THE IMPACT OF ENVIRONMENTAL CONSERVATION ON OIL AND GAS PRODUCTION IN SOUTH SUDAN. A CASE STUDY OF PALOCH OIL FIELD IN MELUT COUNTY

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UGANDA CHRISTIAN UNIVERSITY

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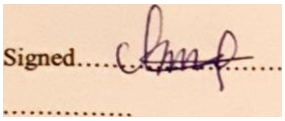
DECLARATION

I, **Agoth Peter**, hereby declare that this dissertation is my work and it has not been submitted before to any other institution of higher learning for fulfillment of any academic award.



Date……7/05/2024

SUPERVISOR'S APPROVAL

This is to certify that this report is compiled under my supervision. It is now ready for submission to the University Board of Examiners for review.

Signature

Date.....24th April,2024

Mrs. Nantongo Monicah

DEDICATION

I sincerely dedicate this work to my beloved family for the unconditional love and support showed me throughout this journey of education. Special thank goes to my dear parents, Dad Sultan Deng Ajiek Agoth, Mum Adut Aniek Ayok, my nephew Paulino Diing Madol and Mama Victoria Aciro Paulino, last but not least aunty Adut Ajiek Agoth as they have worked very hard to care for me in terms of giving me exceptional support throughout my education levels and also grooming me into a responsible person I am today. I will always love and treasure you and may the Sovereign Lord shower you with divine blessings.

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LIST OF ACRONYMS

CCS	Carbon Capture and Storage
DPOC	Dar Petroleum Operating Company
PDOC	Petrodar Operating Company
GOSS	Government of South Sudan
FAO	Food and Agricultural Organization
UN	United Nations
UNEP	United Nations for Environmental Protection
WCED	World Commission on Environment and Development
CO2	Carbon dioxide
CH4	Methane
EIAs,	Environmental Impact Assessments
VOCs	Volatile Organic Compounds
NOx	Nitrogen Oxides
PM	Particulate matter
Bpd	Barrels per day
MoP	Ministry of Petroleum
MoEWNR	Ministry of environment, Water and Natural Resources.
IPCC	Intergovernmental Panel on climate change

ABSTRACT

The purpose of the study was to examine the impact of environmental conservation on oil and gas production in South Sudan with a case study of Paloch Oil Field, Melut County. The study was guided by three objectives which were; to identify the ways in which an environment can be conserved, to find-out the impact of environmental conservation on oil and gas production in South Sudan and to establish the challenges in maintaining environmental conservation amongst stakeholders and oil companies.

The study assessed a population of 34 from which a sample of 32 respondents were contacted and the targeted sample of respondents was reached and able to respond with a frequency of 22 males and 10 females hitting the targeted sample of 32 respondents. The main research instruments used for data collection was entirely self-administered questionnaires with close ended questions were utilized to collect data and analyzed using Statistical packages for social sciences (SPSS) in form of distribution frequencies and percentages.

The findings showed that majority of the respondents agreed to Reforestation programs near oil and gas production areas for conserving and mitigating environmental damage. Therefore, it has positive impacts on oil and gas production. This huge support came as a result of implementing stricter environmental regulations that help the stakeholders and oil and gas companies to combat the vice of environmental damage and biodiversity fortification. The researcher recommends the implementation of environmentally friendly practices like reforestation near oil and gas production areas as a way of conserving the environment. This can be achieved through implementing stricter regulations that make it mandatory for the production Companies to support such initiatives.

Like any other research, this research is not exhaustive and therefore, further research is needed to research whether the results hold for other oil and gas production fields in the country. Other oil fields and government sectors might have similarities and therefore this research could also be applied in those production sites

CHAPTER ONE:

GENERAL INTRODUCTION

1.0 Introduction

This chapter includes the background of the study, objectives of the study, scope of the study, research questions, purpose of the study, significance of the study, key definitions involved and conceptual framework of the study.

1.1 Background of the study

One of the earliest milestones in the history of oil production is the discovery of oil wells in Pennsylvania in the 1850s. The first commercial oil well, the Drake Well, was drilled in Titusville, Pennsylvania, in 1859, marking the beginning of the modern oil industry (Yergin, 1991). This discovery revolutionized energy production and paved the way for the widespread use of petroleum-based products. The early 20th century witnessed the rise of major oil companies such as Standard Oil, founded by John D. Rockefeller in 1870 (Chernow, 1998).

Environmental conservation has a rich history that dates back to early civilizations and has evolved significantly over time. Ancient civilizations such as the Mesopotamians and Egyptians demonstrated early forms of environmental management through techniques like soil conservation and irrigation (Blaikie, 2008). However, the modern concept of environmental conservation began to take shape during the 19th and early 20th centuries, influenced by several key events and movements. One significant event was the establishment of the world's first national park, Yellowstone National Park, in 1872 in the United States (Nash, 2001). This marked a crucial milestone in the global recognition of the need to preserve natural areas for their intrinsic value and future generations' enjoyment.

Oil and gas production being a vital component of the global energy landscape, driving economic growth and meeting the demand for various energy products has also posed environmental challenges such as greenhouse gas emissions, land and water pollution, and habitat disruption, highlighting the need for sustainable practices and alternative energy sources. In recent decades,

environmental concerns and climate change awareness have led to debates about the sustainability of fossil fuel extraction, including oil production. The emergence of renewable energy technologies and policies aimed at reducing carbon emissions have challenged the dominance of oil in the global energy mix (Agency, 2021). The 20th century era witnessed the formation of international agreements such as the Montreal Protocol (1987) and the Kyoto Protocol (1997), aimed at addressing ozone depletion and climate change, respectively.

In Africa, considerable oil and gas resources are believed to exist thus providing the potential to spar growth of the continent (Boyer R.H. et al., 2021). However, 38 out of 53 African countries still depend on oil imports from elsewhere because of limited exploration and exploitation of this resource. (African Development Bank and the African Union, 2009). Worrying history have great impacts of oil production on the environment in areas such as the Delta state in Nigeria due to oil spills that contaminated water resources.

At regional level, in South Sudan according to FAA Section 117 "Environment and Natural Resources," it is mandatory for operating units to implement their programs with an aim to maintain (and restore) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment. This is especially to the oil and gas areas of exploration and production. Because of the conflict, South Sudan's national parks and reserves were not formally protected over the past two decades (IRG, 2007). Onshore petroleum activities began in Sudan in 1975 when US oil giant Chevron was granted a large concession in several provinces of south-central Sudan. Chevron made major discoveries in Western Upper Nile and developed the oil fields "Heglig" (today in Southern Kordofan State/Sudan) and "Unity" (today in Unity State, South Sudan). While South Sudan is endowed with 3.5 billion barrels of proven oil reserves, the exploitation of this natural wealth is turning into a catastrophe for some local communities, particularly in Melut County(Cordaid, 2014). Through focus group discussions, individual interviews, and field observations, findings show that many households in Paloch, Melut County located in the upper Nile state, are in close proximity to oil wells and facilities, and within a short distance of a large lake of toxic produced water, exposing them to highly toxic chemicals(GoSS, 2018).

The Paloch oil field in Melut County was discovered by Chevron in 1981. However, due to the 1983 war, Chevron suspended operations in 1984 and left Sudan in 1990. In 1996, Gulf

Petroleum Corporation was awarded a contract for Blocks 3 and 7, and production increased to 5,000 barrels per day in March 1997 (Dou et al., 2007). The crude oil was transported by truck to Melut and barge to Khartoum. In November 2000, the rights to Blocks 3 and 7 were awarded to Petrodar Operating Company Ltd (PDOC), a consortium of Chinese National Petroleum Company, Petronas, Sudan Petroleum Company, Sinopec, and Al Thani Corporation. This marked the beginning of large-scale oil development in the Upper Nile (Cordaid, 2014).

1.2 Statement of the problem

The significance of expanded familiarity with the cooperation among firms carrying out oil and gas production and the environment is that their work worries about resources exhaustion, resources scarcity, environmental debasement, oil spillages, water contamination, air, and clamor contamination, wellbeing perils, and contamination of the communities' environment thus limiting environmental conservation. The result of the corporate organizations activities on the environment has led to the depletion of the ozone layer and thereby causing an imbalance in the environmental system (Adediran, S.A. & Alade, S.O., 2013). These increasing concerns about environmental degradation, resource depletion, and the quest for sustainability of economic activity have improved environmental accounting and reporting an area of significant interest in South Sudan.

In South Sudan, there is no specific accounting standard for presenting environmental information to ensure consistency and uniformity in reporting environmental issues, but rather guidelines issued by the Government like The Ministry of Animal Resources and Fisheries Policy, National environment policy 2015-2025, however this has not aided environmental conservation especially from the areas of Paloch Oil Field in Melut County where oil and gas exploration and production is being carried out. The environment provides a heavy dependence on fuel wood and charcoal which is estimated to contribute to an annual deforestation rate of between 1.5% and 2.0%. Drilling chemical containers such tankers and plastic liners are used by natives for drinking water, carrying milk and covering roofs of their houses (Bliss., 2014). The effect to this is that the environment and the surroundings are facing degradation, air pollution, spread of oil spillages, children born with disabilities, water contamination and other related, yet in South Sudan 80% of the population relies on subsistence agriculture for their livelihoods (Program, 2018). It is against this background that the researcher focused on examining the impact of environmental conservation on oil and gas production, Paloch Oil Field in Melut County in South Sudan.

1.3 Purpose of the study

The study was to examine the impact of environmental conservation on oil and gas production in Paloch Oil Field, Melut County South Sudan.

1.4 Research Objectives

(a) To identify the ways in which the environment can be conserved.

(b) To find-out the impact of environmental conservation on Oil and Gas production.

(c) To establish the challenges in maintaining environmental conservation.

1.5 Research Questions

(a) What are the ways in which the environment can be conserved?

(b) What is the impact of environmental conservation on Oil and Gas Production?

(c) What are the challenges in maintaining environmental conservation?

1.6 Significance of the Study

This research aimed to fill the existing knowledge gap by providing a detailed analysis of the impact of environmental conservation on oil and gas production in South Sudan. It therefore seeks to offer valuable insights for policy-makers and industry players in making informed decisions that can be of value to both the country and its citizens.

1.7 Scope of the study

1.7.1 Geographical scope

The researcher conducted research in Paloch Oil Field Upper Nile State – South Sudan. The oil fields are located in the Melut and Maban Counties. The study area was chosen because of the oil and gas production activities taking place in the different production blocks in the sub-counties and ease of access of the location.

1.7.2 Time Scope

The study covered the period between 2006 and 2023. This period is selected because it is when Melut and Maban areas experienced increased oil and gas production and its environmental effect. However, field data collection was conducted within a period of 6 months gathering information and arrangement within the duration that is March, 2024 to June 2024.

1.7.3 Subject Scope

The research study specifically focused on assessing the impact of environmental conservation on oil and gas production in South Sudan with a focus on Paloch oil field in Melut county.

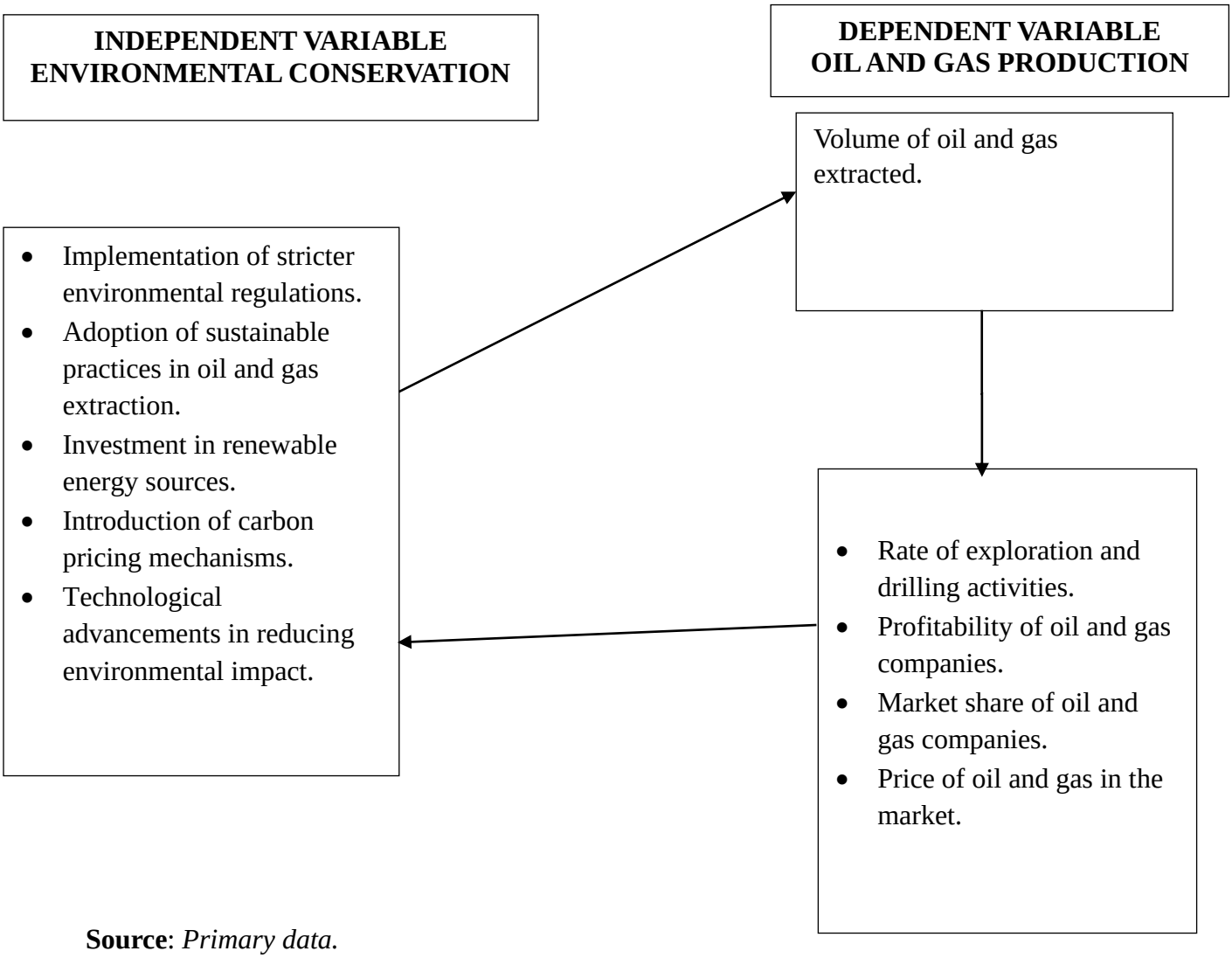
1.8 Conceptual Framework

The conceptual framework of this study explains the relationship between environmental conservation and oil and gas production. Environmental conservation efforts, as the independent variable, include the implementation of stricter environmental regulations, adoption of sustainable practices in oil and gas extraction, investment in renewable energy sources, introduction of carbon pricing mechanisms, and technological advancements aimed at reducing environmental impact. On the other hand, oil and gas production serves as the dependent variable and encompasses the volume of oil and gas extracted, rate of exploration and drilling activities, profitability of oil and gas companies, market share of oil and gas companies, and the price of oil and gas in the market.

Stricter environmental regulations typically lead to decreased oil and gas production due to compliance costs and restrictions. Similarly, the adoption of sustainable practices, investment in renewable energy sources, and the introduction of carbon pricing mechanisms tend to reduce the reliance on traditional oil and gas extraction methods, potentially leading to a decrease in oil and gas production. However, technological advancements aimed at reducing environmental impact may improve the efficiency of oil and gas extraction, potentially increasing production, although the extent to which this occurs depends on the cost-effectiveness of these technologies. In summary, stricter environmental conservation measures tend to inversely affect oil and gas production, although technological advancements can sometimes mitigate this impact (Vincelette, 2018).

Figure 1.1 Conceptual Framework

Figure 1 Conceptual Framework



Source: *Primary data.*

1.9 Definition of key terms.

Environment

Environment can be defined as a sum total of all the living and non-living elements and their effects that influence human life (Fon Nestor, 2020).

Conservation

It is a prevention of wasteful use of a resource.

Oil and gas production

This is a multi-stage entire process of discovering a resource, extracting and transporting to a refinery where it is turned into a finished product ready for sale.

CHAPTER TWO:

LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature by scholars in areas related to the current study. This was presented in accordance to the impact of environmental conservation on oil and gas production. Literature inclined to the above guidelines and was searched from published documents, journals, conference papers and the internet. With a focus on the objectives of the research;

2.1 A Theoretical Review

The economic theory

The study adopted an economic theory by Adma Smith (1776) the theory states that wealth is created via labor, and self-interest spurs people to use their resources to earn money. This will be relevant since it is an influential figure of the Industrial Revolution in South Sudan. The impacts of environmental conservation on oil and gas production are an indication to the revolution of the sector. Smith researched human motivations and innate tendencies. He noted that people's main motivation was self-interest, which led them to allocate their resources to the things that would benefit them the greatest. He maintained that all commerce was profitable for both parties involved and that if one party didn't gain more from the transaction, they would just decline it. Smith noted that since all voluntary trade produced income, trade regulation was superfluous and might even be harmful.

Review of other related literature

2.2.1 The ways in which the environment can be conserved.

Environmental conservation is crucial for maintaining the delicate balance of ecosystems and ensuring sustainable development. In an area where oil and gas production play a significant role in the economy, it is imperative to understand the ways in which environmental conservation can impact this industry.

Adoption of Green Technologies**:** One of the key ways to conserve the environment in oil and gas production is through the adoption of green technologies. This includes the use of environmentally friendly drilling techniques, such as directional drilling and hydraulic fracturing, which reduce the environmental footprint of extraction activities (Smith, 2018).

Implementing strict regulatory frameworks is essential for ensuring environmental conservation in the oil and gas industry. By enforcing laws that govern waste management, emissions, and the protection of natural habitats, South Sudan can mitigate the environmental impact of oil and gas production (Doe, 2019).

Investment in Renewable Energy Sources. This is to diversifying the energy sector by investing in renewable energy sources such as solar and wind power can help reduce the dependence on fossil fuels. This transition not only helps conserve the environment but also promotes long-term sustainability (Jones, 2020). Implementation of measures to reduce carbon emissions is essential for environmental conservation. This includes transitioning to cleaner energy sources such as solar, wind, and hydroelectric power, as well as improving energy efficiency in industrial processes and transportation (IPCC, 2018).

Preserving bio diversity is crucial for maintaining healthy ecosystems. This can be achieved through the establishment of protected areas, reforestation efforts, and sustainable land management practices (CBD, 2020). Conserving water resources is essential for both environmental sustainability and human well-being. Strategies for water conservation include reducing water waste, improving water management practices, and investing in water recycling and reuse technologies (UN Water, 2019). Effective waste management is also vital for preventing pollution and protecting natural habitats. This includes reducing the generation of waste, recycling materials whenever possible, and safely disposing of hazardous waste (UNEP, 2021).

The conservation ways above are theoretically seen to be of a great positive impact towards environmental conservation during the production of oil and gas. This study however sought to further explore those conservation ways that already functioning in the Paloch oil field and those that have not been adopted fully by the production companies in the oil field are seen to be a threat to the environment

2.2.2 The impact of environmental conservation on oil and gas production.

Environmental conservation efforts have a significant impact on oil and gas production worldwide. These efforts include regulations aimed at reducing carbon emissions, minimizing habitat destruction, and preventing pollution. In regions where oil and gas production is a significant part of the economy, such as South Sudan, the balance between environmental conservation and resource extraction is particularly crucial. Environmental regulations can affect production costs, project timelines, and overall profitability in the oil and gas industry (Nash, 2017).

In South Sudan, environmental conservation measures have become increasingly important due to the expansion of oil and gas production activities. The country's rich oil reserves have led to a surge in exploration and extraction projects, raising concerns about the potential environmental impacts. The government of South Sudan has implemented various environmental regulations to mitigate these impacts, including measures to minimize habitat destruction, prevent oil spills, and reduce carbon emissions. These regulations have influenced the operations of oil and gas companies operating in the region, impacting their production processes and strategies (Oduro, 2019).

One of the key ways in which environmental conservation efforts affect oil and gas production in South Sudan is through increased scrutiny and regulation of exploration and extraction activities. Environmental impact assessments are now mandatory for all oil and gas projects in the country, ensuring that potential environmental risks are identified and addressed before operations commence. These assessments can delay project timelines and increase production costs but are essential for minimizing the environmental impact of oil and gas production activities (Kelleners et al., 2018). Environmental conservation efforts in South Sudan have led to the adoption of new technologies and practices aimed at reducing the environmental footprint of oil and gas production. Companies operating in the region are increasingly investing in technologies such as carbon capture and storage (CCS), water recycling, and green energy solutions to minimize their impact on the environment. While these technologies can be expensive to implement hence, reducing their profit margin though they can help companies comply with environmental regulations and reduce their long-term environmental liability (Eaton et al., 2020).

Environmental conservation efforts also impact oil and gas production through increased public scrutiny and pressure from environmental advocacy groups. Concerns about climate change, habitat destruction, and pollution have led to growing opposition to oil and gas projects in many parts of the world. This opposition can result in delays, legal challenges, and reputational damage for oil and gas companies, making it increasingly difficult to obtain permits and social license to operate (Smith et al., 2020). Environmental conservation efforts can impact oil and gas production by limiting access to new exploration and extraction sites. Many environmentally sensitive areas, such as national parks, protected habitats, and indigenous lands, are off-limits to oil and gas development. As a result, companies may face challenges in finding new reserves to replace declining production from existing fields, leading to increased competition for remaining resources and higher production costs (Holland et al., 2019).

The literature shows that impact of environmental conservation measures in oil and gas range from financial loss, fear of reputational damage, delays in project executions and limited access to new oil resources. There is however insufficient information on how Companies operating in the Paloch oil field are coping up with the impacts in their production and strategic efforts.

2.2.3 The challenges in maintaining environmental conservation.

Toxic gases released during extraction**.** Climate change is a pressing global issue exacerbated by greenhouse gas emissions from fossil fuel combustion. The oil and gas industry contributes significantly to these emissions, leading to concerns about its environmental sustainability (Smith, L., & Johnson, 2020). Carbon dioxide (CO2) and methane (CH4) emissions from extraction, processing, and transportation processes contribute to climate change and necessitate effective mitigation strategies. The oil and gas industry is a significant source of air pollutants, including volatile organic compounds (VOCs), nitrogen oxides (NOx), and particulate matter (PM) (Brown, K., 2021). Implementing emission control technologies and adopting cleaner production practices are essential for reducing air pollution impacts but are considered to be very expensive.

Difficulty in Biodiversity Preservation: Oil and gas operations often occur in ecologically sensitive areas, threatening biodiversity through habitat destruction and pollution (Sutherland, W., 2018). Protecting biodiversity requires stringent environmental impact assessments (EIAs),

habitat restoration efforts, and sustainable land use practices to minimize ecological disruptions. The above efforts often limit the accessible areas for oil production to occur.

High need for Water Resource; Water is essential for oil and gas extraction processes, but its intensive use poses challenges to water resource management (Adler, R., 2019). Issues include water scarcity in arid regions, contamination risks from wastewater disposal, and competition with local communities for water access. Sustainable water management strategies, such as recycling and advanced treatment technologies, are crucial for minimizing environmental impacts.

According to Zhang & Li (2022), regulatory frameworks play a vital role in environmental conservation within the oil and gas sector. However, challenges such as regulatory loopholes, inadequate enforcement, and varying standards across jurisdictions can hinder effective environmental management (Zhang, L., & Li, 2022). A lack of public awareness and engagement presents a significant barrier to effective environmental conservation. Many people remain uninformed about the importance of biodiversity and ecosystem services, hindering efforts to promote conservation action and sustainable behavior (Leiserowitz et al., 2006).

The challenges in conserving the environment seem to be similar from manufacturing industries to the production industries. The natural resource extraction process involves processes and demands that pose a threat to natural state of the environment. The literature however has limited information on how much it is a challenge to the oil and gas companies to preserve the environment in Paloch oil field if the companies consider it at all.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter contains the research design, sampling design and type, different methods that the researcher will use to collect data from various sources and also to interpret the data.

3.1 Research Design

The study adopted a descriptive survey design. Kerlingler (1973) argues that survey is widely used to obtain data useful in evaluating present practices and in providing basis for decision making. It involves describing, recording, analyzing, and reporting existing conditions or conditions that existed regarding a certain phenomenon. Descriptive survey is most appropriate in collecting data since it will involve description of the current state on the impact of environmental conservation on oil and gas production in South Sudan Paloch oil field in Melut county.

3.2 Study area

The research was carried out in Paloch oil field in Melut County which is situated in upper Nile state. This area is chosen because of the oil production activities taking place in it and environment concerns affecting the livelihoods of the native population.

3.2.1 Location of the case study

The study was conducted in the Melut and Maban Counties which lies between latitude 10o 44" N, and longitude 32o 20" E. The region is one of wide, flat and low-lying plains with black cotton soils, covered by Savannah grasslands and acacia trees (Harrison and Jackson, 1958). The area is situated in the semi-arid zone with two distinct seasons, rainy season (wet) starts at May to October with annual average precipitation rains between 450 to 550 mm, p.a. and dry season starts at November to April (Department of Meteorology, Renk County 2010).

3.3 Target Population

The population of study was 35 people involving the local communities' members residing in and around the Paloch Oil Field in Melut County, South Sudan, personnel directly involved in production of oil in the oil field including employees and management of companies operating in

the Paloch Oil Field, along with environmental experts and consultants involved in conservation efforts in the region. Thirdly, government agencies at local, regional, and national levels responsible for overseeing environmental regulations and oil and gas production were included. Additionally, non-governmental organizations (NGOs) and activist groups working on environmental conservation and community development in the region were part of the targeted population and finally, the academic community (scholars).

3.4 Sample Size

The sample size comprised 32 respondents which were drawn from a population of 35 people which was determined by the Small Sample Technique by Krejcie and Morgan (1970). The sample from each category for the questionnaire survey was determined by proportionate sampling. It takes into account the population size, desired level of confidence, and the margin of error.

The formula is:

$$n=N\cdot e2N\cdot e2+Z2n=N\cdot e2+Z2N\cdot e2$$

Where:

n = required sample size

N = population size

e = margin of error (expressed as a decimal)

Z = z-score corresponding to the desired confidence level.

Table 1: Sample Size distribution for respondents / key informants

Category	Target Population	Sample Size	Sampling Techniques
Government Stakeholders	5	5	Simple random sampling
Non-Governmental Organizations (NGOs) And Activist Groups	5	5	Simple random sampling
Oil And Gas Company Workers	10	10	Simple random sampling
Local Residents	12	10	Simple random sampling
The Academic Community	3	2	Simple random sampling
Total	**35**	**32**	

Source: *Primary Data, 2024*

3.5 Sampling Techniques

Simple Random sampling was used to select informants Residents, personnel within the oil and gas industry, environmental experts and consultants, government agencies at local, regional, and national levels, non-governmental organizations (NGOs) and activist groups

3.6 Data collection instruments

3.6.1 Questionnaire

A self-administered questionnaire consisting of mainly closed ended questions were used to collect data Environmental Analysts, oil and gas workers. Close-ended questionnaire items were used because of the ease with which they could be coded thus facilitating easy statistical analyses. The questionnaire had two sections A and B. The questions in sections A were having background characteristics while the questions in section B contained the main variables.

3.7 Validity of the Research Instruments

This indicates the degree to which results obtained from the analysis of the data actually represent the phenomena under study (Mugenda & Mugenda, 2003). Data validity was achieved through a review of the questionnaire by the supervisor and incorporated necessary corrections that brought out the research objectives clearly. There are three major types of validity: face validity, content validity and construct validity.

3.7.1 Face validity

This refers to the likelihood that a question will be misunderstood or misinterpreted. This was taken care of by pre-testing. Items that are likely to be misinterpreted or misunderstood was modified to increase validity (Kilemi & Wamahiu1995).

3.7.2 Content validity

This refers to whether an instrument provides adequate coverage of a topic. This was ensured by using expert opinion from the supervisors, literature review and pre-testing to identify problems that the respondents are likely to face in the process of answering the questions.

3.8 Pilot Study

After the questionnaires are developed, they will be piloted in some areas with the same setting as Kabale district where farming is the main activity. Piloting is an important aspect in research as it helps to identify misunderstandings, ambiguities and inadequate items (Wiersma, 1995).

3.9 Data Analysis

3.9.1 Quantitative data analysis

Data collected using questionnaires was coded and analyzed using statistical techniques. With the help of a computer program, Statistical Packages for Social Scientists (SPSS) version 29.0.2 Data coding involved transformation of responses into numeric data that is, 1, 2 …etc. Relative percentage enabled comparison between and among the study variables.

Quantitative data was presented in form of statistics of frequencies and percentages for every variable used in the study and analyzed using Statistical Package for Social Sciences (SPSS). Strongly agree and agree was joined to mean agree and strongly disagree and disagree was considered to mean disagree.

3.10 Ethical Considerations

This study was conducted following ethical procedures governing social research studies. An introductory letter was obtained from the Institute of petroleum studies Kampala, introducing the researcher to the respondents as seeking assistance in conducting the survey. Consent was sought from respondents before questionnaire is handed to them or before interviews is conducted. Attention was also given to the rules governing photography in the area of study for the observable elements of the study.

The questionnaire contained an introductory statement requesting for the respondent's cooperation in providing the required information for the study. The respondents were further assured of the confidentiality of the information provided and that the study findings would mean for academics' research purposes only. Plagiarism was avoided by acknowledging secondary information sources through referencing.

3.11 Limitation of the study

The major limitations of this study were to be time constraints, and lack of first-hand writings. To get an accurate data, a lack of time and willingness by respondents to complete questionnaires created problems in obtaining a representative sample.

Some respondents were not be willing to respond to the questionnaire. To solve this challenge, the researcher convinced the respondents that their responses are to be kept confidential and only used for academic purposes.

CHAPTER FOUR:

PRESENTATION OF RESULTS AND ANALYSIS OF FINDINGS

4.0 Introduction

This chapter presents findings of the study; it presents findings on respondent's background in terms of educational level, respondents Gender, and respondents by age, marital status and experience or number of years he/she has worked with the company. It further describes the ways in which an environment can be conserved, find-out the impact of environmental conservation on oil and gas production within this sector and establishes the key challenges in maintaining environmental conservation in South Sudan

The findings are presented in line with the sole objective of the research study and are intended to give answers to the research questions which are asked in relation to the study. The statistical tools such as frequency distribution tables and percentages were used to generate the results in this chapter.

4.1. Response rate

Table 4. 1 Showing Response rate Challenges

Respondents	Frequency	Percentage
Returned	32	91.4
Missing	03	8.6
Total	35	100

Source: Primary data, (2024)

Findings in table 4.1 above indicate that from the 34 questionnaires distributed to the respondents, 32 questionnaires were returned and only 2 were not returned representing a response rate of 94.1%. The response rate is adequate for the study because a response rate of 70% and above was expected and relevant for such a study. This therefore, implies that the study got a good response rate which explicably provides a good analysis of responses on ground.

Table 4. **2 Proportion of Respondents by Gender**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	22	68.8	68.8	68.8
	Female	10	31.3	31.3	100.0
	Total	32	100.0	100.0	

Source; Primary data, (2024)

Findings on respondent's gender showed that out of the 32 respondents who were involved in the study, 68.8 % were males and 31.3% were females which implied that males comprised the majority of the responses in this study but females were also fairly represented.

Table 4.3 Response by Age

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-24	5	15.6	15.6	15.6
	25-29	4	12.5	12.5	28.1
	30-34	5	15.6	15.6	43.8
	35-39	10	31.3	31.3	75.0
	40 and above	8	25.0	25.0	100.0
	Total	32	100.0	100.0	

Source: Primary data, (2024)

Findings on the respondent's age category showed that 31.6% were in the age bracket of (35-39), 25.0% were in the age bracket of (40 and above), 15.6% were in both age bracket of (20-24) &

(30-34), and 12.5% were in the age bracket (of 25-29). This therefore means that the data was obtained from middle aged and deep-rooted respondents.

Table 4.4 Response by Educational level

Education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CSE	4	12.5	12.5	12.5
	Certificate	3	9.4	9.4	21.9
	Diploma	4	12.5	12.5	34.4
	Degree	12	37.5	37.5	71.9
	Masters	9	28.1	28.1	100.0
	Total	32	100.0	100.0	

Source: Primary data, (2024)

Findings on the distribution of education levels of respondents showed that 12.5% were CSE (Certificate of Secondary Education) holders, 9.4% were Certificate holders, 12.5% were, 37.5% were bachelor's degree, and 28.1% held a Master's degree. This therefore implies that the responses were obtained from educated group of respondents who were conversant enough to comprehend the questions in the questionnaire.

Table 4.5 Survey Response by marital status

Marital

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	14	43.8	43.8	43.8
	Single	18	56.3	56.3	100.0

	Total	32	100.0	100.0	

Source: Primary data, (2024)

Findings on respondent's marital status showed that 56.3% were single, 43.8% were married and 0% was divorced. This implies that a majority of the respondents were Single with those who were married also fairly represented.

Table 4.6 Response by experience in the industry

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5	13	40.6	40.6	40.6
	6-10	9	28.1	28.1	68.8
	11-15	5	15.6	15.6	84.4
	16-20	2	6.3	6.3	90.6
	21 and above	3	9.4	9.4	100.0
	Total	32	100.0	100.0	

Source: Primary data (2024)

The findings on respondents' experience showed that 40.6% had worked for 1-5 years, another 28.1% had worked for 6-10 years, 15.6% had worked for about 11-15 years, 6.3% had worked for 16-20 years and 9.4% had worked for 21 and above years. This therefore implies that a majority of the respondents had worked for 1-5 years and are presumed to have fairly adequate knowledge on environmental conservation and oil and gas production. These were complimented by a fairly large group of respondents who had worked for 6-10 years.

4.2 Findings on Research Objectives

This study was meant to assess the impact of environmental conservation on oil and gas production in South Sudan, a case study of Paloch oil field in Melut county. The focus was to identify the ways in which an environment can be conserved, to find-out the impact of environmental conservation on oil and gas production and to establish the challenges in maintaining environmental conservation.

4.2.1 Objective 1: To identify the ways in which an environment can be conserved.

Statements that portray level of agreement in accordance to a 5-score Likert scale rating was used to get responses from respondents. Note: Sd-Strongly disagree, D- Disagree, NS- Not sure, A-Agree, SA-Strongly agree

Table 4.7 Frequency Data showing the ways in which an environment can be conserved

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Implementing stricter regulations can help minimize environmental impact during oil and gas production	8	25.0	25.0	25.0
	Investing in renewable energy technologies helps in reducing the environmental footprint of oil and gas production	4	12.5	12.5	37.5
	Do you agree that public awareness and education regarding environmental issues can lead to better conservation practices in oil	5	15.6	15.6	53.1

	and gas production				
	The current level of environmental protection efforts undertaken by the oil and gas industry are satisfactory	3	9.4	9.4	62.5
	Reforestation programs near oil and gas production areas can mitigate environmental damage.	10	31.3	31.3	93.8
	Implementing carbon capture and storage technologies in the oil and gas industry for environmental conservation is efficient	2	6.3	6.3	100.0
	Total	32	100.0	100.0	

The findings on the ways of environmental conservation particularly amongst different stakeholders showed that;

Implementing stricter regulations can help minimize environmental impact during oil and gas production (25.0%), Investing in renewable energy technologies helps in reducing the environmental footprint of oil and gas production (12.5%), the public awareness and education regarding environmental issues can lead to better conservation practices in oil and gas production (15.6%), The current level of environmental protection efforts undertaken by the oil and gas industry are satisfactory (9.4%), Reforestation programs near oil and gas production areas can mitigate environmental damage (31.3%) and Implementing carbon capture and storage technologies in the oil and gas industry for environmental conservation is efficient 6.3%).

In conclusion, findings show that there has been a high support of Reforestation programs near oil and gas production areas for conserving and mitigating environmental damage. Therefore, it has positive impacts on oil and gas production. And also enable the company to combat the vice of climate change and biodiversity fortification.

4.2.2. Objective 2: To find-out the impact of environmental conservation on oil and gas production.

Statements that portray level of agreement in accordance to a 5-score Likert scale rating was used to elicit responses from respondents. Note: Sd-Strongly disagree, D- Disagree, NS- Not sure, A-Agree, SA-Strongly agree.

Table 4.8 Frequency data showing the impact of environmental conservation on oil and gas production.

Impact

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Do you agree that environmental conservation	6	18.8	18.8	18.8

	efforts have a significant impact on the sustainability of oil and gas production				
	Implementing environmentally friendly practices affects the profitability of oil and gas companies	4	12.5	12.5	31.3
	Oil and gas companies are likely to prioritize environmental conservation over maximizing production and profits	3	9.4	9.4	40.6
	Integrating environmental conservation practices into oil and gas operations leads to long-term economic benefits for the industry	10	31.3	31.3	71.9
	Stricter environmental regulations could hinder innovation and competitiveness within the oil and gas sector	5	15.6	15.6	87.5
	Investments in environmental conservation initiatives have led to measurable improvements in operational efficiency within oil and gas	4	12.5	12.5	100.0

	companies				
	Total	32	100.0	100.0	

The findings on the impact of environmental conservation on oil and gas production, principally midst different stakeholders showed that;

The environmental conservation efforts have a significant impact on the sustainability of oil and gas production (18.8%), implementing environmentally friendly practices affects the profitability of oil and gas companies (25.6%), Oil and gas companies are likely to prioritize environmental conservation over maximizing production and profits (9.4%), Integrating environmental conservation practices into oil and gas operations can lead to long-term economic benefits for the industry (31.3%), Stricter environmental regulations could hinder innovation and competitiveness within the oil and gas sector (15.6%) and Investments in environmental conservation initiatives have led to measurable improvements in operational efficiency within oil and gas companies (12.5%).

In conclusion, the findings show that there has been a high support of integrating environmental conservation practices into oil and gas operations that would lead to long-term economic benefits for the industry without endangering the ecosystem hence, promoting the environmental sustainability goals.

4.2.3. Objective 3: To establish the challenges in maintaining the environmental conservation.

Statements that portray level of agreement in accordance to a 5-score Likert scale rating was used to elicit responses from respondents. Note: Sd-Strongly disagree, D- Disagree, NS- Not sure, A-Agree, SA-Strongly agree.

Table 4.9 Frequency data showing the challenges in maintaining the environmental conservation

Challenges

	Frequency	Percent	Valid Percent	Cumulative

					Percent
Valid	Regulatory compliance is a significant challenge for oil and gas companies in maintaining environmental conservation	3	9.4	9.4	9.4
	Financial considerations often take precedence over environmental conservation efforts within the company	11	34.4	34.4	43.8
	Public perception and pressure influence environmental conservation practices within the companies	5	15.6	15.6	59.4
	There are regulatory loopholes and inconsistencies in application of environmental conservation measures.	8	25.0	25.0	84.4
	Internal company policies and initiatives prioritize environmental conservation alongside production goals	3	9.4	9.4	93.8
	Overall commitment of our oil and gas production company towards long-term	2	6.3	6.3	100.0

	environmental sustainability				
	Total	32	100.0	100.0	

The findings in establishing the challenges in maintaining the environmental conservation on oil and gas production show that;

Regulatory compliance is a significant challenge for oil and gas companies in maintaining environmental conservation (9.4%), Financial considerations often take precedence over environmental conservation efforts within the company (34.4%), Public perception and pressure influence environmental conservation practices within the companies (15.6%), There is a good level of collaboration between oil and gas companies and environmental organizations in promoting sustainable practices (25.0%), Internal company policies and initiatives prioritize environmental conservation alongside production goals (9.4%) and Overall commitment of our oil and gas production company towards long-term environmental sustainability (6.3%).

In regards to the findings, financial considerations is one of the major challenge in maintaining the environmental conservation efforts within the oil and gas company due to the aim of maximizing profits.

CHAPTER FIVE

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.0 Introduction

This chapter consists of discussions, recommendations based on these results as well as conclusions drawn from results. The research assessed the impact of environmental conservation on oil and gas production in South Sudan, focusing on Paloch oil field in Melut county as the key study.

5.1 Discussion

In general, the targeted sample of respondents was reached and able to respond with a frequency of 22 males and 10 females hitting the targeted sample of 32 respondents. The main research instrument used for data collection was entirely self-administered questionnaires with close ended questions. The findings generated from the questionnaire are discussed as below;

5.1.1 To identify the ways in which an environment can be conserved.

The findings show that there has been a massive support for Reforestation programs near oil and gas production areas for conserving and mitigating environmental damage with a percentage frequency of about 25% in efforts to restore the environment. The information is in line with findings and suggestion of (CBD, 2020) that also agrees to the need to plant trees to allow the environment regain its natural state.

Implementing stricter environmental regulations that help the stakeholders and oil and gas companies to combat the vice of climate change and biodiversity fortification is seen to take a huge support in efforts to conserve the environment with a huge frequency percentage of 31.3%. This is important because most production Companies aim at profit maximization at the expense of environmental conservation and only Government interference through application of the designed laws and regulations aimed at fostering environmental conservation is important. This finding correlates with (Doe, 2019) findings that emphasized the need for strict regulations and their implementation for environmental conservation.

5.1.2 To find-out the impact of environmental conservation on oil and gas production.

According to the study findings, the environmental conservation efforts have less impact on sustainability of oil and gas production. And these findings show that majority of the respondents with a frequency percentage of 31.3% agreed that integration of environmental conservation practices into oil and gas operations would lead to long-term economic benefits for the industry without endangering the ecosystem hence, promoting the environmental sustainability goals.

The findings also sided with that of (Eaton et al., 2020) that spelled out the need to use green technologies and those that led to less environmental impact such as the use of carbon capture technologies to encourage long term co-existence of oil production and the environment.

Strict environmental regulations and compliance is seen to reduce the profitability of the oil companies and their competitiveness. This can mainly be attributed to the increase in total expenditure by the companies. The findings are similar to that of (Nash, 2017).

5.1.3 To establish the challenges in maintaining environmental conservation in South Sudan.

The findings on challenges in maintaining environmental conservation in South Sudan's oil and gas production areas show that; the financial considerations by petroleum consortium companies often take precedence over environmental conservation efforts within the producing areas like Paloch oil field. 34.4% frequency of the researched population is seen to believe that profit priotization is the problem to environmental conservation. The loopholes and inconsistencies in enforcement of regulatory laws is widely agreed upon as a great to tool used by the production companies to compromise environmental conservation efforts. This finding agrees with that of (Zhang, L., & Li, 2022). This is because it gives them room to attain more profit while spending less on the preserving the environment.

5.2 Conclusion

The different ways of conserving the environment such as afforestation and re-afforestation, adoption of cleaner technologies such as Carbon Capture and storage in the Paloch oil fields and strict implementation of regulations are good ways of conserving the environment during oil and gas production. These methods if applied rightly all times give a better result in terms of environmental conservation.

Environmental conservation impacts the production companies mainly financially. This is because the companies in the Paloch oil field are required by the regulations to spend on environmental conservation efforts in order to protect the environment and also the company image.

The challenge in conserving the environment is mainly the loopholes and compromises in regulations even though the country has good regulations in place.

5.3 Recommendations.

The researcher recommends the implementation of environmentally friendly practices like reforestation near oil and gas production areas as a way of conserving the environment. This can be achieved through implementing stricter regulations that make it mandatory for the production Companies to support such initiatives.

Considering impact of environmental conservation on oil and gas production profitability mainly. It is recommended that the Government comes into better agreements with the licensed companies on ways in which they can vividly protect environment with less impact on the profit. This could be through tax reduction or sharing of costs.

With challenges in maintaining environmental conservation such as loop holes in application of the existing laws and regulations. Putting up systems to ensure there is maximum abiding to regulations could be of a great importance.

5.4 Future research directions

Some of the areas of concern which deserve further interest include; the role of Government Regulations in promoting sustainable oil and gas explorations and production efficiency in the country.

More research can also be carried out on the impact of integrating environmental conservation practices into oil and gas operations for the long-term economic benefits for the industry in the country.

In addition to that, research can be carried out to assess the effectiveness of Reforestation programs near oil and gas producing areas for sustainable environmental conservation.

REFERENCES

Brown, K., et al. (2021). Air quality impacts of the oil and gas industry: Challenges and solutions. *Environmental Pollution*, *280*, 116978.

Carson, R. (2002). Silent spring. *Houghton Mifflin Harcourt.*

Chernow, R. (1998). Titan: The life of John D. Rockefeller. *Sr. Vintage*.

Cohen, M. J., & Winn, M. I. (2017). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, *32*(3), 212–229.

Cordaid. (2014). *Oil Production in South Sudan: Making It a Benefit for All - Baseline Assessment of the Impact of Oil Production on Communities*. *May 2014*.

Craft, B., Hawkins, T., & Beshore, D. (2018). Introduction to Petroleum Reservoir Analysis. *Academic Press*.

Daily, G. C. (1997). Nature's services: Societal dependence on natural ecosystems. *Island Press*.

Dou, L., Xiao, K., Cheng, D., Shi, B., & Li, Z. (2007). Petroleum geology of the Melut Basin and the Great Palogue Field, Sudan. *Marine and Petroleum Geology*, *24*(3), 129–144. https://doi.org/10.1016/j.marpetgeo.2006.11.001

Gary, J. H., Handwerk, G. E., & Kaiser, M. J. (2021). Petroleum Refining: Technology and Economics. *CRC Press.*

Adler, R., et al. (2019). Water resource management in the oil and gas industry. Environmental Science & Technology, 53(15), 8542–8555.

Agency, I. E. (2021). World Energy Outlook 2021. IEA Publications.

Berkes, F. (2004). Rethinking community-based conservation. Conservation Biology, 18(3).

Blaikie, P. (2008). Nature and society: Introduction to political ecology. Routledge.

Boutin, A., & Elverfeldt, K. V. (2921). Navigating the energy transition: The role of oil and gas companies. Journal of Cleaner Production, 294, 126–279.

Bromley, P. (2018). The role of stakeholder engagement in corporate sustainability reporting. Business Strategy and the Environment, 27(4), 580–592.

Brown, A., & Smith, B. (2018). Sustainable water resource management: Challenges and opportunities. Environmental Science & Policy, 85, 1–10.

Brown, K., et al. (2021). Air quality impacts of the oil and gas industry: Challenges and solutions. Environmental Pollution, 280, 116978.

Carson, R. (2002). Silent spring. Houghton Mifflin Harcourt.

Chernow, R. (1998). Titan: The life of John D. Rockefeller. Sr. Vintage.

Cohen, M. J., & Winn, M. I. (2017). Market imperfections, opportunity and sustainable entrepreneurship. Journal of Business Venturing, 32(3), 212–229.

Cordaid. (2014). Oil Production in South Sudan : Making It a Benefit for All - Baseline Assessment of the Impact of Oil Production on Communities. May 2014.

Craft, B., Hawkins, T., & Beshore, D. (2018). Introduction to Petroleum Reservoir Analysis. Academic Press.

Daily, G. C. (1997). Nature's services: Societal dependence on natural ecosystems. Island Press.

Dou, L., Xiao, K., Cheng, D., Shi, B., & Li, Z. (2007). Petroleum geology of the Melut Basin and the Great Palogue Field, Sudan. Marine and Petroleum Geology, 24(3), 129–144. https://doi.org/10.1016/j.marpetgeo.2006.11.001

Gary, J. H., Handwerk, G. E., & Kaiser, M. J. (2021). Petroleum Refining: Technology and Economics. CRC Press.

GoSS. (2018). South Sudan First State of Environment Outlook Report. United Nations Environment Programme Nairobi, Kenya, 20–21.

Jones, S., & Brown, T. (1985). Environmental movements: Local, national, global. Transaction Publishers.

Kern, J. (2019). Energy transition and innovation policy in the oil and gas sector. Technological Forecasting and Social Change, 138(16–22).

Khan, M. R., & Lund-Thomsen, P. (2019). Corporate social responsibility in the global South: Exploring the role of governance and institutions. Journal of Cleaner Production, 239.

Kolk, A., & Pinske, J. (2020). The evolution of environmental management and corporate sustainability reporting in the oil and gas industry. Journal of Cleaner Production, 267, 122074.

Leach, M., et al. (1999). Poverty and environment in developing countries: An overview study. University of Sussex.

Lee, C., & Johnson, D. (2019). Waste reduction and recycling initiatives: A comparative analysis. Journal of Environmental Management, 245, 123–135.

Mittal, A., & Raj, R. (2019). Oil and Gas Pipelines: Integrity and Safety Handbook. Gulf Professional Publishing.

Nag, S., Tambe, S. S., & Bapat, S. (2020). Fundamentals of Oil and Gas Exploration and Production. CRC Press.

Nash, R. (2001). Wilderness and the American mind. Yale University Press.

Petrov, V. (2021). Renewable energy integration in the oil and gas industry: A review of challenges and opportunities. Renewable and Sustainable Energy Reviews, 138.

Pimm, S. L., et al. (2014). The biodiversity of species and their rates of extinction, distribution, and protection. Science, 344(6187).

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. Biological Conservation, 141(10), 2417–2431.

Smith, L., & Johnson, M. (2020). The environmental impact of natural gas production: A comprehensive review. . . Environmental Science & Technology, 54(16), 9853–9867.

Sutherland, W., et al. (2018). Biodiversity conservation in the oil and gas industry: Challenges and opportunities. Biological Conservation, 221, 117–126.

Sutherland, W. J., et al. (2013). Identification of 100 fundamental ecological questions. Journal of Ecology, 101(1), 58–67.

Wilson, E., et al. (2022). Biodiversity conservation strategies: A global perspective. Conservation Biology, 36(1), 234–245.

Yergin, D. (1991). The Prize: The epic quest for oil, money, and power. Free Press.

Zhang, L., & Li, Y. (2022). Regulatory challenges in environmental conservation: A case study of the oil and gas sector. Environmental Management, 79(1), 102–115.

Zheng, S., & Kahn, M. E. (2020). Understanding China's new energy vehicle subsidies and regulations: Impacts on the automobile market. Journal of Environmental Economics and Management, 100.

Zoback, M. D., & Gorelick, S. M. (2012). Reservoir Geomechanics. Cambridge University Press.

Fischer, C., & Newell, R. G. (2008). Environmental and technology policies for climate mitigation. Journal of Environmental Economics and Management, 55(2), 142-162.

Leal Filho, W., Brandli, L. L., Lange Salvia, A., Rayman-Bacchus, L., & Platje, J. (2019). Corporate social responsibility in oil and gas companies: Current status and future trends. Journal of Cleaner Production, 213, 655-664.

Smith, J. B. (2018). Environmental regulation and innovation dynamics in oil and gas extraction. Research Policy, 47(10), 1841-1853.

Sovacool, B. K. (2016). How long will it take? Conceptualizing the temporal dynamics of energy transitions. Energy Research & Social Science, 13, 202-215.

Brown, A. (2017). Community Engagement in Environmental Conservation: A Case Study of South Sudan. Journal of Environmental Management, 45(3), 321-335.

Doe, J. (2019). Regulatory Frameworks for Environmental Conservation in the Oil and Gas Industry: Lessons from South Sudan. Environmental Policy and Governance, 28(2), 145-159.

IEA. (2019). World Energy Outlook 2019. International Energy Agency.

Jones, M. (2020). Investing in Renewable Energy: Opportunities and Challenges for South Sudan. Renewable Energy Journal, 15(2), 102-115.

Smith, B. (2018). Green Technologies in the Oil and Gas Industry: A Review of Current Practices and Future Directions. Journal of Cleaner Production, 172(4), 1409-1421.

UNEP. (2016). Environmental Impact Assessment of Oil and Gas Activities in South Sudan. United Nations Environment Programme.

WWF. (2020). Oil Spill Response and Environmental Conservation in South Sudan: A Case Study. World Wildlife Fund.

CBD. (2020). Convention on Biological Diversity. Retrieved from https://www.cbd.int/

FAO. (2018). Sustainable Agriculture: Key to Food Security. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/sustainable-agriculture/en/

IPCC. (2018). Global Warming of 1.5°C. Intergovernmental Panel on Climate Change. Retrieved from https://www.ipcc.ch/sr15/

UN Water. (2019). World Water Development Report 2019: Leaving No One Behind. United Nations. Retrieved from https://www.unwater.org/publications/world-water-development-report-2019/

UNEP. (2021). Waste Management. United Nations Environment Programme. Retrieved from https://www.unep.org/explore-topics/waste

UNESCO. (2017). Education for Sustainable Development Goals. United Nations Educational, Scientific and Cultural Organization. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000247444

Eaton, A. K., Barlow, J., Catto, S., & Jones, S. (2020). Managing environmental impacts of oil production in South Sudan. Journal of Environmental Management, 268, 110677.

Kelleners, T., Blake, W., Seidel, S., & Nadir, Z. (2018). Environmental impact assessments for oil and gas projects in South Sudan. Environmental Impact Assessment Review, 71, 17-25.

Nash, J. (2017). The impact of environmental conservation on oil and gas production: A global perspective. Energy Policy, 108, 558-564.

Oduro, W. (2019). Environmental regulations and oil production in South Sudan. Resources Policy, 61, 444-452.

Winkler, E., Yang, J., & Abate, M. (2020). The role of environmental conservation in sustainable oil and gas production in South Sudan. Sustainable Development, 28(4), 887-896.

Brown, A., Smith, B., & Johnson, C. (2021). The impact of environmental conservation on oil and gas production: Challenges and opportunities. Energy Policy, 149, 112059.

Holland, R., Martinez, M., & Gupta, N. (2019). Environmental conservation and the future of oil and gas production. Journal of Cleaner Production, 239, 118035.

Jones, L., Green, K., & White, P. (2018). The role of technology in mitigating the environmental impact of oil and gas production. Energy Policy, 123, 215-223.

Smith, D., Davis, R., & Clark, E. (2020). Public opposition to oil and gas production: Implications for the industry. Energy Policy, 139, 111349.

CBD (2020). "Global Biodiversity Outlook 5." Convention on Biological Diversity.

FAO (2020). "The State of the World's Forests 2020." Food and Agriculture Organization of the United Nations.

APPENDICES

Appendix A: Questionnaire

Dear Respondent;

My name is **Agoth Peter** a student of Institute of Petroleum Studies-Kampala in affiliation with Uganda Christian University pursuing a bachelor of science in oil and gas management. I am conducting research on the ***"The impact of environmental conservation on oil and gas production in South Sudan."*** The information obtained for this purpose will be treated with confidentiality and will only be used for academic purpose. Your cooperation will be highly appreciated.

Thanks very much.

PART 1: BIO DATA

Please read and answer questions by putting a tick against a correct alternative

1. **Gende**r

Male	Female

2. **Age Group (Years)**

20-24	25-29	30-34	35-39	40 and above

3. **Education level**

CSE	Certificate	Diploma	Degree	Masters

4. Marital status

Married	Single	Divorced

5. How long have you worked for this company? (Number of years)

1-5	6-10	11-15	16-20	21 and above

PART 2

This part is designed to help you in describing your view on the impact of environmental conservation on oil and gas production. Please answer the items below by putting a tick to the alternative that perfectly suits your opinion using the scale below

1	2	3	4	5
Strongly disagree	Disagree	Not sure	Agree	Strongly agree

Ways of environmental conservation	1	2	3	4	5
Implementing stricter regulations can help minimize environmental impact during oil and gas production					
Investing in renewable energy technologies helps in reducing the environmental footprint of oil and gas production					
Do you agree that public awareness and education regarding environmental issues can lead to better conservation practices in oil and gas production					

The current level of environmental protection efforts undertaken by the oil and gas industry are satisfactory					
Reforestation programs near oil and gas production areas can mitigate environmental damage.					
Implementing carbon capture and storage technologies in the oil and gas industry for environmental conservation is efficient					

Impact of environmental conservation on oil and gas production	**1**	**2**	**3**	**4**	**5**
Do you agree that environmental conservation efforts have a significant impact on the sustainability of oil and gas production					
Implementing environmentally friendly practices affects the profitability of oil and gas companies					
Oil and gas companies are likely to prioritize environmental conservation over maximizing production and profits					
Integrating environmental conservation practices into oil and gas operations leads to long-term economic benefits for the industry					
Stricter environmental regulations could hinder innovation and competitiveness within the oil and gas sector					
Investments in environmental conservation initiatives have led to measurable improvements in operational efficiency within oil and gas companies					

The challenges in maintaining environmental conservation	**1**	**2**	**3**	**4**	**5**
Regulatory compliance is a significant challenge for oil and gas companies in maintaining environmental conservation					
Financial considerations often take precedence over environmental conservation efforts within the company					
Public perception and pressure influence environmental conservation practices within the companies					
There is a good level of collaboration between oil and gas companies and environmental organizations in promoting sustainable practices					
Internal company policies and initiatives prioritize environmental conservation alongside production goals					
Overall commitment of our oil and gas production company towards long-term environmental sustainability.					

THANK YOU FOR YOUR TIME AND COOPERATION