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THE BENEFITS AND CHALLENGES OF SUSTAINABLE PRACTICES: A CASE STUDY AT OIL AND GAS COMPANIES IN LIBYA

BY

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ABSTRACT

This study delves into the complexities of sustainability within the Libyan oil and gas industry. Through in-depth interviews with key personnel from seven prominent companies, the research investigates the practical implementation of sustainable practices. The focus is on understanding the multifaceted impacts – environmental, social, and economic – that these initiatives engender.

Findings underscore the industry's commitment to sustainability while simultaneously revealing the formidable challenges hindering progress. Technological limitations, stringent regulatory frameworks, and the need for skilled personnel emerge as critical obstacles. However, the research also demonstrates the potential for significant rewards, including improved financial performance, technological advancements, and enhanced corporate image.

By providing a nuanced understanding of the Libyan oil and gas sector's sustainability journey, this study offers valuable insights for industry stakeholders, policymakers, and researchers. It emphasizes the importance of strategic planning, continuous learning, and collaborative efforts to overcome challenges and unlock the full potential of sustainable operations.

Keywords: sustainability, oil and gas, Libya, environmental impact, social responsibility, economic performance.

ABSTRAK

Kajian ini menyelidiki kerumitan kemampanan dalam industri minyak dan gas Libya. Melalui temu bual mendalam dengan kakitangan utama daripada tujuh syarikat terkemuka, penyelidikan itu menyiasat pelaksanaan praktikal amalan mampan. Tumpuan adalah untuk memahami kesan pelbagai rupa - alam sekitar, sosial dan ekonomi - yang ditimbulkan oleh inisiatif ini.

Penemuan menggariskan komitmen industri terhadap kemampanan dan pada masa yang sama mendedahkan cabaran hebat yang menghalang kemajuan. Had teknologi, rangka kerja kawal selia yang ketat, dan keperluan untuk kakitangan mahir muncul sebagai halangan kritikal. Walau bagaimanapun, penyelidikan itu juga menunjukkan potensi untuk ganjaran yang ketara, termasuk prestasi kewangan yang lebih baik, kemajuan teknologi dan imej korporat yang dipertingkatkan.

Dengan memberikan pemahaman yang bernuansa tentang perjalanan kemampanan sektor minyak dan gas Libya, kajian ini menawarkan pandangan yang berharga untuk pihak berkepentingan industri, penggubal dasar dan penyelidik. Ia menekankan kepentingan perancangan strategik, pembelajaran berterusan, dan usaha kolaboratif untuk mengatasi cabaran dan membuka potensi penuh operasi mampan.

Kata kunci: kemampanan, minyak dan gas, Libya, kesan alam sekitar, tanggungjawab sosial, prestasi ekonomi.

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LIST OF ABBREVIATIONS

AGOCO : Arabian Gulf Oil Company

CSR : Corporate Social Responsibility

EMS : Environmental Management System

GHG : Greenhouse Gas

ISO : International Organization for Standardization

LNG : Liquefied Natural Gas

NOC : National Oil Corporation

O&G : Oil and Gas

UN : United Nations

UUM : Universiti Utara Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

As a pivotal player in the global oil and gas industry, the oil and gas companies in Libya faces a distinctive set of challenges and opportunities in the pursuit of sustainable practices. The oil sector, a cornerstone of Libya's economy, demands a delicate balance between meeting the nation's energy needs and aligning with the imperative for environmental responsibility. This discussion explores into the specific benefits and challenges oil and gas companies encounters in their journey toward sustainability in the Libyan context.

The oil and gas industry plays a pivotal role in global energy production and economic development. However, the environmental impact of traditional practices in this sector has raised concerns worldwide. In response, there has been a growing emphasis on incorporating sustainable practices within oil and gas companies. This shift is driven by the need to address environmental, social, and economic challenges associated with the industry.

Embracing sustainable practices in the operations of oil and gas companies in Libya offers multifaceted advantages. Firstly, environmental conservation becomes paramount. The sensitive ecosystems of the Gulf region for example necessitate a delicate balance between resource extraction and preservation. Sustainable practices, ranging from innovative extraction technologies to habitat protection measures, can mitigate the ecological impact of oil and gas activities, ensuring the long-term health of the region's environment (Manish Kumar & Monto Mani, 2022).

Furthermore, the adoption of sustainable practices brings about resource efficiency. The companies' commitment to minimizing waste, optimizing water usage, and integrating energy-efficient processes not only aligns with global sustainability goals but also translates into tangible operational cost reductions over time. This resource-conscious approach not only benefits the bottom line but also positions the companies as responsible steward of finite resources.

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A robust commitment to sustainability also contributes to building a positive corporate image. In an era where environmental consciousness is integral to public perception, the oil and gas companies can leverage sustainable practices to demonstrate a commitment to corporate social responsibility. This positive image can attract socially conscious investors, enhance stakeholder relations, and foster goodwill among the communities where the company operates.

However, the journey towards sustainability is not without its challenges. One of the primary obstacles faced by the oil and gas companies in Libya is the substantial initial capital investment required for the implementation of sustainable technologies and infrastructure (Ali, 2018). The transition from traditional practices to environmentally friendly alternatives demand a significant financial commitment, challenging the company to balance short-term financial constraints with long-term sustainability goals.

Technological transition poses another hurdle. Shifting operational paradigms requires meticulous planning, employee training, and the phased integration of new technologies. Overcoming resistance to change and ensuring a smooth transition without disrupting ongoing operations is a complex process that demands careful navigation.

Moreover, geopolitical, and regulatory risks add an additional layer of complexity. For example, the Arabian Gulf region's political landscape is dynamic, and evolving regulatory frameworks necessitate continuous adaptation. Navigating these uncertainties requires strategic planning to align sustainability initiatives with geopolitical realities and regulatory developments.

The oil and gas companies find themselves at the nexus of economic imperatives and environmental responsibilities. The benefits of sustainable practices, from environmental conservation to positive corporate image, are apparent.

However, the challenges, including capital investment, technological transitions, and geopolitical risks, underscore the intricacies of steering a course toward sustainability in one of the world's most crucial energy hubs.

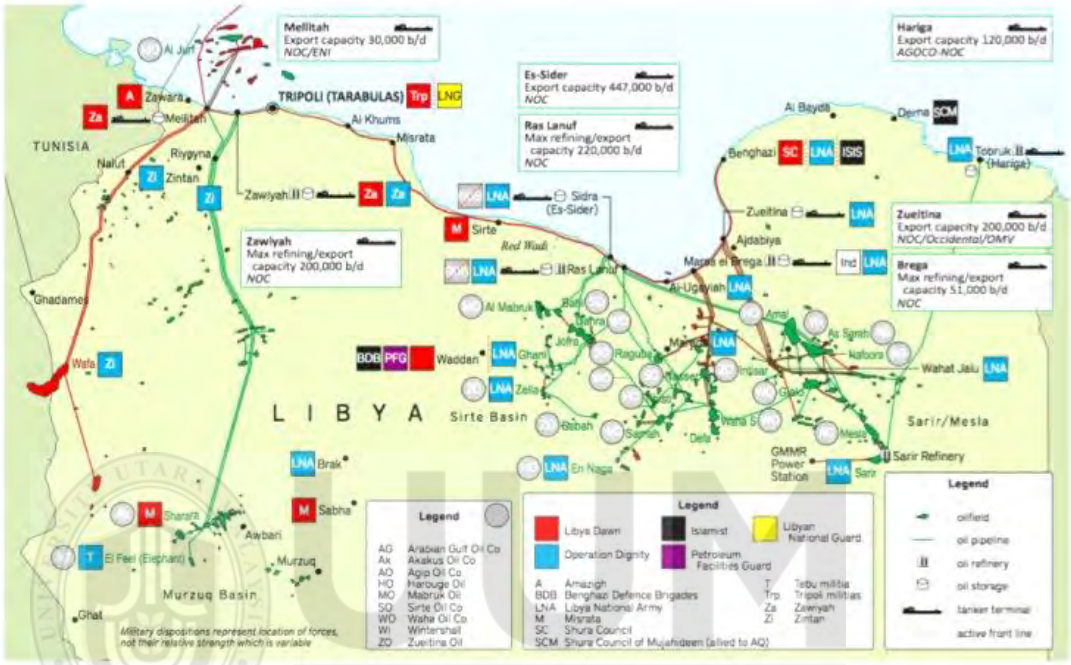

Figure 1.1: Location map of Ghani and other oil fields in Libya
Source: The Trial of Slobodan Milosevic (2006)

Figure 1.1 shows the location map of Ghani and other fields in Libya. The oil and gas companies in Libya operate within a dynamic context where the pursuit of sustainable practices intersects with the nation's economic reliance on the oil and gas sector. Libya, endowed with significant oil reserves, faces the imperative to balance energy extraction with environmental responsibility and societal well-being. Against this backdrop, the company encounters a set of distinct benefits and challenges as it endeavors to integrate sustainable practices into its operations.

For this study ,7 companies were selected namely Mellitah oil company, Waha oil company, Zallaf company, National oil company, Sirt oil company, and Arabian Gulf Oil Company (AGOCO) in Libya.

1.2 Problem Statement

The oil and gas companies in Libya, like many entities in the oil and gas industry, face a critical point in navigating the adoption of sustainable practices. The global emphasis on environmental responsibility and the urgent need to mitigate climate change have placed increasing pressure on oil companies to integrate sustainable initiatives into their operations. In the context of the oil and gas companies in Libya, this study seeks to address several pressing issues and challenges pertaining to the benefits and obstacles of sustainable practices.

Despite the necessity for sustainable practices, the oil and gas industry often face challenges in implementing effective environmental conservation measures. The oil companies may encounter difficulties in fully embracing and optimizing green technologies to reduce their ecological footprint. Additionally, uncertainties may surround the efficiency of existing waste management systems, raising concerns about the potential environmental impact of waste generated during oil extraction and production processes. While sustainable practices are expected to yield economic benefits, the companies may confront challenges in realizing substantial cost savings (Menhat et al., 2020). The integration of eco-friendly technologies and processes may require significant upfront investments, potentially posing financial hurdles.

Moreover, uncertainties may exist regarding the tangible economic returns from sustainability initiatives, prompting a closer examination of revenue generation avenues and the long-term financial sustainability of the company (Jędrzej, 2009).

The social impact of sustainable practices within the oil and gas companies represents another facet of concern. Community engagement initiatives may encounter obstacles in aligning with local expectations, and there may be challenges in balancing the well-being of employees with the operational demands of the industry. Moreover, managing stakeholder perceptions and ensuring a positive corporate image in the context of sustainability endeavours can be intricate, requiring strategic approaches to address potential tensions (Cherepovitsyn et al., 2021).

At different organizational levels, challenges may arise according to (Yousif Abdelbagi , 2015). Operational hurdles could impede the seamless integration of sustainable technologies into day-to-day activities. Managerial teams may struggle with decision-making processes related to resource allocation for sustainability initiatives. Leadership perspectives on sustainability may also influence the pace and extent of implementation, highlighting the need for a cohesive organizational approach. Considering these multifaceted challenges, understanding the nuances of sustainable practices within the oil and gas companies in Libya becomes imperative. This study aims to investigate these challenges and opportunities, providing actionable insights for the company to enhance its environmental, economic, and social sustainability.

1.3 Research Questions and Objectives

Research Questions:

1. Does the operation of oil and gas companies in Libya impact the environment, society, and economy?
2. To what extent do the oil and gas companies in Libya implement sustainable practices?
3. What are the main challenges faced by oil and gas companies in Libya in implementing sustainable practices?
4. What are the benefits have been gained from implementing sustainable practices in oil and gas companies in Libya?

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Research Objectives:

1. To examine the environmental, social, and economic impact of the operations of oil and gas companies in Libya.
2. To investigate the extent of sustainable practices implemented by the oil and gas companies in Libya.
3. To investigate the main challenges faced by the oil and gas companies in Libya in implementing sustainable practices and their approach to overcoming those challenges.
4. To identify the benefits gained by the companies in implementing sustainable practices.

1.4 Scope of the Study

The general purpose of this study is to comprehensively investigate and analyse the benefits and challenges associated with the adoption of sustainable practices within the oil and gas companies in Libya. By focusing on environmental, economic, and social dimensions, the study aims to provide insights that can inform strategic decision-making, policy formulation, and operational improvements within the companies. The overarching goal is to contribute to the growing body of knowledge on sustainability in the oil and gas industry, offering practical recommendations for enhancing the company's overall sustainability performance.

The geographical focus of the study is Mellitah oil company, Waha oil company, Zallaf company, National oil company, Sirt oil company, and Arabian Gulf Oil Company (AGOCO) in Libya. The study will concentrate on the specific operational sites, facilities, and practices within the companies' operation in Libya. The findings and recommendations will be context-specific to the unique challenges and opportunities present in the Libyan operational environment.

By exploring these scopes, the study aims to offer a nuanced understanding of the dynamics surrounding sustainable practices within the oil and gas companies, facilitating informed decision-making, and contributing to the broader discourse on sustainability within the oil and gas sector in Libya.

1.5 Significance of the Study

The study on the benefits and challenges of sustainable practices within the oil and gas companies in Libya holds significant importance for various stakeholders understanding the benefits and challenges of sustainable practices in the oil and gas companies contributes to the broader discourse on environmental conservation within the oil and gas industry. The findings may offer insights into effective strategies for reducing the ecological footprint, promoting responsible resource management, and mitigating the environmental impact of oil extraction and production.

The study provides valuable information for the oil and gas companies' leadership, guiding strategic decision-making in adopting sustainable practices. It allows the companies to assess the environmental, economic, and social implications of such practices and make informed choices that align with global sustainability goals. Examining the economic benefits and challenges of sustainable practices contributes to the optimization of operational efficiency and cost management. Insights gained from the study may aid in identifying cost-saving measures, enhancing resource efficiency, and improving the overall economic sustainability of the oil and gas companies. The study sheds light on the social impact of sustainable practices, emphasizing the role of the oil and gas companies in Libya in fulfilling their corporate social responsibility.

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Positive social practices, such as community engagement and employee well-being initiatives, can enhance the company's reputation, improve stakeholder relations, and contribute to sustainable development in the local context.

The research findings can serve as a benchmark for other companies in the oil and gas industry, providing insights into industry best practices for sustainable development. Comparative analysis with similar companies can help establish benchmarks and inspire broader adoption of sustainable practices across the sector. By addressing these aspects, the study contributes not only to the academic understanding of sustainable practices but also to the practical implementation of sustainability initiatives within those companies, fostering positive impacts on the environment, economy, and society.

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CHAPTER 2

LITERATURE REVIEWS

2.1 Overview of the Oil and Gas Industry

The oil and gas industries continue to play a crucial role in driving the global economy. Despite the growing emphasis on renewable energy, fossil fuels remain a significant source of energy worldwide. The industry faces complex investment challenges due to the operational risks involved in exploration and production activities. These include local and global environmental hazards such as groundwater contamination and climate change (Sudusinghe & Seuring, 2020).

Workforce rules are designed to ensure a workplace that is both safe and secure. Nevertheless, exploration and production activities continue to pose local and worldwide environmental hazards, such as the poisoning of groundwater or the exacerbation of climate change on a larger scope. Examining and communicating methods are essential metrics of sustainable growth within the realm of oil and gas corporations. However, the process of acquiring and examining necessary data remains an ongoing difficulty in determining the extent to which these discoveries can impact the day-to-day and long-term decisions made by oil and gas businesses. Artificial intelligent technologies are recognised as an effective prevention method for enabling oil and gas industries to detect and control risks and manage events through extended monitoring and overseeing operations.

This study examined the importance of environmental policies by conducting interviews with executives and stakeholders. The findings revealed that the implementation of environmental protection policies is influenced by the financial stability of companies. In times of economic hardship, companies appear to be less committed to strictly enforcing these policies. This study offers a thorough examination of new technologies that can be used to tackle current and anticipated challenges in sustainable development within the oil and gas sectors. The goal is to propose effective solutions for strategic planning efforts. The oil and gas industry, which has historically faced environmental issues, is now transitioning towards sustainability in response to the urgent need to address climate change and environmental responsibility. The sector is now implementing policies and initiatives aimed at minimising its impact on the environment, fostering social responsibility, and assuring long-term economic sustainability (Ali, Valid & Adrian 2018). Typically, the oil and gas industry can be categorised into three distinct sectors: upstream, midstream, and downstream, as illustrated in Figure 2.1.

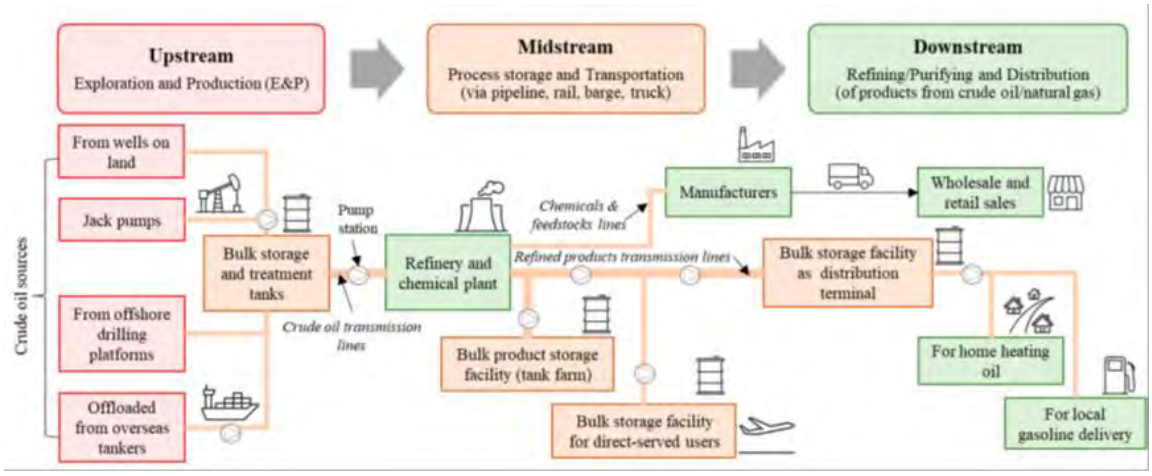

Figure 2.1: Three major levels of a general petroleum pipeline system
Source: Mahmood et al., (2023)

2.2 Upstream sector

In the upstream sector, the activities of prospecting and producing crude oil and gas take place. These activities can be categorised based on the properties of the well reservoirs and the production areas (Koroteev & Tekic, 2021). Upstream exploration focuses on locating on-shore or offshore reservoirs of crude oil and natural gas, which is then followed by the building of boreholes for assessment and appraisal purposes. Prior to the commencement of commercial production, many production wells are drilled and connected to processing units and distribution networks on the surface (Zhao et al., 2018). Geological exploration entails the identification of possible deposits by the utilisation of either invasive (drilling) or non-invasive (seismic) techniques and protocols (Farfour & Yoon, 2016; Lummus, 1970). Exploration areas typically encompass vast territories, which might span across national boundaries and encompass both terrestrial and offshore regions.

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During this stage, there can be significant impacts, but if the selection of the site is carefully planned and the project is well organised, these effects are typically minimised. After identifying an economically viable resource, advanced equipment and technology are employed to drill production boreholes into the reservoir (Barclays, 2015). Engineered or natural drilling fluids are used to carry drill cuttings to the ground (Hossain et al., 2012). An oil pump or pressurised system is commonly employed to propel oil to the surface. To enhance oil production, it is possible to use the recirculation of natural gases. Under high-pressure settings, cracks can be induced by explosives or water, along with various chemical additives, to increase the permeability of the subsurface.

One common technique for preventing obstacles is to introduce acids or other chemicals (ASME Shale Shaker Committee, 2005). The byproducts of oil and gas production are typically combusted and released into the atmosphere. The hydrocarbons that have been extracted are divided into gases and liquids and then subjected to a dehydration process in order to reduce the remaining water content. Extraction wells commonly provide distinct processing and handling facilities at oil and gas-producing sites. There could exist a comprehensive infrastructure for overseeing and dispersing extracted oil and gas, which may include many locations where flaring occurs (Allen et al., 2016; Elvidge et al., 2018).

2.3 Midstream sector

An oil and gas midstream operation includes the processing, storing, transporting (for example, via pipeline, railway, shipping vessel, oil tanker, and trailer), and wholesale marketing of oil, natural gas, and other energy products that are produced in the field (Furman et al., 2017).

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Pipelines, along with various transportation methods, can be utilised to convey crude oil from drilling sites to refinery facilities and subsequently distribute the refined and processed final products to customers and distributors downstream. Natural gas is transferred to users downstream, such as municipal utility companies, as part of its distribution infrastructure, following treatment and processing at treatment facilities (Faramawy et al., 2016a).

Within the midstream sector, there exist several intermediate terminals that provide a diverse range of services to producers, distributors, wholesalers, and various consumers. These services include delivery, storage, blending, stock management, and chemical injection services (Gülen, 2016; Kalita, 2020; Saji & Umoren, 2020). A crucial element of the midstream sector classification is the provision of services that expedite the transition between raw upstream operations and refineries promptly.

2.4 Downstream sector

A downstream industry refers to a sector that engages in the processing of petroleum crude oil, refining and treating natural gas, as well as marketing and distributing products that are obtained from these resources (Ghaithan et al., 2017). The process yields many byproducts such as petrochemicals, asphalt, and petrol oils. These byproducts have multiple applications, including the production of petrol, diesel, kerosene, jet fuel, lubricating waxes, and liquefied natural gas (Waheed & Oni, 2015). The outcome of oil and gas refinement usually consists of standardised commercial products or more simply put, it yields multiple distinct end-products.

During the process of oil refinement, crude oil undergoes physical separation followed by chemical processing to produce various petroleum fractions. The distillation of crude oil and gas yields many fractions, including natural gas, naphtha, paraffin, and gas (Barclays, 2015).

Multiple factors exert influence on the yield and quality of diverse products. The elements influencing the outcome are dictated by the characteristics of crude oil, the distillation parameters employed in the process, and the requirements of the end user (Corma et al., 2017; Waheed & Oni, 2015).

Secondary transformation techniques involve the use of high temperatures, chemical catalysts, and hydrogen to break down heavy fractions into lighter fractions, allowing for customisation of their composition and volume (Sahu et al., 2015). Petrochemical refineries utilise a significant number of chemical compounds and additives in their production facilities to treat and incorporate into the final products. The predominant substances include minerals, metal compounds, organic and inorganic acids, corrosive bases, lead alloys, octane boosters, and solvents (Corma et al., 2017). A refinery comprises facilities for crude oil handling, distillation, hydrocracking, and various other treatment processes. Additionally, there will be a designated space for storing both unprocessed and processed items, along with a method for distributing them. Extensive transportation networks, such as oil pipelines, ships, or vessels, are utilised to facilitate the delivery of crude oil and processed fuels, often involving cross-border movements. Pipelines are used to carry oil and gas, and they can be situated either above or below the surface (Askari et al., 2018; Green & Jackson, 2015).

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The ancillary facilities encompassed in this list are a receiving and dispatch hub, a pumping station, a control centre, service and repair roads, pressure boosters, and auxiliary pumping stations.

Typically, oil and gas products are transported by pipelines to centralised fuel depots once they have undergone processing. In order to streamline the process of distributing goods to consumers, specialised sites are usually positioned near strategic distribution hubs (Barclays, 2015). Refined petroleum products are stored in either above-ground or subterranean storage tanks. In order to avoid spills or unintended releases, it is necessary for these tanks to have specific containment measures in place (Shukla & Karki, 2016). Usually, petrochemicals are conveyed in containers or tankers to their final consumers in specifically engineered containers. Spacious reservoirs have the capacity to store and retain natural gas for immediate distribution to users. LNG (Kanbur et al., 2017) is transported using refrigerated storage containers and custom-engineered shipping containers. The oil and gas business often has extensive distribution infrastructures, which might include a significant number of commercial and industrial fuel distribution facilities. The environmental impacts of a large-scale and intricate distribution system require careful management.

2.5 The Oil and Gas Industry in Libya

The National Oil Corporation (NOC) was founded on November 12, 1970, in accordance with Law No: 24/1970, with the purpose of taking on the duties related to the operations of the oil industry (National Oil Corporation, 2005).

The Arabian Gulf Oil Company (AGOCO) and Waha Oil Company (WOC) are the two major oil producers among NOC's subsidiaries. The primary sources of AGOCO's oil output are the Sarir, Nafoora, and Messla fields. The National Oil Corporation (NOC) projected AGOCO's production to be approximately 430,000 barrels per year in 2003. WOC was established in 1986 to assume control of activities previously managed by Oasis Oil Company, which was a collaboration between NOC (National Oil Company) with a 59.16 percent stake, Conoco with a 16.33 percent stake, Marathon with a 16.33 percent stake, and Amerada Hess with an 8.16 percent stake. WOC is one of the Libyan enterprises that experienced the negative consequences of the US embargo. This is because the oilfields primarily have outdated US equipment, which WOC is unable to obtain necessary spare parts. Consequently, the production at WOC has experienced a significant decline, dropping from over 1 million barrels per day at its highest point in the late 1980s to roughly 300,000 barrels per day in 2002.

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Libya is one of the leading oil producers in Africa (Gurney, 1996). In addition to other North African oil providers, the country is also the primary oil supplier to Europe. Libya's annual oil production capacity is 1.4 billion barrels, while its confirmed oil reserves amount to 39 billion barrels. Million barrels per day. France, Germany, Italy, and Spain collectively account for 74% of Libya's total exports.

2.5.1 Oil production

The oil and gas industry originated in 1859 in Pennsylvania, United States. The discovery of oil reserves in Libya (specifically at Amal and Zelten, today known as Nasser) occurred 100 years later, as documented by Waddams in 1980. Oil exploration in Libya commenced in 1955, following the implementation of the significant national Petroleum Law No. 25 in April of the same year. The initial oil sources in Libya were uncovered in 1959, and the country commenced exporting oil in 1961. Figure 2 depicts the trajectory of Libyan oil production between 1970 and 2010. In 1970, Libya reached its highest oil production level of 3.3 million barrels per day (bbl/d). However, this declined to 1.5 million bbl/d from 1970 and 1974 due to government-imposed production limitations.

From 1992 to 1999, the fines placed on Libya did not significantly decrease its oil output. Following the complete removal of sanctions, Libya is seeking foreign firms to enhance the nation's oil production capacity from 1.5 million barrels per day in 2003 to 2 million barrels per day by 2010. In 2004, the projected oil output in Libya was approximately 1.6 million barrels per day (bbl/d). The country used 237,000 bbl/d and had a net export of 1.34 million bbl/d. Libya is regarded as a highly appealing destination for oil exploration because of its economically advantageous oil recovery methods (EIA, 2004). Graph 2.2 displays the amount of oil produced by Libya between the years 1970 and 2010.

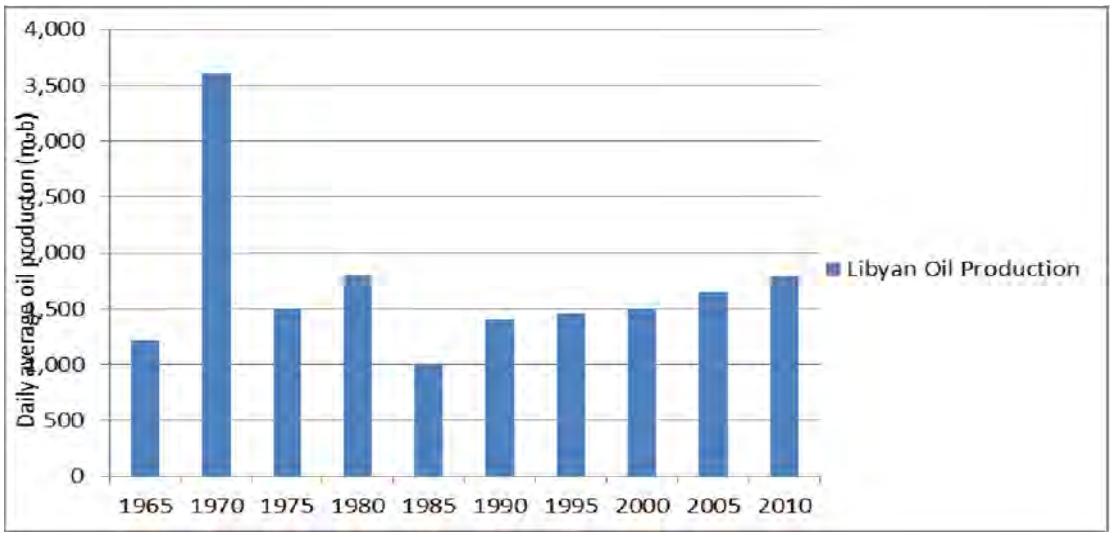

Figure 2.2 Libya's oil production from 1970 to 2010

Source: https://www.azernews.az/region/116764.html

2.5.2 Gas production

Libya maintains a strong emphasis on the production of natural gas due to two significant factors. Initially, Libya aims to prioritise the internal utilisation of natural gas above oil, with the intention of increasing the availability of oil for international trade.

Production reached its highest point in 1979, with a daily rate of 2.2 billion cubic feet (Don Hallett., 2002). Production had dropped to 1.2 billion cubic feet per day by 1994. Roughly one-third of the entire output is reinjected or used in industry. Following Algeria in 1964, Libya was the second nation in the world to export liquefied natural gas (LNG) in 1970. Since then, technical obstacles that prevent Libya from exporting LNG have mostly caused the country's LNG exports to stagnate.

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2.6 Sustainable Practices

Sustainable practices refer to methods and strategies that meet the needs of the present without compromising the ability of future generations to meet their own needs. In the context of the oil and gas industry, sustainable practices encompass a wide range of activities designed to reduce environmental impact, enhance social responsibility, and improve economic performance. These practices may include the adoption of cleaner technologies, efficient resource management, reduction of greenhouse gas emissions, and engaging in corporate social responsibility (CSR) initiatives. The goal is to create a balance between economic growth, environmental stewardship, and social equity, ensuring that the industry contributes positively to the broader goals of sustainable development.

2.7 Definition of Sustainable Practices

Sustainable practices are actions and strategies implemented by organizations to balance economic growth, environmental protection, and social equity. These practices aim to meet present needs without compromising the ability of future generations to fulfill their needs. In the oil and gas industry, sustainable practices include reducing greenhouse gas emissions, conserving natural resources, and engaging in corporate social responsibility (CSR) initiatives. Adopting these practices is crucial for long-term business success and is increasingly driven by global environmental policies and stakeholder expectations (Buhovac, 2014).

2.7.1 Environmental sustainability

Environmental sustainability in the oil and gas industry aims to minimize the environmental impacts on air, water, soil, and ecosystems. Implementing effective Environmental Management Systems (EMS) is crucial to ensure that the entire organization becomes more eco-efficient by reducing water, energy, and resource consumption while safeguarding the natural environment and biodiversity (Kumar & Mani, 2022).

Environmental sustainability refers to responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. This includes practices such as reducing greenhouse gas emissions, improving energy efficiency, and adopting renewable energy sources (UNEP, 2021).

2.7.1.1 Reduction of Greenhouse Gas Emissions (Air Emissions)

By implementing effective trip management strategies, selecting appropriate fleets, vehicles, and fuel for operations, and adopting eco-driving practices, stakeholders can collectively reduce air pollution. Methane emissions, a significant contributor to global warming, can be reduced by preventing leaks through advanced monitoring technologies and comprehensive maintenance strategies (EPA, 2022).

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2.7.1.2 Implementing effective Environmental Management Systems (EMS)

The implementation of efficient Environmental Management Systems (EMS) is crucial to ensuring that the entire organisation becomes more eco-efficient by reducing water, energy, and resource consumption, while also safeguarding the natural environment and biodiversity that may be impacted by the industry's activities. It necessitates the examination, surveillance, and authentication of objectives, as well as ongoing enhancement.

2.7.1.3 Reduction of greenhouse gas emissions (air emissions)

By implementing effective trip management strategies, such as selecting appropriate fleets, vehicles, and fuel for operations, all stakeholders including workers, contractors, and suppliers may collectively reduce air pollution. Implementing fundamental eco-driving practices can result in a fuel efficiency improvement of up to 10% without incurring any extra expenses. Methane is 25 times more potent than carbon dioxide and is the second most significant contributor to the phenomenon of global warming.

The primary sources of methane are landfills, animal enteric fermentation, and oil and gas networks. Therefore, the oil and gas sector has a role in decreasing methane emissions by preventing methane leaks from entering the environment. This can be achieved by employing surveillance technologies, such as the Internet, and implementing improved equipment together with a more comprehensive maintenance strategy (EPA, 2022).

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2.7.1.3 Using renewables resources

Moreover, oil and gas operations have a tendency to rely on their own oil and gas resources for energy consumption. This presents an opportunity to introduce renewable energy sources into their operations, thereby diversifying their energy usage (Environmental Sustainability in the O&G Industry 2022).

2.7.1.4 Improving efficiency

Oil and gas activities require a significant amount of energy, making efficiency a crucial factor. Optimising processes can be accomplished by implementing modern technologies like IoT sensors, which can monitor performance, identify leaks, and detect equipment faults. The integration of IoT, machine learning, and artificial intelligence technologies is crucial for identifying areas of possible enhancement in efficiency for oil and gas operations (Uyanik & Avinash, 2019).

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2.7.1.5 Carbon sequestration

Amines can be used to absorb carbon dioxide from industrial processes. Moreover, the gases that have been caught can subsequently be pumped into an underground formation for permanent storage. Additionally, it can be employed in improved oil operations by injecting it into an oil reservoir to augment the characteristics of the hydrocarbons, hence boosting overall recovery. Simultaneously, this process facilitates the storage of carbon dioxide inside the formation (Gupta, 2023).

2.7.1.6 Water efficiency

Water efficiency includes water use minimization, water recycling, water separation and treatment and minimization of wastewater discharged.

2.7.2 Social sustainability

2.7.2.1 Workplace safety

The oil and gas industry is widely known for the inherent hazards it presents to worker safety. Adherence to rigorous protocols and safety measures is necessary to ensure the protection of the workforce. While the specific regulations may vary depending on the sector within the oil and gas industry, most businesses in this field are obligated to follow strict protocols for fire safety, occupational safety, and process safety. Regulatory bodies also exist to ensure that these standards are met and to assist firms in doing so. The industry should continuously strive to improve its safety protocols and develop an appropriate mechanism for employees to report any safety concerns to management.

2.7.2.2 Community engagement and stakeholder relations

The operations of the oil and gas sector can have detrimental effects on their surrounds and the planet, despite their significance, which might lead to opposition against these operations. Therefore, it is crucial for oil and gas businesses to acknowledge the potential consequences they may have on different stakeholders and to actively respond to their concerns in order to prevent negative repercussions that could impede future projects and disrupt ongoing operations. Therefore, a Thorough understanding of the impact on stakeholders is essential for oil and gas operations (Spence. 2010).

2.7.3 Economic sustainability

Oil and gas firms must prioritise addressing stakeholder concerns while still maintaining profitability during their operations. Oil firms encounter this difficulty and must strive to achieve a harmonious equilibrium between their requirements, the interests of their stakeholders, and the preservation of the environment. Furthermore, in order to enhance the sustainability of the oil field, it necessitates investment to bolster efficiency through the use of superior equipment and the digitisation of their fields.

2.7.3.1 Diversification

The corporations might leverage their proficiency in interconnected domains such as geothermal energy, carbon capture and storage, and hydrogen transportation and storage. This will enable these enterprises to enhance their sustainability in the long term and position themselves independent on hydrocarbons, so enabling them to fulfill the net zero requirements set by global institutions (Pott, 2021).

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2.7.3.2 Stakeholder assistance

Stakeholders exert influence over the economic viability of companies by deciding to provide financial support or boost investment for companies that adhere to specific practices. Governments can provide subsidies to enterprises that utilise carbon dioxide injection, so making it more cost-effective for these operations. This would stimulate advances in carbon sequestration and enhance companies' motivation to engage in such activities.

The idea being referred to is called the social licence to operate, which can be withdrawn even if there is support from other stakeholders (Snashall & Sabrina, 2017). Furthermore, investors have the ability to influence the oil and gas business by adhering to the Environmental, Social and Governance (ESG) agenda. The ESG, or Environmental, Social, and Governance, is a set of criteria that investors use to evaluate a company's bioecological performance prior to making an investment.

2.7.3.3 Social Sustainability Empowering Economic Sustainability

Recent studies have demonstrated that socially sustainable practices can significantly enhance economic sustainability in various industries, including the oil and gas sector. Practices ensuring the social sustainability of the human factor inside the company and in society create a positive impact on economic performance. However, the effect produced by internal practices was higher compared to external practices (Sudusinghe & Seuring, 2020).

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Sustainable leadership practices are critical for small and medium-sized enterprises (SMEs) to achieve sustainability and resilience. In the context of community-based social enterprises, essential sustainable leadership practices include enabling human capital with stakeholder care, fostering ethical values, cultivating social capital through social innovation, and supporting pro-environmental behaviour and social responsibility (Suriyankietkaew et al., 2022).

The sustainable performance of industries such as the automobile sector can be significantly influenced by corporate sustainable practices, government initiatives, technology usage, and organizational culture. Sustainable practices not only improve environmental and social performance but also enhance economic outcomes (Moslehpour et al., 2022).

Airports have considerable economic, environmental, and social impacts on communities. Social sustainability practices in small hub airports focus on various stakeholder categories, including passengers, employees, communities, and local businesses, demonstrating the multifaceted benefits of sustainability in diverse sectors (Marete & Johnson, 2021).

2.8 Challenges Faced by the Oil and Gas Industry in Adopting Sustainable Practices

In recent years, the petroleum industry has encountered numerous intricate issues. The oil and gas industry should allocate investment proportionally to the growing global energy demand. Price volatility is a major obstacle faced by the oil and gas business.

The oil and gas industry encounters several significant challenges in pursuing sustainable development, influenced by various factors that complicate its efforts to balance economic viability with environmental responsibility. One major challenge is the mounting pressure from shareholders, who are increasingly focused on value creation rather than mere output due to persistently low returns on investments (Ramos, Taamouti, Veiga, & Wang, 2017). This pressure is compounded by the complexity of the drilling and production processes, which involve intricate technical operations and high temperatures, high-pressure

conditions that exacerbate environmental risks (Gupta & Grossmann, 2017). Additionally, the industry faces a surge in demand for oil and gas, particularly in regions with growing energy needs (BP, 2017a), This situation necessitates rigorous measures to maintain safety and environmental standards, making it a central concern for the industry. Furthermore, protecting the social license to operate and meeting corporate social responsibilities have become essential, as public scrutiny and community expectations intensify (Tomlinson, 2017; Banerjee, 2017).

Other pressing issues include the fluctuation of fiscal regimes, which can impact investment and operational decisions, and the need for continuous R&D and innovation to address emerging challenges (Hall & Vredenburg, 2003). The industry must also handle the growing volume of data and manage knowledge effectively to optimize operations and mitigate risks (Bratianu & Bolisani, 2015). Additionally, the unstable partnerships between National Oil Companies (NOCs) and International Oil Companies (IOCs) pose a challenge to cohesive and effective collaboration (Whitson, 2009).

These challenges manifest in various environmental concerns such as flaring and venting, the decommissioning of oil and gas installations, and the disposal of oil storage tanks. Managing drill cuttings and produced water, as well as handling drilling muds and fluids, are critical issues that contribute to environmental impact. Estimating and validating greenhouse gas emissions, dealing with subsidence, and addressing spills and safety concerns are also crucial areas requiring attention.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Qualitative research is a methodological approach that seeks to explore and understand the complexities of human experiences, behaviours, and phenomena in depth. Unlike quantitative research, which focuses on numerical data and statistical analysis, qualitative research emphasizes the collection and analysis of non-numerical data, such as interviews, observations, and textual or visual materials. This approach allows researchers to gain a comprehensive understanding of the context, perspectives, and underlying meanings associated with a particular phenomenon.

The research at hand delves into the benefits and challenges of sustainable practices within the oil and gas industries, with a specific focus on the Mellitah Oil Company, Waha Oil Company, Zallaf Company, National Oil Company, Sirt Oil Company, and Arabian Gulf Oil Company (AGOCO) in Libya. The aim is to unravel the intricate dynamics surrounding sustainability initiatives within a sector traditionally associated with environmental and social concerns. By employing qualitative research methods, this study endeavours to uncover the nuanced perspectives of key stakeholders, identify best practices, and shed light on the unique challenges faced by the companies in their pursuit of sustainable practices.

By adopting a qualitative research methodology, this study aspires to contribute to the existing body of knowledge on sustainable practices within the oil and gas sector, with a specific focus on the previous mentioned oil companies in Libya. The qualitative approach aligns with the research's goals of providing a nuanced understanding of the benefits and challenges associated with oil and gas companies' pursuit of sustainability. The subsequent chapters will delve into the research design, data collection methods, and analysis techniques employed to unravel the intricacies of sustainable practices in the selected case study (Creswell, 2013).

3.2 Research Design

This study employs a qualitative research design to explore the benefits and challenges of sustainable practices within the oil and gas industry in Libya. The research design includes in-depth interviews with key stakeholders from selected companies, aiming to gather comprehensive insights into their experiences and perspectives. A thematic analysis approach is used to identify patterns and themes within the collected data, providing a nuanced understanding of how sustainability is implemented and perceived in the industry. This qualitative approach allows for a detailed exploration of the complexities involved in adopting sustainable practices.

3.2.1 Selection of Sampling and Respondents

Identifying and selecting appropriate respondents for qualitative research is a critical step in ensuring the richness and depth of the data collected. In the case of investigating the benefits and challenges of sustainable practices at the 7 oil companies in Libya.

the potential respondents will include key stakeholders representing various facets of the organization and its external environment.

They are top management and executives of the company who are essential for capturing a holistic understanding of sustainable practices within the interview questions were carefully crafted and refined through a number of face validity process. The questionnaire has been reviewed by three academicians at Universiti Utara Malaysia. Feedback from this process was used to modify the questions, making them more precise and relevant. This rigorous process ensured that the final set of questions was both robust and insightful.

3.2.2 Sampling Method

Purposive sampling was used to select respondents for the study. This sampling method involves selecting individuals who are most likely to provide rich, relevant, and diverse information related to the research questions (Patton, 2015). The criteria for selecting respondents included their roles and responsibilities within the oil and gas companies, their involvement in sustainability initiatives, and their knowledge and experience in the industry.

3.2.3 Top Management and Executives

CEO, COO, and other top executives: These individuals can provide insights into the overall strategic direction of oil companies regarding sustainability, including the goals, priorities, and decision-making processes related to sustainable practices (Blowfield & Murray, 2008).

Considering the complexity of the benefits and challenges of sustainable practices at the oil and gas companies in Libya, and the diverse perspectives needed from the top management, a starting point might be to interview a range of 15 to 20 respondents. This number allows for a diverse representation of viewpoints while also providing a manageable dataset for in-depth analysis (Patton, 1990).

3.3 Data collection

Conducting interviews as the data collection method in qualitative research involves a systematic and structured process to gather in-depth information from participants. Below is an elaboration on the interview procedure, including considerations for when and how the interviews will be conducted. Prior to the interview, the participants will be provided with detailed information about the research purpose, procedures, and potential use of the data. Obtain informed consent, ensuring that participants are willing to share their experiences and perspectives (Hesse-Biber, 2014).

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A semi-structured interview guide was developed which includes open-ended questions related to the benefits and challenges of sustainable practices at the companies. The guide should be flexible to allow for the exploration of unexpected insights. A pilot interview was conducted with a small subset of participants to test the interview guide and identify any potential issues. This helps refine the questions and ensures clarity and relevance (Creswell & Creswell, 2017).

Besides, interview schedules were coordinated with participants, considering factors such as time zones, work shifts, and availability. Suitable platforms were chosen for interviews, such as face-to-face, video conferencing, or telephone calls (Bloor et al, 2001). the interviews were recorded with the participants' consent (Gibbs, 2018).

Furthermore, probing techniques was employed during interviews to encourage participants to provide detailed and nuanced responses. Follow-up questions are based on participants' responses to explore emerging themes or seek clarification (Seidman, 2013). Detailed field notes were taken during and after each interview to document non-verbal cues, contextual information, and the researcher's reflections.

Data saturation was assessed continuously throughout the interview process. Data saturation occurs when no new information or themes emerge from successive interviews, indicating that a comprehensive understanding has been achieved (Guest et al., 2006). In addition, the recorded interview was transcribed verbatim. Transcription is essential for the subsequent analysis phase, allowing for a detailed examination of participants' responses (Flick, 2018).

Besides, interview data was organized and managed systematically, using codes or labels to identify key themes, patterns, and noteworthy information to ensure data security and confidentiality (Miles et al., 2014).

3.4 Data Analysis

After completing the interviews, data analysis was done. It involves identifying patterns, themes, and insights within the collected data. Various qualitative analysis methods, such as thematic analysis, can be employed.

The timing of the interview was planned strategically, taking into account the participants' availability, the project timeline, and any external factors that may impact scheduling. The interview schedule was regularly reviewed and adjusted to accommodate unforeseen challenges and ensure a comprehensive data collection process.

3.4.1 Thematic Analysis Process

The thematic analysis process involved several steps:

1. **Familiarization**: The first step involved immersing oneself in the data by reading and re-reading the interview transcripts and field notes. This helped the researcher become thoroughly familiar with the data.
2. **Coding**: The next step was to generate initial codes from the data. This involved identifying and labelling specific segments of data that were relevant to the research questions. Codes were used to organize data into meaningful groups.
3. **Generating Themes**: After coding, the researcher searched for themes among the codes. Themes are broader patterns of meaning that capture significant aspects of the data. The researcher reviewed the codes and identified recurring themes that were relevant to the research questions.

4. **Reviewing Themes**: The identified themes were then reviewed and refined. This involved checking whether the themes accurately represented the data and were distinct from each other. The researcher also ensured that the themes were coherent and meaningful.
5. **Defining and Naming Themes**: In this step, the researcher defined and named each theme. This involved articulating what each theme was about and what aspects of the data it captured. Clear definitions and names were provided for each theme.
6. **Writing the Report**: The final step involved writing the report, where the themes were presented and discussed in relation to the research questions. This included providing detailed descriptions and examples from the data to illustrate each theme.

3.4.2 Justification of Methodology

The qualitative research methodology was chosen for several reasons. First, it allowed for an in-depth exploration of complex phenomena, such as sustainable practices in the oil and gas industry, which cannot be fully captured through quantitative methods. Second, qualitative methods are well-suited for understanding the perspectives and experiences of individuals, which was essential for this study's objectives. Finally, the use of semi-structured interviews enabled the researcher to gather rich, detailed data that could provide a comprehensive understanding of the research topic.

3.5 Ethical Considerations

Ethical considerations were strictly adhered to throughout the research process. Informed consent was obtained from all participants, ensuring that they were fully aware of the research purpose, procedures, and potential use of the data. Participants were assured of their anonymity and the confidentiality of their responses. The study received ethical clearance from the relevant institutional review board, and all ethical guidelines were followed to ensure the integrity of the research process (APA, 2017).

3.6 Data Presentation

The findings from the thematic analysis was presented in a detailed and structured manner in the subsequent chapters. Each theme was discussed in relation to the research questions, with supporting quotes and examples from the data. Tables and figures will be used where appropriate to illustrate key findings and enhance the clarity of the presentation.

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3.7 Conclusion

This chapter outlined the research design, data collection methods, data analysis techniques, and ethical considerations for the study. The use of a qualitative research methodology, specifically semi-structured interviews and thematic analysis, was justified based on the research objectives and the need for in-depth exploration of sustainable practices in the oil and gas industry. The next chapter will present the results of the study, highlighting the key themes identified through the data analysis process.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This section presents the findings of the research via the interviews conducted with 13 people who worked in different oil and gas companies in Libya. The results analysis presented in this chapter uses the thematic method. Qualitative analysis is applied to analyse the interview results. There is a total of phases of the thematic analysis. Each phase of the theme will be explained in detail. The next section shows the phase 1 finding and discussion using thematic analysis.

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4.2 The Findings

The qualitative results and analysis involve the interview data with 13 employees of the Mellitah Oil Company, Waha Oil Company, Zallaf Company, National Oil Company, Sirt Oil Company, and Arabian Gulf Oil Company (AGOCO) in Libya. The interview process was conducted online. Various positions of the employees, names, years of experience, and ages are recorded in the interview form.

4.2.1 Participants' profiles

This section presents the participants' profiles who participated in the interviews. The participants' names, job titles, years of experience, and roles in the companies are recorded in Table 4.1.

Table 4.1: Participants' information

ID	Positions	Company Name	Years in service
R1	Superintendent of Technical Affair	Arabian Gulf Oil Company (AGOCO)	30
R2	HSE Coordinator (HQ)	Melltah Oil Company	18
R3	HSEQ Coordinator	Mellitah Oil Company	20
R4	Senior Manager	Mellitah Oil Company	20
R5	Senior Consultant	Arabian Gulf Oil Company (AGOCO)	20
R6	Operation Manager	Zallaf Company	25
R7	Inspection Superintendent	National Oil Company	22
R8	Electrical Engineer	Sirt Oil Company	23
R9	Senior Consultant	Sirt Oil Company	20
R10	Coordinator	Arabian Gulf Oil Company (AGOCO)	38
R11	Project Manager	National Oil Company	18
R12	HSE Engineer	Arabian Gulf Oil Company (AGOCO)	18
R13	Corrosion Supervisor	Arabian Gulf Oil Company (AGOCO)	24

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4.2.2 Demographic

a) Gender

Most of the participants were males. They all have working experiences more than 10 years. Some of them came from different oil and gas companies, but they had the same thinking when came to the interview. The results showed that there was no female in the survey. Perhaps there are females working in the oil and gas companies, but the quantity is less. Apart from that, most of the males work as high position and in charge on specific duties. Quite a number of them worked as manager levels.

b) Age

Regarding the age, most of them not young. Majority of them having age more than 35 years old. Some of them reaching the retire age. They seem like the company and retain their position. Their working experiences were very high, typically averaging more than 10 years of working experience.

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4.3 Theme

There are four themes proposed and the results of thematic of the analysis are summarized in Table 4.2.

Table 4.2: Thematic analysis on the theme

Theme	Description	Evidence
Environmental, Social, and Economic Impact	Influence of environmental, social, and economic factors on the operations of oil companies. Participants highlighted the importance of market demand, environmental regulations, and social support.	R1: "The business depends on the economic condition of the country and the world". R2: "The supply of oil depends on market demands and social factors". R3: "Environmental regulations and societal expectations shape how we conduct our business".

Sustainable Practices Implemented in Operation	Current sustainable practices adopted by the companies, including energy-efficient technologies, waste reduction programs, and continuous improvement strategies.	R8: "My duties are only relevant if there is continuous business in the company". R9: "We need to keep upgrading our technology and training our employees to maintain sustainability". R11: "We have implemented energy-efficient technologies and waste reduction programs".
Main Challenges in Implementing Sustainable Practices	Primary obstacles faced by companies in adopting sustainable practices, such as technological challenges, manpower skills, regulatory changes, and resistance to change.	R8: "Technological challenges and manpower skills are significant obstacles". R9: "My job faces a lot of challenges related to sustainability because the company tries to meet the goals and visions set by the management". R12: "Regulatory changes and geopolitical issues add layers of complexity to our sustainability efforts."
Benefits Gained from Implementing Sustainable Practices	Advantages and positive outcomes of sustainable practices for the companies, including long-term profitability, technological advancements, job creation, and improved corporate image.	R11: "The organization gains long-term profits and technological advancements". R12: "Implementing sustainability will help to gain profits and hence moving the company into a new era of competition". R13: "No doubt that implementing sustainable practices will bring positive impacts to the business. This can provide jobs for many people".

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Table 4.3 shows the interviewed of 13 people who work in the Gulf Oil company in Libya related to the four themes proposed. Note that these four themes are extracted from the research objectives.

Table 4.3: Thematic analysis each theme

Theme	**Meaning of the theme**	**Subtheme**	**Evidences**
1	Assess the environmental, social, and economic impact in the operation	interviewees contribute about the environmental, social, and economic impact in operation	**R1:** **-** I am agreed with the environment, social, and economic that brings impact to the organization. The business depends on the economic of the country and also on the world. **R2:** - Certainly, the supply of oil will be depending on the market demands and not only in the social. I personally agreed with the factors of economic, environment, as well as the social that affects the operation of the organization.
2	Sustainable practices implemented in operation	Interviewees contribute to the practices of operation with sustainability	**R3:** - My duties will only available if there is a sustainable or continues of business in the company. **R4:** - I had been trained to keep in mind on the sustainable business. Even though the oil company has long terms business and sustainable, from time to time the

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			company has to practice by improving the technology. This way, it helps to sustain the business. **R5:** - I personally believed that the company needs to practice or train the employees to have sustainable operations in the company. **R6:** - Although I am an operational manager, but I need my employees remember on sustainable operation and business. Only with sustainable operation and management, the business will be sustainable. **R7:** - Although my duties as inspection, I still believed that economic, environment, and social have great impact to the sustainable business operation in the Gulf Oil company.
3	The main challenges faced in implementing sustainable practices	The interviewees contribute the answers of the main challenges faced by the organization.	**R8:** **-** There were many challenges such as technologies challenges and manpower challenges when practicing the sustainability. **R9:** - My jobs faced a lot of challenges related to the sustainability. This is because the company

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			tries to meet the goals and visions. **R10:** - With the challenges, it helps the company compete with other in business and hence sustain the business.
4	Benefits gained in implementing sustainable practices	Interviewees provides the effective communication	**R11:** - I believed that the organization not only gained the profits in long-term business but also gain the technology used in the oil company. **R12:** - Implementing the sustainability will help to gain the profits and hence moving the company into new era or competition. **R13:** - No doubt that implementing the sustainable practice will bring positive impact to the business. This can provide jobs for many people.

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4.4 Analysis of interview Data

Participants generally agreed that environmental, social, and economic conditions significantly affect their business operations. R1, "The business depends on the economic condition of the country and the world". Similarly, R2 emphasized the interplay between market demand and operational output, stating, "The supply of oil depends on market demands and social factors".

R3 added that environmental considerations are integral to their operations, mentioning that "Environmental regulations and societal expectations shape how we conduct our business". This sentiment was echoed by R4 who stated, "We must balance our operations with environmental protection to ensure long-term sustainability".

Interestingly, while most participants acknowledged the significant impact of economic conditions, some, like R5, emphasized the resilience of the oil and gas sector. He said, "Despite economic fluctuations, the demand for oil and gas remains relatively stable, making our operations less vulnerable compared to other industries".

However, there were differing opinions regarding the social impact. For instance, R6 highlighted the positive aspects, stating, "Our operations provide numerous job opportunities and contribute to local economies". In contrast, R7 pointed out potential negatives, noting, "There are concerns about the environmental footprint and health impacts on nearby communities".

Sustainable Practices Implemented in Operation

Sustainable practices were a major focus for the respondents, who highlighted various initiatives undertaken by their companies. R8 stated, "My duties are only relevant if there is continuous business in the company". This underscores the direct link between sustainability and job security. R9 stressed the importance of continuous improvement, saying, "We need to keep upgrading our technology and training our employees to maintain sustainability".

This was supported by R10, who emphasized the need for a cultural shift towards sustainability, "It's crucial that we train our employees to prioritize sustainable practices in all aspects of their work".

Several respondents discussed specific sustainable practices. R11 mentioned, "We have implemented energy-efficient technologies and waste reduction programs". R12 added, "Our inspection protocols now include sustainability checks to ensure we are meeting environmental standards".

There were, however, some contradictions. While most participants spoke positively about their companies' sustainable practices, R13 noted, "There is still a lot of room for improvement. Not all departments are fully committed to sustainability yet".

Main Challenges Faced in Implementing Sustainable Practices

Technological and manpower challenges were frequently mentioned as obstacles to implementing sustainable practices. R8 pointed out, "Technological challenges and manpower skills are significant obstacles." He elaborated that "Upgrading to newer, more efficient technologies requires substantial investment and skilled personnel, which are not always available".

R9 highlighted the complexity of these challenges, stating, "My job faces a lot of challenges related to sustainability. This is because the company tries to meet the goals and visions set by the management, which often require new skills and technologies". He also mentioned the resistance to change among some employees, "There's always resistance when introducing new practices, especially from those who are used to the old ways".

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R10 observed that overcoming these challenges is crucial for maintaining competitiveness, "With the challenges, it helps the company compete with others in business and hence sustain the business". He also noted that addressing these challenges requires a strategic approach, "We need a comprehensive strategy that includes training, investment in new technologies, and continuous monitoring".

Interestingly, some participants felt that external factors posed significant challenges. R12 mentioned, "Regulatory changes and geopolitical issues add layers of complexity to our sustainability efforts". This view was supported by R13, who added, "Navigating these external factors requires flexibility and adaptability from the company".

Benefits Gained in Implementing Sustainable Practices

Several participants noted long-term profitability and technological advancements as key benefits of implementing sustainable practices. R11 Oil and Gas remarked, "The organization gains long-term profits and technological advancements". He elaborated that "Sustainability practices lead to more efficient operations and reduced costs in the long run".

R12 and R13 highlighted the positive impact on job creation and company growth. R12 stated, "Implementing sustainability will help to gain profits and hence moving the company into a new era or competition". R13 added, "No doubt that implementing sustainable practices will bring positive impacts to the business. This can provide jobs for many people".

There were also discussions about the broader societal benefits. R4 mentioned, "Sustainable practices enhance our corporate image and improve relationships with stakeholders". This view was echoed by R3, who noted, "Our commitment to sustainability helps build trust with the communities we operate in".

However, not all participants were equally optimistic. R2 pointed out, "While there are benefits, we also need to be realistic about the costs and challenges involved". He emphasized the need for a balanced approach, "We must weigh the benefits against the costs and ensure that our sustainability initiatives are economically viable".

Table 4.4: Summary of Research Objectives and Corresponding Results

Objective	Results
Objective 1: Assess the environmental, social, and economic impact on the operations of oil companies in Libya.	Participants generally agreed that environmental, social, and economic conditions significantly affect their business operations. - Most participants acknowledged that economic factors, such as market demand and operational output, are crucial in determining the success of oil and gas companies. - The resilience of the oil and gas sector, despite economic fluctuations, was highlighted, emphasizing its stability compared to other industries.
Objective 2: Identify sustainable practices implemented by oil companies in Libya.	Participants emphasized the importance of implementing sustainable practices, including energy-efficient technologies and waste reduction programs. - Continuous improvement and the need for employee training were recognized as essential to maintaining sustainability. - However, some participants noted that

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	not all departments are fully committed to sustainability, indicating room for improvement.
Objective 3: Investigate the main challenges faced in implementing sustainable practices.	Technological challenges and the need for skilled personnel were frequently mentioned as significant obstacles. - Resistance to change and external factors such as regulatory changes and geopolitical issues were also identified as challenges. - Participants stressed the need for a comprehensive strategy, including training, investment in new technologies, and continuous monitoring, to overcome these challenges.

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4.5 Discussion and Comparison with Previous Studies

Table 4.5: Comparison of Findings with Previous Studies

Study	Findings	Comparison with Current Study
Ali (2018)	Emphasized the importance of sustainability for long-term business success and its positive impact on financial performance and corporate reputation.	The current study aligns with Ali's findings, as participants acknowledged the long-term benefits of sustainability, including technological advancements and profitability.
Yousif Abdelbagi (2015)	Highlighted challenges in adopting sustainable practices, particularly the need for significant investment in new technologies and skilled personnel.	The challenges identified by participants in the current study echo those found by Abdelbagi, particularly regarding technological and manpower challenges.
Gupta & Grossmann (2017)	Discussed the economic advantages of sustainability in the oil and gas industry, including operational efficiencies and cost savings.	The current study supports Gupta & Grossmann's conclusions, with participants noting the long-term profitability and technological advancements resulting from sustainable practices.

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The findings from this study align with broader industry trends and previous studies on sustainability in the oil and gas sector. The emphasis on sustainable practices corresponds with Ali (2018), who noted the importance of sustainability for long-term business success. Ali's study highlighted that companies committed to sustainability tend to have better financial performance and corporate reputation, which aligns with the respondents' views on the benefits of sustainable practices.

The challenges faced in implementing sustainable practices, such as technological and manpower issues, echo the findings of Yousif Abdelbagi (2015), who discussed the pressures on sustainability in similar contexts. Abdelbagi's research highlighted the significant investment required for new technologies and the need for skilled personnel, which were also mentioned by the participants in this study.

The resistance to change noted by one of the respondents, R 9 is a common theme in organizational change literature, emphasizing the need for effective change management strategies.

Furthermore, the benefits of sustainable practices, including long-term profitability and technological advancement, support the conclusions of Gupta & Grossmann (2017), who highlighted the economic advantages of sustainability in the industry. Gupta & Grossmann's study demonstrated that sustainability practices lead to operational efficiencies and cost savings, which were also identified by the respondents.

Interestingly, the emphasis on external factors such as regulatory changes and geopolitical issues aligns with the findings of Tomlinson (2017), who explored the impact of external pressures on sustainability efforts in the oil and gas industry. Tomlinson's research suggested that companies need to be adaptable and flexible to navigate these challenges effectively.

The differing opinions on the social impact of operations, with some highlighting positive aspects and others pointing out potential negatives, reflect the complex nature of the industry. This aligns with the findings of Spence (2010), who discussed the dual nature of corporate social responsibility in the oil and gas sector. Spence noted that while companies contribute to local economies and provide jobs, they also face significant scrutiny over their environmental footprint and health impacts on communities.

Overall, the findings from this study are consistent with existing literature on sustainability in the oil and gas industry. The emphasis on sustainable practices as a cornerstone of long-term business success is a recurring theme in studies such as those by Ali (2018) and Gupta & Grossmann (2017). Additionally, the challenges identified in this study, particularly related to technology and workforce skills, mirror the pressures discussed by Yousif Abdelbagi (2015).

4.6 Summary

The analysis of qualitative data highlights a strong consensus among participants on the importance of sustainability in the Libyan oil and gas industry. Despite facing significant challenges, participants recognize the long-term benefits, such as technological advancements and enhanced profitability, as key motivators for maintaining sustainable practices. The commitment to sustainability is evident across the industry, reflecting global trends and contributing positively to environmental, social, and economic outcomes.

Participants, many with over 10 years of experience, emphasized the significance of sustainable practices in their operations, particularly in technology upgrades and resource management. The majority expressed that these practices not only secure their jobs but also help the companies remain competitive. Theme 2, which focuses on the implementation of sustainable practices, garnered the most attention, with several participants acknowledging the benefits of such practices in retaining skilled employees and ensuring long-term operational success.

Interestingly, while external factors like environmental, social, and economic conditions are recognized, participants noted that the demand for oil and gas remains constant, irrespective of these changes. The stability and reliability of oil and gas as energy sources were underscored, particularly when compared to renewable alternatives like solar and wind, which were perceived as less consistent. Overall, the study suggests that sustainable practices are crucial for the continued success and competitiveness of the oil and gas sector in Libya.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, there are four themes proposed in the thematic analysis of the results. The four themes are address the four research questions and research objectives. The interview results had showed that majority of the participants have positive opinions and agreed that environment, social, and economy have great impact on the oil and gas companies' operation in Libya. The environment is about the location of the oil companies near to the oil plant. If the company is near to the oil plant, it helps the company reduces the transportation cost and hence fast processing the oil extracted from the oil plant. If the environment of the oil and gas companies are very far from the oil plant, this might involve the cost of delivery the oil or gas for the processing and hence this may cause slow refinery of oil and gas. The result is unable meet the market demands.

For the social, it is about the citizen impact on the operation of oil companies. The society may support the operation of the oil companies because this will bring them jobs and income. There is no objection on the social to the operation of oil and gas companies, but the oil companies have to think of environmental effects such as pollution. With proper control the burning of waste, the environmental pollution will be well controlled.

In terms of economy, the oil and gas companies can contribute GDP (Gross Domestic Product) to the country. Hence this indirectly helping to grow the economic. The sustainability of the oil and gas companies will lead to more job opportunities open to the public.

To answer the second research question, the oil and gas companies have successfully implemented the sustainable practice. The evidences can see all the participants have working experiences more than 10 years. If the oil companies can sustain its business, this means the jobs for the employees are secure. Because of that, most of the employees will not leave the company. Plus, the company has given good benefits to the employees, this even hold the position of the employees longer. As a matter of fact, there is no doubt the organization is having problems on the sustainability implementation. The oil companies also upgrade its technology and constantly train the employees to meet the sustainability of the business.

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Throughout the interview, the participants also highlight there were some challenges when they work in the oil and gas companies. They believed that the use of technology in their works is challenging and also the manpower skills also challenging. The technology is a new technology used in processing the oil and also new technology to handle the communication as well as the administration. Some technologies need to learn especially the software. Same thing also happens to the hardware like machine. The employees have to learn how to operate the new machines in new technology.

For the challenge, there is no big issue because the company will provide training. The challenge faced is to address research question number 3.

To answer the last question in the research question, the interview results showed that the sustainability practice provides good benefits to the oil companies in Libya. One of the benefits are low turnover rate. As can see, most of the participants work more than 10 year. This showed that they are loyal to the oil and gas companies in Libya. The next benefits of sustainability to the oil and gas companies in Libya is to help the company earn stable income via continuous upgrade. This is needed to compete with the competitors in the market.

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5.2 Recommendations

The research can be improved by adding the quantitative analysis instead of qualitative analysis using thematic. Apart from that, the research also can add another research part, which is called data intervention and see how the research outcomes can help the oil and gas companies in Libya to improve its sustainability. Data intervention can be divided into two parts called data intervention cycle 1 and data intervention cycle 2. A comparison of data intervention cycle 1 and cycle 2 can be conducted after second time of interviews. The next recommendation is to apply the statistical tools to analyse the analyse the results. This may turn the research into quantitative instead of qualitative. A mix method of research (qualitative plus quantitative) can be used to analyse the results.

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APPENDIX A: INTERVIEW TOOLS

Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)					
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? What kind of effect? Is it a positive or negative effect? How do their operations affect the environment? Can you explain in more detail?
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)
5	Is there any effort to minimize those negative impacts? What strategy/approach does your organization use to reduce those negative impacts?
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations?

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	Could you list the rules or standards that you are familiar with?
7	To what extent do you think Oil and Gas companies in Libya meet those standards? (If not meeting the standard) Why are such companies failing to meet those standards? They just started recently and will take time to meet these standards
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?

***Sustainable practices** = approaches and strategies designed to reduce the industry's ecological footprint and foster ecological practices. These practices prioritize resource utilization efficiency, waste reduction, emission mitigation, and the integration of renewable energy sources.

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APPENDIX B: RESPONDENTS SURVEY RESULTS

Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (30Year)	Abdalsalam Nagem	Position S. Cons	AGOCO	Male	55
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? Environmental risks.. associated with the impact of the production activities ,workover and drilling operations, represented in oil spills and water lakes at gathering centers , toxic gases emissions and NORM in some cases What kind of effect? Is it a positive or negative effect? these EFFECTS include everything from the negative health effects to the environment. How do their operations affect the environment? Can you explain in more detail? AGOCO is operating and managing most of oil production stages , exploration, drilling, production, transportation, refinery, crude storing at oil terminals,water spills associated with residuals of oils due to the unproper separations practices has a very negative impact on the environment, gas emitions from the flares which contains a high concentration of toxic gasws such as H2S gas in addition to the danger of the presence of the radioactive materials and NORM contaminated slugs of oil or materials.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) Positive Social Impacts: • Job Creation and Economic Benefits: • Energy Security: • Technological Advancements Negative Social Impacts: • Environmental Pollution: O&G exploration

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	• Climate Change • Health Impacts
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) • Government Revenue: O&G companies pay taxes and royalties to governments, which can be used to fund public services, infrastructure development, and social programs.
5	Is there any effort to minimize those negative impacts? There areefforts from civil societies, especially from the towns surrounding the oil fields, in cooperation with the company to develop solutions to these ngative impacts What strategy/approach does your organization use to reduce those negative impacts? The main strategies of AGOCO risk management are ..(risk predicting, risk impact analysis , risk measuring by knowing the associated losses and being prepared to face it, choosing the best method to deal with risk, how to avoid and eliminate the risk in the future projects.
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? AGOCO established loss prevention manual includes the applicable standards and associated procedure documents, AGOCO manual contains 173 documents cover all the standard safety ,environment ,maintenance and operating procedures Could you list the rules or standards that you are familiar with? **Environmental Regulations:** • National and International Regulations • Environmental Impact Assessments (EIAs • Industry Standards and Best Practices, (API,ISO): **Sustainability Reporting and Initiatives:** • Global Reporting Initiative (GRI • Sustainability Accounting Standards Board (SASB • Industry-Specific Initiatives

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7	To what extent do you think Oil and Gas companies in Libya meet those standards? It is difficult to say with certainty what the oil companies or the national oil corporation are taking, but i believe that this issue is a priority for the companies and they are working to achieve the highest levels of sustainability standards/ (If not meeting the standard) Why are such companies failing to meet those standards? It could be referred to the sufficient knowledge or capabilities
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year) 23 years	Saleh Abdussalam Ali	HSE Manager	Harouge Oil Operations	M	48 y
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? HSE and firefighting responsible, with over 23 years of oil and gas industry experience in fire, safety and environment management. Extensive operational experience leading and commanding response at emergency cases involving large and complex emergency incidents and situations. Establish and develop appropriate HSE management for the organization in accordance with the local and international standards. Establishment, development, implementation and rollout of new organization's HSE policies and procedures. Provide direction, leadership, data interpretation, and technical assistance to all personnel in regards to HSE where required. To keep track of required safety policies, procedures, strategies are in place. Develop a strong safety culture within the workforce
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? Yes What kind of effect? Is it a positive or negative effect? In most cases, is negative effect How do their operations affect the environment? Can you explain in more detail? Oil and gas operations could release many tons of harmful pollutants into the air and harmful chemicals into the water due to discharge the produced water and oil in large pits and lagouns for years. and contaminate the soil due to oil spills and leaks

3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) No, the majority of Oil and Gas fields are located kilometres far than the cities, towns and away from where people live
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) Yes, Projects and budgets (in millions) are allocated to environmental rehabilitation due to legal and moral commitment
5	Is there any effort to minimize those negative impacts? Definitely, there is What strategy/approach does your organization use to reduce those negative impacts? The strategy is to treat the existing contamination and upgrade the production facilities and develop the processes and activities to minimize or reduce the pollution and contamination
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Yes Could you list the rules or standards that you are familiar with? Its local rules established by environmental governance association of Libya and Ministry of Environment
7	To what extent do you think Oil and Gas companies in Libya meet those standards? comparatively (If not meeting the standard) Why are such companies failing to meet those standards? They just started recently and will take time to meet these standards
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices?

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	Budget and know-how What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges? Not yet
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? yes
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices? for time being, NO
13	How does your company balance between short-term profitability and long-term sustainability goals? our company is an operator to the owners (NOC) and this is the responsibility of the owners to balance
14	Do you have anything to add? NO

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)	Abdo Balgon Zeltawi 30	Superintendent of Technical affairs	Arabian Gulf oil Company	Male	56
Interview Information					
Time 11:30	Date 11/6/2019	Location Benghazi	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? it has the greatest impact on the environment. What kind of effect? Is it a positive or negative effect? Natural negative effect How do their operations affect the environment? Can you explain in more detail?
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)
5	Is there any effort to minimize those negative impacts? What strategy/approach does your organization use to reduce those negative impacts?
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Could you list the rules or standards that you are familiar with?
7	To what extent do you think Oil and Gas companies in Libya meet those standards? (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?

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1. Among my duties as a technical support superintendent is coordinating the work of the department's coordinators, technical inspection, corrosion, process engineering, and project follow-up. Ensuring the integrity of work implementation and the desired quality is meet .

2. It has the greatest impact on the environment .

natural negative effect.

2. Oil production processes produce pollutants such as associated water and gases associated with hydrogen sulfide or sulfur dioxide, and thermal warming as a result of operation.

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3 Regarding employment, the impact is small if prevention methods are followed, but there are social impacts that may be positive if development is supported and sustained in production areas.

4. As for the economy, it is a rentier economy that depends entirely on oil and is affected negatively and positively by the efficiency of oil operations

5. There are modest but not serious efforts to reduce negative impacts by investing in the environment and making it a priority

6. Libya is aware of the latest developments in terms of environmental laws and environmental impact, but the implementation process and considering commitment as an investment and not an expense and a burden is considered something else.

7. Weak percentage of commitment. Weak awareness, lack of seriousness, and considering production a priority are important factors in weak implementation

8. Commitment not to use and produce environmentally harmful materials. Not to use

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carcinogenic materials. Produce automobile gasoline in accordance with Euro 5 specifications.

9.The biggest challenge is the awareness among decision makers that adopting a healthy environment is an investment and not an expense and a burden on companies.

10. The biggest challenge is the obsolescence of surface equipment, lack of resources, lack of spare parts, lack of a real partner, and the absence of the employee-owner concept and a supplay chain.

11. Certainly, all problems will be solved by adopting an integrated management system, adopting the approach of first class companies, reducing the time and effort spent on ineffective production, and reducing the costs of failure and unprogrammed stoppages.

12. The company finally adopted the concept of KBI, and this opened a unified means of communication

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between various levels of management to monitor performance based on real, influential indicators.

13. Unfortunately, current administrations and the prevailing way of thinking are fascinated by short-term profitability at the expense of long-term sustainability

14. Complete quality management and providing a sustainable climate requires support from the top of the pyramid in the organization. Then the idea is conveyed to every individual in the company so that he becomes certain within himself that he is the owner of the organization.

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)	Zeid Ragas	Head HSE Engineer	AGOCO	M	45
Interview Information					
Time	Date	Location	Duration	Remarks	
10	11-8-2024	Benghazi			

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? What kind of effect? Is it a positive or negative effect? How do their operations affect the environment? Can you explain in more detail?
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)
5	Is there any effort to minimize those negative impacts? What strategy/approach does your organization use to reduce those negative impacts?
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Could you list the rules or standards that you are familiar with?
7	To what extent do you think Oil and Gas companies in Libya meet those standards? (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?

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⑧ I can't compaire

8) Note founde

9) fristly oil pets r seecandly emmissions
No efferts spended yet.

10 Many difficualts in opratiam + equipmet
and facilities are not upgraded.

11 not clear

12 not noticed yet

13 No blamce

14 NO

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Interview Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)	A M Mahdi 38 years	S. Consultant	AGOCO	Male	59
Interview Information					
Time 17:00	Date 11 June 24	Location BN	Duration one Hr	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
	I work as a senior consultant in the Technical Affairs Department of the General Department of Engineering and Civil Construction at the Arabian Gulf Oil Company since 1988 and have graduated as Ph.D. Environmental Engineering from USM since 2015. In this role, I provide environmental (oil waste) management technical expertise to AGOCO in E&P Businesses to ensure that waste is effectively managed from cradle to grave as well as defining waste management standards, strategies and plans plus monitor and drive compliance with international conventions & treaties, in-country legislations and company specific HSE standards.
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment?
	The Libyan environment was affected by the operations of the oil and gas industry, which contributed to the pollution of various elements of the environment (water, air, and soil), through the drilling of oil wells, whether exploratory or productive, and the water and mud they left behind, acids and various chemicals that could leak or mix with elements of the environment, causing Pollution, as many liquid or solid materials are added during the drilling process, and these additions lead to pollution of groundwater in particular, surface water, and lands adjacent to the drilling area. In addition to burning natural gas associated with oil. Pollution resulting from the oil industry in Libya constitutes the most prominent pollutant of the living environment and the most capable of causing disruption to the ecosystem and its living and non-living components due to the severe damage caused by the production processes of oil projects to the local population.
	What kind of effect? Is it a positive or negative effect?
	Just 1 gallon of oil can contaminate 1 million gallons of water. Oil pollution can have a devastating effect on the water environment, it spreads over the surface in a thin layer that stops oxygen getting to the plants and animals that live in the water. Oil spills contaminate soil and water and may cause devastating explosions and fires. The government agency and industry are developing standards, regulations, and procedures to reduce the potential for accidents and spills and to clean up spills when they occur.

	How do their operations affect the environment? Can you explain in more detail?
	Oil exploration, extraction, transportation, refining, and use have significant and multifaceted impacts on the environment. These impacts span various stages of the oil lifecycle and affect air, water, soil, and ecosystems. Here's a detailed explanation of these effects: **Exploration and Drilling** 1. **Habitat Disruption:** o **Land Use:** Oil exploration often requires large tracts of land, leading to deforestation, destruction of habitats, and displacement of wildlife. o **Seismic Surveys:** These surveys use explosions or sound waves to map underground oil deposits, which can disrupt marine and terrestrial wildlife. 2. **Pollution:** o **Chemical Spills:** Drilling fluids and other chemicals can leak into the soil and water, contaminating local environments. o **Air Emissions:** Drilling operations emit pollutants such as methane, volatile organic compounds (VOCs), and nitrogen oxides (NOx), contributing to air pollution and greenhouse gas emissions. **Extraction** 1. **Water Contamination:** o **Produced Water:** Extraction brings up water containing hydrocarbons, salts, and heavy metals, which can contaminate surface and groundwater if not properly managed. o **Oil Spills:** Accidental releases of oil during extraction can have devastating effects on marine and terrestrial ecosystems. 2. **Soil and Groundwater Contamination:** o **Leaks and Spills:** Equipment failures or human error can lead to oil leaks, contaminating soil and potentially seeping into groundwater supplies. **Transportation** 1. **Oil Spills:** o **Pipeline Leaks:** Pipelines can rupture, leading to large-scale oil spills. These incidents can devastate local ecosystems and require extensive clean-up efforts. o **Tanker Spills:** Marine oil transportation poses the risk of tanker accidents, leading to spills that can affect vast areas of ocean and coastlines. 2. **Air and Water Pollution:** o **Emissions:** Transporting oil, especially via ships, contributes to air pollution through the release of sulfur oxides (SOx), NOx, and particulate matter. o **Ballast Water:** Ships' ballast water can introduce invasive species to new environments, disrupting local ecosystems.

Refining

1. **Air Pollution:**
    - **Emissions:** Refineries release a range of pollutants, including sulfur dioxide (SO2), NOx, VOCs, and particulate matter, which can harm human health and contribute to acid rain and smog.
    - **Greenhouse Gases:** Refineries are significant sources of CO2 and other greenhouse gases, contributing to climate change.
2. **Water Pollution:**
    - **Wastewater:** Refining processes produce wastewater that contains toxic substances, which can pollute rivers, lakes, and oceans if not adequately treated.

Use

1. **Air Pollution:**
    - **Combustion Emissions:** Burning oil products in vehicles, power plants, and industry releases CO2, NOx, SOx, carbon monoxide (CO), and particulate matter, leading to air pollution and health problems.
    - **Climate Change:** CO2 emissions from burning fossil fuels are a major driver of global warming and climate change.
2. **Oil Waste:**
    - **Used Oil:** Improper disposal of used oil can contaminate soil and water. Recycling and proper disposal are essential to mitigate this impact.

Long-Term Environmental and Health Impacts

1. **Ecosystem Damage:**
    - **Biodiversity Loss:** Oil spills and pollution can lead to long-term damage to ecosystems, resulting in loss of biodiversity and disruption of food chains.
    - **Habitat Destruction:** Continuous oil operations can transform landscapes, leading to the loss of natural habitats.
2. **Human Health:**
    - **Exposure to Pollutants:** Communities near oil operations can suffer from health issues due to exposure to air and water pollutants, including respiratory problems, cardiovascular diseases, and cancer.

Mitigation and Regulation

To mitigate these impacts, stringent regulations and best practices are essential:

- **Regulations:** Governments and international bodies enforce regulations on oil operations to minimize environmental damage, including spill response protocols, emission standards, and waste management practices.
- **Technological Advances:** Innovations such as improved drilling techniques, better leak detection systems, and cleaner refining processes help reduce the environmental footprint of oil operations.
- **Alternative Energy:** Transitioning to renewable energy sources can significantly reduce reliance on oil and its associated environmental impacts.

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	Understanding and addressing the environmental impacts of oil and their operations is crucial for protecting ecosystems and public health, as well as for mitigating climate change.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)
	See answer no. 2
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)
	Yes, the operations of oil and gas companies have significant impacts on the economy, both positive and negative. These impacts can affect costs, revenues, employment, and overall economic stability. Below is an overview of how oil and gas operations impact the economy both negatively and positively. Including jobs, job creation, taxes, royalties, and export revenues, and the negative effects of price volatility, economic uncertainty, and market turmoil. Environmental and health costs: Pollution, oil spill clean-up, and environmental damage from oil and gas operations can be costly, resulting in significant financial obligations for companies and governments. As well as increased health care costs and loss of productivity. Overall, while oil and gas operations can provide significant economic benefits, they also pose risks and challenges that need to be managed through careful planning and diversification strategies.
5	Is there any effort to minimize those negative impacts?
	In brief, **Environmental Mitigation** 1. **Regulations:** Enforcing strict environmental laws and spill response plans. 2. **Technology:** Using cleaner drilling technologies, advanced leak detection systems, and carbon capture and storage (CCS). 3. **Best Practices:** Reducing flaring, efficient waste management, and implementing Environmental Management Systems (EMS). **Economic Mitigation** 1. **Diversification:** Investing in non-oil sectors like technology and renewable energy. 2. **Stabilization Funds:** Using sovereign wealth funds to manage oil revenue and economic stability. 3. **Renewable Energy:** Oil companies investing in wind, solar, and bioenergy projects. **Community and Social Efforts** 1. **Engagement:** Involving local communities in decision-making and investing in local infrastructure. 2. **Health and Safety:** Improving occupational health and safety standards and mitigating health impacts of pollution. **International Cooperation and Standards** 1. **Global Agreements:** Complying with the Paris Agreement and IMO regulations to reduce emissions.

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	2. **Industry Standards:** Adopting ISO standards for environmental management and safety. **Financial Incentives** 1. **Carbon Pricing:** Implementing carbon taxes and cap-and-trade systems. 2. **Green Financing:** Promoting sustainable investment funds that focus on ESG criteria.
	What strategy/approach does your organization use to reduce those negative impacts?
	Organizations focuses on minimizing the negative impacts of oil and gas operations primarily through the promotion of sustainable practices and the development of advanced technologies. Here are key strategies and approaches used: Promotion of Sustainable Practices Research and Education: Sharing knowledge on sustainable practices and offering educational resources. Policy Advocacy: Supporting robust environmental regulations and industry guidelines. Technological Innovation Advanced Analytics and AI: Using AI for predictive maintenance and optimization to minimize waste and environmental footprint. Sustainable Technologies: Promoting renewable energy integration and carbon capture technologies. Collaborative Efforts Partnerships: Working with industry and academia to develop and implement sustainable solutions. Stakeholder Engagement: Encouraging community involvement and transparency in environmental reporting. Supporting Economic Transition Economic Diversification: Advising on diversification strategies and supporting renewable energy investments. Sustainable Investment: Promoting the use of ESG criteria in investment decisions.
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations?
	Yes, oil and gas companies operating in Libya need to comply with various rules and standards related to sustainability. These regulations are established by national authorities and international agreements to ensure that the environmental and social impacts of their operations are minimized. Here are some key standards and regulations: National Regulations Environmental Protection Law: Regulates emissions, waste management, and pollution control. NOC Guidelines: Health, safety, and environmental (HSE) standards set by the National Oil Corporation. Environmental Impact Assessment (EIA): Required for new projects to mitigate environmental impacts. International Standards ISO 14001: Environmental Management System. ISO 45001: Occupational Health and Safety Management.

	IFC Performance Standards: Guidelines for managing environmental and social risks. Equator Principles: Framework for assessing environmental and social risks in project financing. Global Conventions Barcelona Convention: Protects the Mediterranean marine environment. Paris Agreement: Commits to reducing greenhouse gas emissions. Industry Best Practices IOGP Standards: Best practice guidelines for environmental and social performance. Sustainable Development Goals (SDGs): Encourages alignment with UN sustainability goals.
	Could you list the rules or standards that you are familiar with?
	Certainly, here are some key rules and standards related to sustainability that oil and gas companies, including those operating in Libya, commonly need to comply with: National Regulations (Libya) - National Oil Corporation (NOC) Guidelines - Environmental Impact Assessment (EIA). ISO 14001: Environmental Management System: Provides a framework for managing environmental responsibilities and International Association of Oil & Gas Producers (IOGP) Standards Through these standards and regulations collectively help ensure that oil and gas operations are conducted responsibly, minimizing their environmental impact and promoting sustainable development.
7	To what extent do you think Oil and Gas companies in Libya meet those standards? (If not meeting the standard) Why are such companies failing to meet those standards?
	Oil and gas companies in Libya, like those in many other countries, often face challenges in meeting international standards in various aspects such as safety, environmental sustainability, and corporate governance. Here's an overview: Safety Standards: While some companies may adhere to basic safety standards, there have been instances of accidents and incidents in the Libyan oil and gas industry. Lack of proper maintenance, aging infrastructure, and sometimes inadequate safety protocols contribute to safety concerns. Environmental Standards: Compliance with environmental standards can be lacking due to various factors such as outdated technology, limited resources for environmental monitoring, and sometimes lack of enforcement of regulations. Oil spills, gas flaring, and improper disposal of waste are some common environmental issues. Corporate Governance: Transparency, accountability, and adherence to ethical standards are essential components of corporate governance. However, in some cases, there may be issues related to corruption, lack of transparency in contracts and revenue management, and political interference. Reasons for failing to meet standards:

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	Political Instability: Libya has faced political instability since the overthrow of Country Leader in 2011. Political unrest can disrupt operations, hinder investments in infrastructure, and lead to inconsistent regulatory frameworks. Security Concerns: Oil and gas facilities are often targeted during conflicts, leading to disruptions and damage to infrastructure. Security concerns make it challenging to implement and maintain proper safety and environmental standards. Lack of Investment: Limited investment in infrastructure upgrades, technology, and workforce training can result in inadequate safety measures and environmental controls. Economic challenges and uncertainty may deter companies from investing in improving standards. Regulatory Framework: Inconsistent or inadequate regulatory frameworks can lead to ambiguity and lack of enforcement. Weak governance structures may result in non-compliance without significant consequences for companies. Capacity Constraints: Libyan oil and gas companies may lack the technical expertise and resources necessary to implement and maintain international standards, particularly in remote or conflict-affected areas. Improving standards in the Libyan oil and gas industry requires a concerted effort from both companies and government bodies. It involves investing in infrastructure, implementing robust regulatory frameworks, enhancing transparency and accountability, and promoting responsible corporate practices. International cooperation and support can also play a vital role in helping Libya meet global standards in its oil and gas sector.
8	Could you tell me if any sustainable practices are implemented in the operations of your company?
	The Arabian Gulf Company has prepared an action plan that includes specific projects to improve environmental performance in conjunction with the relevant departments concerned with the study, specifying other steps that must be taken to mitigate environmental impacts, including setting a timetable to reach the stage of completely stopping burning, and establishing an environmental monitoring laboratory in the region.
	Could you explain each one in more detail?
	The company is changing its priorities using business intelligence to not only save costs but also become environmentally conscious. Although there is a research process for innovative and effective solutions to treat the water produced in oil wells so that it can be reused or treated before discharging it, and also through designing a program and projects dedicated to waste management, the positive effects are not visible and tangible to the public and are very slow.
9	In your view, what are the main challenges your company has faced when implementing sustainable practices?
	The Chairman of the Board of Directors of the National Oil Corporation discussed with the Arabian Gulf Oil Company the difficulties and obstacles

	facing the company, including settling the debts owed to it. There are also electricity problems, which are a result of the fluctuations in electrical power that the company suffered from due to high temperatures. The company was exposed to technical problems that affected oil supplies to some of its fields. As mentioned previously, these shortcomings are due to the current conflict as well as the legacy of the previous regime, which created a complex network of state-owned and heavily subsidized monopolies that had little ability to reform or improve their cost-effectiveness. As a result, Libya continues to rely on burning its primary exports to produce electricity at exorbitant costs. Addressing these problems and threats requires long periods of time and, given the seriousness of their impact, requires setting higher priorities. Fortunately, if there is sufficient political will, it is possible to address these issues even while peace in Libya remains fragile.
	What about any other challenges? Would you mind sharing more with us?
	Common barriers to change towards sustainability include: - The current management crisis in Libya and the prioritization of profit and growth over the environment and human capital. Organizational systems fall short of task management. Lack of capital to invest in new ways to design and manage operations. Increasingly unstable management and its implications, lack of adequate skills supply, cost and availability of raw materials are challenging that the technical operations team must confront. Resolving internal conflicts that can break out between employees or departments must also be addressed. It can be difficult for a company to keep up with changing legislation, customer or supply chain demand, and stakeholder pressures from investors, employees, consumers and customers.
	How does your company overcome those challenges?
	Environmental planning and resource management: applying techniques and policies to reduce the environmental impact of extraction, production, and waste disposal operations. Environmental technology and environmental performance: Using technology to reduce emissions and increase energy efficiency in production processes to reduce environmental impact.Social Responsibility and Community Participation: Supporting corporate social responsibility initiatives, investing in local communities through sustainable development programs and improving living conditions. Occupational Safety and Health: Following strict occupational safety and health standards to protect workers, communities and the environment. Technical innovation: Working to develop new technologies that reduce environmental impacts and increase the efficiency of operations. Water and energy management: Reduce water consumption and use renewable energy sources as much as possible.
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?

	Common obstacles to change towards sustainability include: - The current management crisis in Libya, prioritizing production, profit, and growth over the environment, and neglecting human capital. Organizational systems fall short of task management. Lack of capital to invest in new ways to design and manage operations. Increasingly unstable management and its implications, lack of adequate skills supply, cost and availability of critical materials pose a challenge that the technical operations team must confront. It must also be addressed to resolve internal conflicts that could erupt between employees or departments or as complaints from residents in the area increase. It can be difficult for a company to keep up with changing legislation, customer or supply chain demand and stakeholder pressures from investors, employees, consumers and customers.
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
	As for the Arabian Gulf Company, although there is a non-serious and slow research process to find innovative and effective solutions to treat the water produced in oil wells or the accompanying quantities of water discharged in the form of large basins in the soil so that it can be reused or treated before discharging it, and also through research and Studies to design programs and projects dedicated to waste management, the positive effects are considered invisible and tangible to the public due to weak decision-making in management.
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
	See and same as item No. 11
13	How does your company balance between short-term profitability and long-term sustainability goals?
	There may be a conflict between the short-term financial goal of profitability and the long-term growth goal. Businesses entering new markets will require new equipment and more employees. Finding the right balance between short-term profitability and long-term sustainability is crucial for a company. They can achieve this by focusing on sustainable practices, investing in research and development, adopting responsible supply chain management, and considering the long-term impact of their decisions. Therefore, to balance and enhance sustainability through Sustainable finance is the provision of financing for investments taking into account environmental, social and governance (ESG) considerations. Sustainable finance includes a strong green finance component that aims to support economic growth while: reducing pressures on the environment; tackling greenhouse gas emissions and tackling pollution; “Reducing waste and improving efficiency in the use of natural resources.” From this perspective, financial sustainability functions as a process that goes beyond the traditional neoclassical logic of explaining sustainability based only on the final economic value, directed towards the triple bottom line of investment activity. Nowadays, the focus is increasingly

	on socially responsible investments, which means that it is not about the importance of obtaining profit or the quantitative and intrinsic value of it, but rather about the effects that these investments can generate in terms of increasing the quality of social life or protecting the environment.
14	Do you have anything to add?
	Lack of environmental awareness and concern, lack of cultural feasibility, absence of an implementation plan, lack of intention for sustainability, lack of infrastructure, and lack of governmental and regulatory support as is the case in Libya now, are major obstacles to sustainability practices. Integrating sustainability into global business operations has also become a growing trend, with many companies realizing the tangible and intangible benefits of adopting sustainable practices. Sustainability, once viewed by many as a “luxury” or “good business,” is now recognized as a core business strategy that can drive financial performance and create long-term value through prioritize resource utilization efficiency, waste reduction, emission mitigation, and the integration of renewable energy sources.

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year) (18 years)	Wesam Alzorghani	HSE Coordinator (HQ)	MOG	Male	45
Interview Information					
Time	Date	Location	Duration	Remarks	

Mellitah Oil & Gas

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? HSE coordinator is a person whose duties are to oversee the health, safety, and environmental management for a company or facility. HSE Coordinator is responsible for monitoring site-specific health, safety and environmental operations and tasks to site staff. Maintain and update corporate safety, training and health programs, establishing objectives and training programs and checking site weekly, monthly, quarterly and annually reports. Conduct and assist in incident investigations and corrective actions as required.
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? Certainly, it affects the environment. What kind of effect? Is it a positive or negative effect? It may be affecting the water sources, the seawater and Sea creatures, the sand, the surrounding communities, and the quality of air. How do their operations affect the environment? Can you explain in more detail? The emissions that emitted in the air, the industrial wastes and hazardous wastes which generated by the operations, the pollution that may occurred such oil spills, the H2S release that affecting the health of staff.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) Any company generated emissions, industrial wastes and hazardous wastes, those will affect the health of employees and surrounding communities.
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) Yes,
5	Is there any effort to minimize those negative impacts? Definitely, It can be managed and controlled by adopting some policies, procedures and plans.

	What strategy/approach does your organization use to reduce those negative impacts? Reduce emissions as low as possible (zero flaring), control hazardous and industrial wastes by implementing waste management procedure
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Yes, there are local laws and rules, international standards, laws, protocols and conventions. Could you list the rules or standards that you are familiar with? **Libyan laws** Law 8 : Preventing Pollution of the sea with Oil Law 93 : Industrial Security and Labour Safety Law Law 5 : Protection of Pastures and Forests amended by law 14/1992 Law 3 : Protection of antiquities, museums, ancient towns, and historical buildings International : Convention on Biological Diversity, Rio de Janeiro International : Barcelona Convention 1976 - for the protection of the Mediterranean Sea Against Pollution International : African Convention on the Conservation of Nature and Natural Resources International : Agreement on transboundary cooperation with a view to preventing or limiting harmful effects for human beings, property or the environment in the event of accidents., Helsinki (Finland)
7	To what extent do you think Oil and Gas companies in Libya meet those standards? It is different from company to another. (If not meeting the standard) Why are such companies failing to meet those standards? Some implement the basic (laws and procedures) while another's implements high standard.
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Implementing effective Environmental Management Systems Reduce Emissions Workplace safety Health monitoring programs Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? Culture constrains. What about any other challenges? Would you mind sharing more with us? Mentality. How does your company overcome those challenges? By awareness and training

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10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? You would face some difficulties whenever you develop a new system, and once it is implemented, it became normal.
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? Providing suitable and continuous awareness and training at workplace to staf f has improved operational efficiency.
12	Have you noticed any improvements in operational efficiency or resource utilization because of adopting sustainable practices? For instance, Workplace safety training has improved operational efficiency, staf f knowledge and consequently reduced accidents costs and injuries compensations.
13	How does your company balance between short-term profitability and long-term sustainability goals? Developing long term objectives (4 years) are one of the main balances.
14	Do you have anything to add? Nothing

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year) 20	Misbah Attia	HSEQ Coord.	Mellitah Oil and Gas B.V	Male	38
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? My overall role and responsibility, is to create a work environment that's safe, healthy, good for the environment, high work quality. Also, ensure that effective supervision on the fellows and good communication between the up and down management level.
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? Yes What kind of effect? Is it a positive or negative effect? **Yes, Negative impact,** How do their operations affect the environment? Can you explain in more detail? **Emissions and soil contamination as well as underground water pollution. Global warming and climate change.**
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) Yes, there are several health impacts which could cause occupational illness.
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) **Yes, sure, as they play a vital role in the energy sector which is the core of the industry.**
5	Is there any effort to minimize those negative impacts? Yes, there are many organizations and authorities trying to solve these raised issues. What strategy/approach does your organization use to reduce those negative impacts? **My company is taking several measures to reduce its negative environmental impact. Reducing the gas flaring and produced water disposed rates.**
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? **There isn't a well-developed set of legal requirements specifically focused on sustainability in Libya's oil and gas sector.** Could you list the rules or standards that you are familiar with? There is none.
7	To what extent do you think Oil and Gas companies in Libya meet those standards?

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	I think, Some companies are striving to establish the principle in their operational sites. (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? No Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? Yes, Resistance to Change.
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? **Yes, Reduced Costs, improved Employee Engagement, Reduced Risk**
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices? Yes
13	How does your company balance between short-term profitability and long-term sustainability goals? Strategic Planning: • Align Goals • Long-Term View • Stakeholder Engagement. • Financial Strength. • Corporate Social Responsibility (CSR):
14	Do you have anything to add? No

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (22 Year)	Munam Mohamed	Inspection superintendent	National Oil Corporation	male	47
Interview Information					
Time:15:00	Date: 07-06-2024	Location: Benghazi	Duration45 minutes:	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? • I have been working in oil and gas industry for more than 20 years, currently I work as inspection and standard specification superintendent in the inspection and measurement general directorate in Libyan National Oil Corporation. Mainly my responsibility is to ensure the implementation of local and international standards in the ongoing projects
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? • Yes, there is remarkable and significant impact on the environment as a result of the processes associated with oil and gas production. What kind of effect? Is it a positive or negative effect? It is a negative effect. How do their operations affect the environment? Can you explain in more detail? • The impact on the environment can be described in three areas as follows. **Firstly, Oil and Gas Fields** This is due to the effect of the toxic gases associated with gas and crude oil production on the atmosphere as well as the environment surrounding the production, Fields and the failure to follow adequate procedures to implement the Zero Flare process. In addition, there are many water ponds to disposal the associated water, which has a significant short- and long-term impact on wildlife and groundwater. **Secondly, Transportation Pipeline of Crude Oil, Gas and Petroleum Products** The occurrence of oil leaks in large quantities is an essential factor in affecting the environment surrounding the location of the leak. **Thirdly, oil export terminal.** oil spills and petroleum residues from oil tankers have a direct impact on the environment around the export terminal.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) • Yes, as the work environment in oil fields is classified as the most dangerous worksites because of its direct negative impact on personal safety and health.

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4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) • Yes, oil and gas revenues are considered the main source of income, so all oil and gas production operations play the major role to increase income for the country.
5	Is there any effort to minimize those negative impacts? • In recent years, the National Oil Corporation has identified the factors that have a direct impact on the environment, and this step is considered as part of the efforts made to mitigate, avoid the impact of these factors, as well as take the preventive or corrective measures to prevent their occurrence in the future. What strategy/approach does your organization use to reduce those negative impacts? • The strategies that the National Oil Corporation has worked to implement in all its oil operation sites, some of which can be mentioned below, but not limited to: • The National Oil Corporation adopts its policy of preserving the environment in all its oil fields in a sustainable manner. • Participation in all local and international conferences and workshops related to the environment and how to preserve it. • Work to reduce gas emissions in oil fields by installing gas processing units. • Design production equipment in the newly discovered field to cover all the needs for applying the Zero Flare approach. • Replacement of corroded crude oil and petroleum products transportation lines that were the main cause of oil spills. • Work to plant trees in oil sites to provide plant cover to absorb emitted gases and reduce their impact on the climate
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? • Yes, there are many standards implemented by the national oil Operation. Could you list the rules or standards that you are familiar with? • ISO 14001 Environmental management systems
7	To what extent do you think Oil and Gas companies in Libya meet those standards? • To a reasonable extent, the Libyan National Oil Corporation works to implement international standards, laws and regulations related to the environment. (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? • Zero flare Approach Could you explain each one in more detail? • Work to avoid flaring the gas by installing gas processing units and benefiting from gas derivatives as much as possible, as well as benefiting from injecting gases into oil reservoirs to maintain reservoir pressure.
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? • The increase in demand for energy sources and the increase in oil and gas production have a negative impact on the environment, which requires increased efforts and steps to preserve the environment. What about any other challenges? Would you mind sharing more with us? • Oil spills.

	• Emitted gases. • Petroleum waste. • Drainage of water associated with oil and gas. How does your company overcome those challenges? • Working to follow the international standards to deal with these challenges, as well as benefiting from the other practices implemented in oil companies in the world
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? • Some of the difficulties that face operating process to preserve the environment, including but not limited to, ✓ Lack of spare parts for gas processing equipment. ✓ Delay in response to oil spills, especially in desert areas.
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? • Yes, the measures taken have a positive impact on operations to some extent.
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices? • Yes, there is a significant improvement in the efficiency of operating operations and the spread of Sustainable environmental culture
13	How does your company balance between short-term profitability and long-term sustainability goals? • Any profits made in the short or long term must be reflected in sustainable preservation of the environment surrounding the operations sites.
14	Do you have anything to add? • Working to spread environmental culture and understanding the benefits gained from preserving the environment is a major and important factor in implement the sustainable environmental and its application

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Title: The Benefits and Challenges of Sustainable Practices at oil and Gas Company: A Case study of Arabian Gulf Oil Company in Libya

RESEARCH QUESTIONS

1. How do the operations of the Arabian Gulf Oil Company affect the environment, social, and economy?

The impact on the society is high because it meets what the society needs to live at high level of living.

2. To what extent does the Arabian Gulf Oil Company implement sustainable practices in its operations?

The AGOCO is not as good as what society needs exactly, because it is not has awareness about which the most important project should be given priority.

3. What are the main challenges faced by the Arabian Gulf Oil Company in implementing sustainable practices, and how does the company overcome those challenges?

The most main challenges are culture and awareness of people who deal with and instability of political bodies such as municipalities. The AGOCO has to put a long range plan and agreement with the nearby society to its operations in order to make a clear picture and what should be done during the next few years.

4. How far does the implementation of sustainable practices provide benefits to the Arabian Gulf Oil Company?

To make stability of production and ease other operations such as oil and as exploration and drilling and so on.

RESEARCH OBJECTIVES

1. To examine the environmental, social, and economic impact of the Arabian Gulf Oil Company's operations.
2. To identify the sustainable practices implemented by the Arabian Gulf Oil Company in its operations.
3. To investigate the main challenges faced by the Arabian Gulf Oil Company in implementing sustainable practices and its approach to overcoming those challenges.
4. To assess the benefits gained by the Arabian Gulf Oil Company in implementing sustainable practices.

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year) 24 years	Yousef Elkeza	Corrosion Supervisor	AGOC	male	47
Interview Information					
Time11:40	Date31/06/2024	Location	Duration	Remarks	

NO	Q & A
1	**Can you briefly explain about your role and responsibilities in the company?** The Responsibility of the Corrosion Protection Section supervisor is to follow up the chemical treatment and Cathodic Protection in different locations (five oilfields, Two Refineries & Gas Treatment Plant). Preparing Purchase orders & follow up with supplier. Reviewing Monthly & Annually Reports. Preparing chemical treatment trial in the oilfields and Refineries. Preparing scope of work for the cathodic protection projects. Preparing and holding meetings with clients.
2	**Based on your experience, do you think Oil and Gas companies' operations affect the environment?** YES What kind of effect? Is it a positive or negative effect? BOTH How do their operations affect the environment? Can you explain in more detail? Oil and Gas companies' operations have both positive and negative effects on the environment.: Negative Effects: Air Pollution: Drilling, refining, and transportation release pollutants such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. These contribute to smog, acid rain, and respiratory issues. Water Contamination: Spills, leaks, and improper disposal of wastewater can contaminate water sources. Fracking, for example, uses large volumes of water mixed with chemicals, which can seep into groundwater. Habitat Destruction: Exploration and infrastructure development disrupt ecosystems, affecting wildlife habitats and biodiversity. Climate Change: Burning fossil fuels releases greenhouse gases (like CO2) that contribute to global warming. Positive Effects: Energy Supply: Oil and gas provide essential energy for transportation, heating, and electricity generation. Economic Growth: These industries create jobs, boost local economies, and generate revenue for governments.

	Technological Advancements: Research and development in oil and gas often lead to innovations in other fields.
3	**What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)** Beyond environmental impact, Oil and Gas companies also have significant social effects: Health and Safety: Employees in these industries face occupational hazards, including exposure to toxic chemicals, accidents, and physical strain. Companies must prioritize safety protocols, training, and protective gear to minimize risks. Local Communities: Oil and Gas operations can disrupt communities, affecting land use, infrastructure, and quality of life. Economic dependence on these industries can lead to boom-and-bust cycles. Perception and Trust: Public perception varies. Some view these companies as essential for energy security, while others criticize their environmental impact. Transparency, ethical practices, and community engagement influence trust.
4	**Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)** The operations of Oil and Gas companies significantly impact the global economy in various ways: Economic Growth and Jobs: • The oil and gas industry supports millions of jobs worldwide.. Energy Supply and Infrastructure: • Oil is crucial for transportation, heating, and electricity generation. • It's a key component in products ranging from plastics to pharmaceuticals. Consumer Savings: Price Volatility and Inflation: • Rising oil prices can lead to inflation concerns. • Geopolitical tensions and economic recovery impact oil prices
5	**Is there any effort to minimize those negative impacts?** Efforts to minimize the negative impacts of Oil and Gas companies' operations include: Environmental Regulations: • Governments impose regulations on emissions, waste disposal, and safety standards. • Companies must comply with these rules to reduce environmental harm. Technological Innovations:

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	• Research focuses on cleaner extraction methods, carbon capture, and renewable energy. • Advancements improve efficiency and reduce environmental impact. Corporate Social Responsibility (CSR): • Companies invest in CSR initiatives, supporting local communities and environmental causes. • Transparency and accountability are essential. Industry Collaboration: • Sharing best practices and collaborating on sustainability initiatives. • Industry associations promote responsible practices. What strategy/approach does your organization use to reduce those negative impacts? My Company Strategy to reduce negative impacts: Sustainable Practices: • it adopts sustainable practices, such as minimizing waste, optimizing resource use, and reducing emissions. • They invest in cleaner technologies and energy-efficient processes. We try to set up Environmental Management Systems (EMS): • Implementing EMS frameworks (like ISO 14001) helps monitor, assess, and improve environmental performance. • Regular audits ensure compliance with standards.
6	**Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations?** Oil and Gas companies operating in Libya are guided by various sustainability measures and strategies: Emissions Reduction: • Fugitive emissions (such as leaks from industrial plants and pipelines) are a global concern. • Industry leaders focus on limiting methane emissions, improving energy management, and addressing combustion, flaring, and venting. Tailored Strategies: Each company develops a distinct long-term sustainable strategy based on its assets, activities, and geographic footprint. Priorities differ for onshore versus offshore operations and the type of assets managed. Collaboration and Measurement: International oil operators work with organizations like Bureau Veritas to measure emissions, identify leakage sources, and recommend action. Solutions include improving integrity, reliability, and emissions control from the outset. Could you list the rules or standards that you are familiar with?

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7	**To what extent do you think Oil and Gas companies in Libya meet those standards?** (If not meeting the standard) Why are such companies failing to meet those standards?
8	**Could you tell me if any sustainable practices are implemented in the operations of your company?** Environmental Management System and Procedures Manual. Could you explain each one in more detail? Environmental Policy. Code of Practice for the Implementation of the AGOCO Environmental Policy Environmental Management System and Procedures Manual. 03.00.00 Environmental Policy. 03.00.01 Code of Practice for the Implementation of the AGOCO Environmental Policy 03.02 General Environmental Considerations for Planning. 03.02.01 General Environmental Considerations for ALL Operations. 03.02.02 Procedure for the Preparation of A Project Environmental Assessment . 03.02.03 Guidance Document on Emergency Response Planning. 03.02.04 Guidance Document on the Completion of Audits and Inspections. 03.03 Environmental Operating Codes of Practice. 03.03.01 Site Selection of Wells Sites and Facilities. 03.03.02 Lease Preparation and Well Site Construction. 03.03.03 Bunding Requirements for Tanks and Facilities. 03.03.04 Drilling Waste Management. 03.03.05 General Housekeeping. 03.03.06 Vegetation Management. 03.03.07 Surface Water and Ground Water Protection. 03.03.08 Protection of Historical Resources. 03.03.09 Noise Control. 03.03.10 Control of Atmospheric Emissions. 03.03.11 Reduction of Greenhouse Gas Emissions. 03.03.12 Incident Management and Spill Site Reclamation. 03.03.13 Well Site and Facility Reclamation. 03.03.14 Management of Earthen Pits. 03.03.15 Waste Management.

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	03.03.16 Code of Practice for Storage. 03.03.17 Disposal Wells and Produced Water Management.
9	**In your view, what are the main challenges your company has faced when implementing sustainable practices?** Investment Costs: • Transitioning to cleaner technologies or renewable energy often involves significant upfront costs. • Long-term benefits may outweigh initial expenses. Behavioural Shifts: • Employees need to embrace sustainable practices. • Cultural change within an organization can be challenging. How does your company overcome those challenges?
10	**Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?** Yes , budget
11	**How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?** Resource Optimization: • Sustainable practices encourage efficient use of resources (energy, water, raw materials). • Reduced waste and streamlined processes lead to cost savings.
12	**Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?** The feed back from local societies close to our oilfield
13	**How does your company balance between short-term profitability and long-term sustainability goals?** There is new department to establish new Department in my company (Renewal Energy Department)
14	**Do you have anything to add?** no

Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year) 23	KARIM JAIDI	ELECTRICAL ENGINEER	——	MALE	50
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? ELEC. ENG
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? YES What kind of effect? Is it a positive or negative effect? ENVIRONMENTAL/NEGATIVE EFFECT AIR AND WATER POLLUTION / GREEN HOUSE GAS EMISSION (CO_2), OIL SPICES. How do their operations affect the environment? Can you explain in more detail?
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) YES / JOB CREATION, INCREASE REVENUE/Negative effect: Health problem/ Social effect
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) YES/INCREASE INCOME
5	Is there any effort to minimize those negative impacts? RENEWABLE ENERGY/Improved Technology What strategy/approach does your organization use to reduce those negative impacts? STRICTER Regulation and Enforcement/Awareness
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Comply to International Code of practice and Regulation Could you list the rules or standards that you are familiar with? GLOBAL REPORTING INITIATIVE (GRI) ISO 14001
7	To what extent do you think Oil and Gas companies in Libya meet those standards? MINOR (If not meeting the standard) Why are such companies failing to meet those standards? LACK OF AWARENESS SESSION AND TRAINING
8	Could you tell me if any sustainable practices are implemented in the operations of your company? NOT TOUCHABLE/NO REMARKABLE ACTIONS Could you explain each one in more detail? ——
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? NOT IMPLEMENTED YET What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges? TRAINING AND AWARENESS SESSIONS
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? YES
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? WORKING IN HEALTHY ENVIRONMENT +
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices? NO + RISK MANAGEMENT + WASTE REDUCTION + RESOURCE EFFICIENCY

13	How does your company balance between short-term profitability and long-term sustainability goals? SHORT TERM AND LONG TERM FINANCIAL PLANNING + OPERATIONAL EFFICIENCY AND RISK MANAGEMENT.
14	Do you have anything to add? NO

***Sustainable practices** = approaches and strategies designed to reduce the industry's ecological footprint and foster ecological practices. These practices prioritize resource utilization efficiency, waste reduction, emission mitigation, and the integration of renewable energy sources.

1.

2. & 3. Yes, oil and gas company operations absolutely affect the environment, and it's important to be aware of both the positive and negative impacts.

Environmental Impact

- Greenhouse Gas Emissions: Burning oil and gas releases significant amounts of carbon dioxide, a major greenhouse gas contributing to climate change.
- Water Pollution: Oil spills and leaks from pipelines can contaminate water sources, harming aquatic life and making water unfit for drinking or irrigation. Additionally, oil and gas extraction often requires large volumes of water, which can strain local water supplies.
- Air Pollution: Refineries and other facilities release pollutants like nitrogen oxides and sulfur oxides, contributing to smog, acid rain, and respiratory problems.
- Habitat Destruction: Exploration, drilling, and pipeline construction can disrupt ecosystems and destroy habitats for wildlife.

Potential Positives

- Technological Advancements: New technologies for cleaner oil and gas extraction, as well as carbon capture and storage, are being developed, but their widespread adoption is still uncertain.

The overall impact of oil and gas companies on the environment is negative. The industry is a major contributor to climate change and other environmental problems. However, there are some positive developments, such as investments in clean energy and technological advancements.

4. Absolutely, oil and gas companies have a significant impact on the economy, with both positive and negative effects to consider.

Positive Economic Impacts

- **Job Creation:** The oil and gas industry employs a large number of people directly in jobs like exploration, drilling, refining, and transportation. These jobs can provide good wages and benefits, supporting local economies.
- **Government Revenue:** Oil and gas companies pay taxes and royalties to governments, which can be a significant source of income for countries rich in these resources. This revenue can be used to fund public services, infrastructure development, and social programs.
- **Energy Security:** Having a domestic supply of oil and gas can reduce a country's reliance on foreign imports, promoting energy independence and potentially lower energy costs.
- **Economic Growth:** A thriving oil and gas industry can contribute to overall economic growth by stimulating activity in related industries such as manufacturing, transportation, and construction.

Negative Economic Impacts

- **Environmental Damage:** The environmental costs associated with oil and gas production, such as spills and pollution, can be significant. These costs can be borne by communities and governments in the form of cleanup efforts and lost revenue from tourism or recreation.

- **Dependence on Fossil Fuels:** Overreliance on oil and gas can slow down the development and adoption of renewable energy sources, which are crucial for long-term energy security and sustainability.
- **Job Losses:** As the world transitions to a low-carbon economy, jobs in the oil and gas industry may be lost. This could have a negative impact on communities that rely heavily on these industries.

Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)	Ahmed	Coordinator		Male	44
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company? I am responsibility for economic and evaluation
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? Yes, What kind of effect? Is it a positive or negative effect? Negative, Air pollution. How do their operations affect the environment? Can you explain in more detail? By Air and Water Pollution and Greenhouse gas Emissions.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) Economic Dependency- Community Displacement – Job creation.
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) Job creation – Energy price
5	Is there any effort to minimize those negative impacts? Improve the economy and development. What strategy/approach does your organization use to reduce those negative impacts? Improve the technology.
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Environmental Regulations, International standards and industry initiatives. Could you list the rules or standards that you are familiar with? **Corporate sustainability reporting**

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7	To what extent do you think Oil and Gas companies in Libya meet those standards? Most of the companies in Libya face difficulties in fully meeting international sustainability due t: The regulatory environment and infrastructure (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? By reducing greenhouse gas emissions, improving energy efficiency and using renewable energy sources. Could you explain each one in more detail? Besides this, it could adopt technologies to minimize environmental impact. Companies may also focus on water management, waste reduction, and biodiversity protection.
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? The main challenge for oil and gas companies in implementing sustainable practices is balancing economic goals with environmental responsibilities. This includes managing the high costs of new technologies, regulatory compliance, stakeholder expectations, and the need to transition to low-carbon operations without disrupting supply and profitability. What about any other challenges? Would you mind sharing more with us? 1. *High Costs and Investment*: - *Technological Upgrades*: Implementing sustainable practices often requires significant investment in new technologies such as carbon capture and storage (CCS), renewable energy integration, and energy-efficient equipment. These technologies can be expensive to develop, deploy, and maintain. - *Research and Development*: Continuous investment in R&D is essential to innovate and improve sustainable practices, which can strain financial resources, especially during periods of low oil prices. 2. *Regulatory Compliance*: - *Stringent Regulations*: Governments worldwide are imposing stricter environmental regulations to reduce emissions and protect ecosystems. Compliance with these regulations can be challenging and costly, requiring companies to regularly update their operations and practices. - *Varying Standards*: Different countries have different regulatory standards, making it complex for multinational companies to maintain uniform sustainable practices across all their operations. 3. *Stakeholder Expectations*:

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	- *Investor Pressure*: Investors are increasingly prioritizing environmental, social, and governance (ESG) criteria. Companies need to demonstrate sustainable practices to attract and retain investment, which can be challenging if these practices conflict with short-term profitability. - *Community and Public Pressure*: Local communities and the general public are more aware and concerned about environmental issues. Companies must engage in meaningful dialogue and take concrete actions to address these concerns, which can be resource-intensive. 4. *Operational Transition*: - *Legacy Systems*: Transitioning from traditional operations to more sustainable ones involves overhauling legacy systems and infrastructure, which can be disruptive and expensive. - *Supply Chain Adjustments*: Ensuring that the entire supply chain adheres to sustainable practices is complex. It requires collaboration with suppliers, contractors, and partners, many of whom might have different capabilities and priorities. 5. *Market Dynamics*: - *Volatile Oil Prices*: Fluctuations in oil prices can impact the financial stability of companies, making it challenging to allocate consistent funding for sustainable initiatives. - *Competition*: Balancing sustainability with competitive pricing and market share is difficult, especially if competitors are not equally committed to sustainable practices. 6. *Technological and Knowledge Gaps*: - *Innovation Pace*: Keeping up with the rapid pace of technological innovation in sustainability can be challenging. Companies need skilled personnel and up-to-date knowledge, which requires continuous training and development. - *Data Management*: Effective implementation of sustainable practices requires robust data collection, analysis, and reporting systems to track progress and identify areas for improvement. Addressing these challenges requires a strategic approach that balances short-term operational needs with long-term sustainability goals. This often involves cross-sector collaboration, stakeholder engagement, and a commitment to ongoing innovation and improvement. How does your company overcome those challenges? Oil and gas companies can overcome these challenges through a combination of strategic initiatives, technological innovation, stakeholder engagement, and regulatory compliance. Here are some specific approaches: 1. *Investing in Technology and Innovation*: - *Adopting Advanced Technologies*: Companies can invest in carbon capture and storage (CCS), renewable energy integration, and energy-efficient processes. This can reduce emissions and improve overall efficiency. - *Research and Development*: Continuous investment in R&D to innovate and develop new sustainable technologies and practices is crucial.

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	2. *Regulatory Compliance and Advocacy*: - *Proactive Compliance*: Staying ahead of regulatory changes by adopting best practices and exceeding minimum standards can help companies avoid penalties and build a positive reputation. - *Engaging with Policymakers*: Actively participating in policy discussions and advocating
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? Yes, incorporating sustainable practices into existing operational processes or systems in the oil and gas industry has been challenging. Some specific difficulties include: 1. *Legacy Infrastructure*: - *Compatibility Issues*: Many existing facilities and equipment are designed for traditional operations, making it difficult to integrate new sustainable technologies without significant modifications or replacements. - *Costly Upgrades*: Retrofitting or upgrading old infrastructure to accommodate sustainable practices can be expensive and time-consuming. 2. *Operational Disruptions*: - *Downtime*: Implementing new practices often requires temporary shutdowns or slowdowns in operations, leading to potential losses in productivity and revenue. - *Complex Transition Processes*: Shifting to sustainable operations involves complex changes that can disrupt established workflows and require meticulous planning and execution. 3. *Technological Challenges*: - *Integration of New Technologies*: New technologies designed to improve sustainability need to be seamlessly integrated with existing systems, which can be technically challenging and require specialized knowledge. - *Data Management*: Sustainable practices often rely on advanced data analytics and monitoring systems. Integrating these with current data management frameworks can be complicated. 4. *High Costs*: - *Initial Investment*: The upfront costs associated with implementing sustainable technologies and practices can be substantial, posing financial challenges, especially for smaller companies. - *Long-Term Payback*: Sustainable investments may have long-term payback periods, which can be a deterrent for companies focused on short-term financial performance. 5. **Regulatory and Compliance Challenges
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? Sustainable practices have boosted efficiency and effectiveness in oil and gas operations in several ways. Firstly, they've led to reduced waste and improved resource management, like water recycling and minimizing emissions. This

	streamlines operations and cuts costs. Secondly, they enhance reputation and stakeholder relations, attracting investors and customers. Lastly, by fostering innovation, like renewable energy integration and cleaner technologies, they future-proof businesses against regulatory changes and market shifts.
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices? Absolutely, adopting sustainable practices has led to noticeable improvements in operation efficiency and resource utilization. For example, companies are implementing technologies to optimize drilling techniques, reducing energy consumption and environmental impact. Additionally, recycling and reusing materials in operations have become more prevalent, conserving resources and reducing waste. Overall, these sustainable practices not only benefit the environment but also contribute to cost savings and long-term viability.
13	How does your company balance between short-term profitability and long-term sustainability goals? By recognizing the importance of balancing short-term profits with long-term sustainability goals. While maximizing profits remains a priority, integrating sustainable practices into their operations allows them to mitigate risks associated with environmental regulations, resource scarcity, and changing consumer preferences. By investing in sustainability, they can enhance their resilience, reputation, and ultimately, their bottom line, both now and in the future
14	Do you have anything to add? No I do not

***Sustainable practices** = approaches and strategies designed to reduce the industry's ecological footprint and foster ecological practices. These practices prioritize resource utilization efficiency, waste reduction, emission mitigation, and the integration of renewable energy sources.

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (25 Year)	mohamed	Operation manager	Zallaf company	Male	50
Interview Information					
Time	Date	Location	Duration	Remarks	

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? The operations of oil and gas companies predominantly have negative effects on the environment, including air and water pollution, soil contamination, biodiversity loss, and contribution to climate change. While there are some positive efforts through technological innovations and environmental remediation projects, the overall impact remains a significant environmental challenge. Effective regulatory frameworks and sustainable practices are essential to mitigate these effects and transition towards a more environmentally friendly energy sector. What kind of effect? Is it a positive or negative effect? 1. Negative Environmental Effects - Air Pollution - water pollution -soil contamination - Biodiversity Loss - Deforestation - waste generation 2. Positive Environmental Effeects - Technological Innovations - Environmental Remediation - Regulatory Compliance How do their operations affect the environment? Can you explain in more detail? <u>Drilling and Extraction</u>: Hydraulic Fracturing (Fracking): Uses large volumes of water mixed with chemicals, leading to potential groundwater contamination and increased seismic activity. Offshore Drilling: Risk of major spills, such as the Deepwater Horizon spill, which can have catastrophic effects on marine ecosystems. <u>Refining and Processing</u>:

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	Chemical Emissions: Refineries emit various pollutants, including CO2, SO2, and NOx, affecting air quality. Energy Consumption: High energy use contributes to greenhouse gas emissions. Transportation: Pipelines: Risk of leaks and ruptures can lead to soil and water contamination. Shipping: Oil tankers pose a risk of spills, particularly in sensitive marine areas. Storage: Tank Farms: Large storage tanks can leak, leading to soil and groundwater contamination. Waste Pits: Improperly managed waste pits can leach toxic substances into the environment. Decommissioning: Abandoned Wells: Improperly sealed wells can leak methane and other pollutants. Site Rehabilitation: Requires careful management to restore ecosystems and prevent ongoing contamination.
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.) Yes, the activities of oil and gas companies have significant social impacts, including health effects on employees and their perceptions about safety, among other factors.
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.) Yes, the operations of oil and gas companies significantly impact the economy in various ways, including influencing costs, revenues, and broader economic dynamics
5	Is there any effort to minimize those negative impacts? Efforts to minimize the negative impacts of oil and gas operations are widespread and involve a combination of regulatory measures, industry best practices, technological innovations, and community engagement What strategy/approach does your organization use to reduce those negative impacts? a combination of regulatory measures, industry best practices, technological innovations, and community engagement
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Yes, oil and gas companies operating in Libya are required to comply with various rules and standards related to sustainability, both at the national and international levels. While the regulatory framework in Libya may have

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	specific provisions, companies also adhere to international standards and best practices to ensure sustainable operations. Could you list the rules or standards that you are familiar with? - Environmental Protection Law - National Oil Corporation (NOC) Guidelines - Environmental Impact Assessments - ISO standards - International Finance Corporation (IFC) Performance Standards - American Petroleum Institute (API) Standards
7	To what extent do you think Oil and Gas companies in Libya meet those standards? The extent to which oil and gas companies in Libya meet sustainability standards can vary significantly based on several factors, including the company's size, resources, commitment to sustainability, regulatory enforcement, and the political and economic environment in Libya (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? - Local Community Engagement - Local Hiring and Procurement Could you explain each one in more detail? Local Hiring and Procurement Local Employment: Prioritizing the hiring of local workforce to boost local economies. Local Procurement: Sourcing goods and services from local suppliers to support the local economy and reduce carbon footprint associated with transportation.
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? - Technological Challenges - Stakeholder Resistance - Knowledge and Skills Gaps What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges? - Learning from other industries and adopting best practices and technologies that have been successfully implemented elsewhere. - Creating programs that directly benefit local communities, such as infrastructure development, educational initiatives, and healthcare services, to foster positive relationships and mitigate resistance. - Providing continuous education and training programs to equip employees with the necessary skills and knowledge to implement and manage sustainable practices.
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems? Yes, incorporating sustainable practices into existing operational often presents several difficulties.

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	- Legacy Systems and Infrastructure - Operational Disruptions - Resistance to Change - Regulatory and Compliance Complexitie
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company? - Operational Efficiency: Sustainable practices often lead to streamlined processes and reduced waste generation, resulting in lower operating costs. - Mitigation of Environmental Risks - Reduced Environmental Footprint - Enhanced Stakeholder Relations
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?yes - Reduced Waste Generation - Optimized Water Usage - Reduced Emissions
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?no

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Interviewee Information					
Code	Name	Position	Organisation	Gender	Age
Working experience (Year)	Zeid Ragas	Head HSE Engineer	AGOCO	M	45
Interview Information					
Time	Date	Location	Duration	Remarks	
10:00	11-6-2024	Bayhe 7			

NO	Q & A
1	Can you briefly explain about your role and responsibilities in the company?
2	Based on your experience, do you think Oil and Gas companies' operations affect the environment? What kind of effect? Is it a positive or negative effect? How do their operations affect the environment? Can you explain in more detail?
3	What about other effects? Do the activities of Oil and Gas companies also have a social impact? (e.g. health effects on the employees, their perception about their safety, etc.)
4	Do Oil and Gas companies' operations affect the economy as well? (e.g. cost increase, reduction of revenues, etc.)
5	Is there any effort to minimize those negative impacts? What strategy/approach does your organization use to reduce those negative impacts?
6	Are there any rules or standards related to sustainability that Oil and Gas companies in Libya need to comply with in doing their operations? Could you list the rules or standards that you are familiar with?
7	To what extent do you think Oil and Gas companies in Libya meet those standards? (If not meeting the standard) Why are such companies failing to meet those standards?
8	Could you tell me if any sustainable practices are implemented in the operations of your company? Could you explain each one in more detail?
9	In your view, what are the main challenges your company has faced when implementing sustainable practices? What about any other challenges? Would you mind sharing more with us? How does your company overcome those challenges?
10	Have there been any difficulties in incorporating sustainable practices into existing operational processes or systems?
11	How have sustainable practices positively impacted the efficiency and effectiveness of operations within your company?
12	Have you noticed any improvements in operational efficiency or resource utilization as a result of adopting sustainable practices?
13	How does your company balance between short-term profitability and long-term sustainability goals?
14	Do you have anything to add?

(1) Q

(1) environmental coordinator.

(2) oil companies impacted negatively on air, water, soil.

(2) They causing air pullation by produce emmisians, pullated water by suspend water production, pullated soil by oil Leakage

(3) Yes, that is confirmed by Health survey on what cities (Jalu, awjla, Ajera). plus effect on employees.

(4) yes, on economy postively.

(5) Yes, They spend efforts but is not envgh to control on impacts.

(6) NOC standard, Low No 15-2008

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8 I can't compaire

8) Note found

9) fristly oil pets r secondly emmissions
No efforts spended yet.

10 Many difficults. in opration + equipment
and facilities are not upgraded.

11 not clear

12 not noticed yet

13 No blance

14 NO

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