainly Indian, Chinese, and Malaysian (Table 2). The main interest of these external investors is extraction of more profit rather than the health and safety of the locals (Reng and Tiitmamer, 2018; Kuch and Bavumiragira, 2019). Despite the country having great potential for (safe) renewable energy, like solar and hydropower, less investments has been put towards exploration of such options to develop the energy security of the nation (Bilali, 2020).

High poverty levels

South Sudan Oil and gas production accounts for 98% of the country's national budget (GOSS, 2018), but the sector is highly capital intensive, the oil and gas companies do not need several laborers. This implies limited employment opportunities from the locals since most skilled staff are mostly foreign expatriates. Locals only get petty jobs or work on short contracts as casual employees. Most community members work as guards, cleaners, drilling machine operator assistants. The combination of less employment opportunities and low salaries for the menial jobs has entrenched high levels of poverty in the country (Cordaid, 2014). The link between poverty and environmental degradation is well supported by theory and empirical evidence (Bucknall et al., 2000). For example, rather than poverty being the main culprit leading to compromised environmental situations, the opposing argument is that

factors such as greed, misuse of power, and rent seeking behavior are responsible for environmental degradation in the global south (Rai, 2019).

High dependence on external partners

The petroleum sector has attracted several upstream oil foreign companies to work in the country particularly India, Malaysia, and China (Reng and Tiitmamer, 2018). The presence of the foreign national implies that they play an essential role in the country's oil and gas supply chain. That also denotes a disruptive factor in the country's stability in the context of the state fragility triggered by civil war and implementation of the environmental governance principles (Abii and Nwosu, 2009; Cordaid, 2014; Trimmer, 2019;). There have been assertions that these oil companies are complicit in war crimes to cover up their lack of adherence to environmental protection (Bilali, 2020). Despite the peace agreement, the international oil companies are allegedly fueling carnage in the country so continue with their unchallenged environmental degradation.

5. Conclusion

The paper analyses the environmental policy and legal framework governing oil and gas production in South Sudan. The paper concludes that since the country gained independence from Khartoum on 11th July 2011 and took away 75% of oil reserve fields in Sudan, the young nation has made tremendous efforts in preventing the "environmental resource curses" using policies and laws. The legal and policy framework is a bold step of entrancing the environmental management principles in the oil and gas production sector. The research Transitional Constitution of the Republic of South Sudan, Mining Act (2012), Petroleum Act (2012), Petroleum Revenue Management Act (2013), the Land Act (2009), National Environment Policy (2015- 2025) and Mining Regulations, as the key instruments that the Government of South Sudan has put in place to deal with environmental maladies linked oil and gas production. The findings show that the oil-rich nation has a very progressive legal and policy landscape depicting the government's efforts in advancing sustainable development in the petroleum industry. Further, the paper identified political instability, corruption, and lack of awareness and inadequate green technological investments, high poverty levels, and dependence on external partners as some of the challenges facing the implementation of the environmental governance laws and policies in South Sudan.

6. Recommendation

The paper recommends the need;

1. All the stakeholders including national government, regional governments, civil societies, international actors, and local communities in the oil regions to work together towards peacebuilding of South Sudan.
2. Lack of redress of the war impacts presents an uncondusive atmosphere for implementation of environmental governance strategies in oil and gas production sector. But the presence of peace in South Sudan, will provide an

enabling condition for implementation of the identified progressive laws and policies, promotes ecological integrity, protects human life, and advances sustainable development.

3. Strengthen Governance and Political Stability: Sustainable implementation of environmental laws requires a stable political environment. It is imperative for national and international stakeholders to support peacebuilding initiatives and strengthen democratic institutions, enabling consistent policy enforcement and long-term planning.

4. Enhance Public Awareness and Environmental Education: Awareness campaigns and formal environmental education programs should be scaled up to build a culture of environmental stewardship. This includes integrating environmental studies into school curricula and promoting community-based conservation through traditional knowledge systems.

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