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Claims-to-Action Consistency of Major Oil and Gas Firms: A Comparison of Saudi Aramco, ExxonMobil and Shell

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List of Abbreviations

GHG	Greenhouse Gas
ESG	Environmental, Social, And Governance
CSR	Corporate Social Responsibility
SRI	Socially Responsible Investment
TIS	Technological Innovation System
CCUS	Carbon Capture, Use, and Storage
CCS	Carbon Capture Storage
OGCI	Oil and Gas Climate Initiative
LDAR	Leak Detection and Repair
REC	Renewable Energy Certificates
AUM	Assets Under Management
QGC	Queensland Gas Company
R&D	Research and Development
CO2e	Carbon Dioxide Equivalent
BOE	Barrel of Oil Equivalent
LCS	Low-Carbon Solutions
MGS	Master Gas System
SASREF	Saudi Aramco Shell Refinery Company
QSGTL	Qatar Shell Gas-to-Liquid
MCC	Mobile Carbon Capture

Abstract

This thesis takes a critical look at the energy change from the vantage point of the three biggest oil organisations: Saudi Aramco, ExxonMobil, and Shell. The primary emphasis is on the businesses' actions and words in this area. considering the significant influence that these firms have on the energy system throughout the entire globe, corporations play an important part in the procedure of transitioning to ecologically friendly energy systems. But there continues to be a lack of consensus on the veracity of their statements and the extent to which their claims are consistent given the behaviours that were previously put into place.

This study examines the consistency of claims with actions, especially in areas like carbon emissions, lower emissions investment, methane and flaring reduction, renewable energy resource investment, environmental initiatives, and CCUS (Carbon Capture, Use, and Storage). It does this by drawing on publicly available company reports and ESG Environmental data from Refinitiv Eikon. The establishment of a "claims-to-action" consistency Analysis Framework, intended to evaluate and compare the organisations' transition efforts, is one of the main contributions of this thesis. In doing so, the research hopes to add to the larger conversation on corporate transparency and accountability in the context of the energy transition by exposing discrepancies between claimed promises and concrete actions.

To acquire a deeper understanding of the organisations' transition plans, the Technological Innovation System (TIS) functions of entrepreneurial activities, knowledge development, knowledge dissemination, and legitimacy creation are utilised. According to this study, there are considerable differences between the organisations in the degree of "claims-to-action" consistency, which has an impact on their energy transition procedures and overall sustainability initiatives.

Even if the results are eye-opening, they point to the necessity for more reliable systems to monitor and validate corporate statements and to advocate for more significant action in the energy transition process. This thesis informs plans for a more transparent and successful energy transition while offering useful information for stakeholders, such as legislators, investors, and academics.

Key words: Energy transition, ESG (Environmental data), Claims-to-Action, TIS

1 INTRODUCTION

For several decades, the world has been increasingly concerned about the impact of greenhouse gases and climate change caused by Anthropogenic carbon emissions (Intergovernmental Panel on Climate Change, 2014). As a result, a global shift towards non-polluting renewable energies like wind and solar power is being pursued. This energy transition is vital in reducing environmental impacts, particularly those associated with fossil fuels, which have become a significant focus of discussion and reform efforts (International Energy Agency, 2019). Environmental impacts refer to the effects of human activities on the natural environment, including air and water pollution, habitat destruction, and biodiversity loss. The oil and gas industry is responsible for 32% of anthropogenic greenhouse gas emissions worldwide, making it a significant contributor to climate change (International Energy Agency, 2019).

While the oil and gas industry has made commitments to transition to more sustainable energy sources, there are concerns about the truthfulness of these claims (Friends of the Earth Europe, 2022). For example, Shell has stated its ambition to become a zero-emissions energy firm by 2050 (Shell Plc, 2022). Claims or transition claims refer to the assertions, ambitions, plans, promises, commitments, statements or strategies set or announced by the oil and gas industries toward fulfilling or achieving their energy transition goals. To evaluate these commitments, it is crucial to examine the industry's implementation history, particularly the top three oil giants namely, Saudi Aramco, ExxonMobil, and Shell's implementation record, and compare it to their transition claims. Implementation record includes environmental, social, and political impacts. Hence, the term "Claims-to-Action Consistency" in this study denotes the degree to which a company's claims or assertions align with its actual efforts in fulfilling those claims.

Despite oil and gas companies' transition claims and commitments over the years, their operations seem to lean towards environmental implications. For example, in 2021, there was litigation against Shell by a group of activists known as Milieudefensie, the Dutch wing of Friends of the Earth, which said that Shell's business model and corporate strategy "is on a collision course with global climate targets" and presented "a great danger for humanity" (Anjli Raval, 2021). Yet the fact that Shell has been releasing its energy transition progress reports every year since 2017 makes one suspicious about its strategies and operations. This study only examines environmental impacts such as ESG (environmental) data due to time constraints and the complexity of studying all three areas which are the environmental, social, and political

impacts. Experts recommend regularly assessing the oil and gas industry's energy transition promises, to avoid greenwashing (ClientEarth, 2021). This research defines "greenwashing" as a company making false claims about being environmentally responsible and climate-friendly through public messaging and advertising or "overreporting positive impact" and "underreporting negative impact" (Dahl, 2010; Schmuck et al., 2018).

Assessing a company's record of execution enables a more accurate evaluation of its progress towards renewable energy targets, ensuring accountability and transparency in the transition to renewable energy to avoid greenwashing (CDP, 2016). The research problem is important because it must be verified that firms are fulfilling their sustainability claims by switching to renewable energy, reducing fossil fuel production, carbon footprint reduction, diversifying their energy mix, and being transparent in their operations and investments. Due to their size, finance, influence, and greenhouse gas (GHG) emissions, Saudi Aramco, ExxonMobil and Shell's decisions, and pledges, if implemented, could affect international climate change efforts (Griffin, 2017).

Through the use of the TIS theory to explore the claims-to-action consistency working towards a company’s successful energy transition is a contribution to the pool of knowledge. The research has the potential to make a valuable contribution to the existing body of academic literature pertaining to corporate communication, sustainability, and ethical business practices. This study has the potential to offer novel perspectives on the difficulties that organizations encounter when attempting to synchronize their claims with their actions, as well as the potential repercussions that arise from such inconsistencies.

The “claims-to-action” analysis broadens the scope of TIS by focusing beyond technological innovation to encompass broader socio-environmental and ethical dimensions. The TIS framework should consider integrating concepts from environmental social governance (ESG) to capture the complexities of claims-to-action consistency. The analysis of the different companies provides a comparative analysis framework that aids the TIS theory in analyzing differences in organizational culture, communication strategies, stakeholder engagement, and response to environmental challenges.

This study can potentially improve energy industry accountability and transparency by assessing what this research terms “claim-to-action consistency”. This research subject is important because it has the potential to expand our understanding of claims versus actions of Saudi Aramco, ExxonMobil, and Shell in the long run and the role of companies in the energy

transition (Markard et al., 2012). The outcomes of this study will contribute to understanding whether and how the oil and gas industry's transition claims have been fulfilled and whether they contribute to the Paris Agreement goals (Gielen et al., 2019).

This section introduces the research topic and problem ought to be solved, the consequent sections; section 1.1 delves into the main research question including the two follow up questions to be answered, the consequent section 1.2 explains the objectives of this research, whereas the next section 1.3 describes the background of the problem in this research.

1.1 Research Question

The focus of this paper is to compare the oil and gas industry's implementation track record. I do so by using the top three oil and gas majors; Saudi Aramco, ExxonMobil, and Shell as a case study and comparing them with one another. These three companies; Saudi Aramco, ExxonMobil, and Shell were chosen because they are the three largest oil and gas companies in terms of revenue and are located in three different continents; Asia, USA, and Europe respectively, across the globe. This selection gives different perspectives and a form of balance. Hence, this poses the main research question:

How are the oil and gas companies' energy transition claims reflected in their ESG environmental data?

In responding to this question with my research study, the following sub questions will be answered:

What is Saudi Aramco, ExxonMobil, and Shell's claims about energy transition?

What is Saudi Aramco, ExxonMobil, and Shell's track record regarding ESG environmental data?

1.2 Research Objectives

This research’s main objective is to contribute to the understanding of claim-to-action consistency by comparing Saudi Aramco, ExxonMobil, and Shell's implementation records with their transition claims.

This study aims to compare the environmental impacts of Saudi Aramco, ExxonMobil, and Shell's energy transition goals with the companies claims about their commitments to the energy transition. The purpose of this aim is to understand better the consistency between the oil and gas industry's claims about the energy transition and its implementation. Saudi Aramco, ExxonMobil, and Shell's importance and influence in the oil and gas sector encouraged the decision to conduct this research (Griffin, 2017).

The study seeks to determine if Saudi Aramco, ExxonMobil, and Shell have been consistent in their efforts to realize each of their energy transition ambitions by contrasting Saudi Aramco, ExxonMobil, and Shell's transition claims with the ESG environmental data that is already accessible. This research will reveal any gaps or contradictions in these three company's reporting by comparing the environmental impacts from the ESG environmental data and Saudi Aramco, ExxonMobil, and Shell's energy transition claims. Additionally, it will provide insights into the alignment of Saudi Aramco, ExxonMobil, and Shell's energy transition strategy. Both of these outcomes will be the result of the comparison, by exploring the methods and approaches that these three oil giants have used, the findings of this research could be used to inform the future of the oil and gas industry's energy transition policies and also to be used to know whether Saudi Aramco, ExxonMobil, and Shell are saying the truth of their transitioning or green washing (ClientEarth, 2021).

1.3 Empirical Background

The oil and gas industry's shift to a more sustainable energy source is a crucial challenge for combating global climate change. Oil and gas remains the world's primary energy sources, despite the rise in popularity of renewable energy sources like solar and wind power (IEA, 2020a). As a result, the sector needs to develop strategies for lowering emissions and switching to renewable energy sources.

In response to the issue, oil and gas firms have made a variety of assertions about their plans for the energy transition. One of the pioneering businesses in this area has been Royal Dutch Shell now referred to as Shell, which has declared its commitment to creating an energy firm with net-zero emissions by 2050 (Shell Plc, 2022). The business has not yet offered a thorough plan for achieving this objective (ClientEarth, 2021).

This research aims to comprehend how Saudi Aramco, ExxonMobil, and Shell's assertions regarding the energy transition have changed concerning their environmental effects. It will also review each company's future ambitions to produce energy with little or no net emissions by the coming years. Additionally, this study will point out areas where fossil-fuel energy companies' energy transition strategies need to be improved and offer guidance to other businesses in the sector.

Figure 1 Some of Shell Energy Transition plans (Shell Plc, 2022).

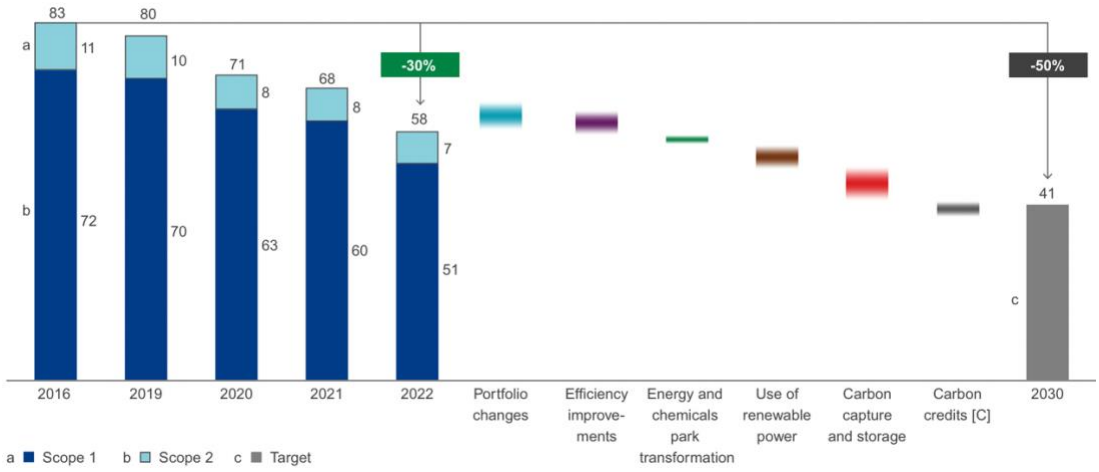


Figure 2 . Shell shows its historic reduction of its absolute Scope 1 and 2 emissions in million tonnes per annum [A] [B] [C] Including nature-based solutions (Shell Plc, 2022).

2 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Literature review

Oil and gas firms have progressively made claims about their commitment to decarbonizing the global economy over the last several decades. Increased public pressure to confront the global climate crisis has prompted this shift in rhetoric (Supran & Oreskes, 2021). Many energy transition statements, however, include wording that describes commitments to reduce emissions but does not identify dates, objectives, or tactics which could be seen as greenwashing (Zhang et al., 2023). Furthermore, such pronouncements may be used by oil and gas companies to position themselves as climate leaders while maintaining their business structures (Frynas, 2009). Additionally, firms may invest in low-carbon technologies while prioritizing hydrocarbon-producing projects (IEA, 2020b).

According to Gillan et al. (2021), in 2004, after a request from UN Secretary-General Kofi Anon, 20 financial institutions collaborated to create the acronym ESG. ESG refers to how firms and investors incorporate environmental, social, and governance considerations into their business strategies, as the name implies (Gillan et al., 2021). Responsible Investment was the idea that led to ESG (Sparkes, 2001). Sparkes (2001) says that Responsible Investment is "investment practises that take into account environmental, social, and governance (ESG) issues with the main goal of getting higher risk-adjusted returns." Responsible investing is another way of saying that environmental, social, and governance (ESG) issues are considered during the investment process and when making decisions (Mersham, 2022).

Currently, the estimated value of ESG investment stands at more than $20 trillion in assets under management (AUM), which accounts for approximately 25% of all professionally managed assets globally. This substantial expansion is rooted in the longstanding Socially Responsible Investment (SRI) movement. In contrast to SRI, which employs ethical and moral standards and predominantly use negative screening methods, such as abstaining from investments in alcohol, tobacco, or weapons, ESG investing operates under the premise that ESG aspects has financial significance (Mersham, 2022). According to Mersham (2022) the ESG idea has gained significant traction as a viable substitute for CSR (corporate social responsibility) in numerous publications and academic research. It is common for ESG and CSR to be regarded as interchangeable terms within these contexts. CSR "corporate social responsibility" refers to what businesses do to improve their status as "good corporate citizens"

in the community (Gillan et al., 2021). Nevertheless, when it comes to definition and evaluation, ESG encompasses a greater level of intricacy compared to CSR (Roh et al., 2022).

ESG factors include a wide range of problems that have hitherto been excluded from financial analysis but has now gained significance in the monetary aspect. This encompasses various aspects such as the company's response to climate change, the management of energy and water resources, the implementation of health and safety rules, and the management of supply networks (Mersham, 2022). This makes ESG an important factor to businesses. Senadheera et al. (2022) explains that the environmental pillar, one of the three pillars of ESG, focuses on significant environmental issues such as greenhouse gas emissions, carbon footprint, waste control, and resource utilization. On the other hand, the social pillar places its emphasis on significant societal dimensions, including community concerns, workforce administration, human rights, and product accountability. While the governance pillar primarily centers around policy formulation, employee governance, business ethics, and corporate social responsibility (Senadheera et al., 2022).

According to Ognen et al. (2017), the ESG criteria encompass the primary factors that possess substantial potential to impact a company's sustainability significantly. Therefore, a significant number of investors regard ESG investing as a crucial strategy for effectively mitigating financial risks. Organizations that exhibit superior environmental, social, and governance (ESG) performance are more likely to achieve sustainability objectives and effectively meet their goals and targets (Ognen et al., 2017). Berry and Rondinelli (1998) says companies that demonstrate exceptional environmental performance adhere to the principle that actions are more likely to be accomplished when they are quantified and monitored. Consequently, there has been a recent increase in the attention given by investors and other stakeholders to evaluations based on environmental, social, and governance (ESG) criteria (Senadheera et al., 2022). Rating agencies such as Refinitiv Eikon utilize ESG performance as a database score on an ongoing basis (Mersham, 2022). According to the findings of Sachini et al. (2021), stakeholders have accorded significant attention to the E (environmental) pillar within the Environmental, Social, and Governance (ESG) framework. This is primarily due to its role in assessing the environmental impact of industrial activities (Sachini et al., 2021).

The oil and gas industry's heavy regulation and geopolitical sensitivity necessitate the establishment of a comprehensive energy transition strategy in compliance to policies (Zhang et al., 2023). The transition to a more sustainable energy source and combating climate change

are top concerns for the oil and gas industry, but there is still opportunity, uncertainty, and difficulty (IEA, 2020b). Stranded assets, which occur when the financial expectation of a certain energy asset fails to be satisfied, are one of the company's risks connected with this transition (Firdaus & Mori, 2023). Integrating renewable energy sources like wind and solar introduces new risks because these technologies are very sensitive to market conditions and price volatility (Fattouh et al., 2019; IEA, 2017). This can result in huge losses for energy corporations investing in these technologies, especially if such risks are not effectively hedged.

Fattouh et al. (2019) explore the problems and options for oil businesses and oil-producing countries to adjust to the increase of renewables and energy transition. Transitioning to a low-carbon economy would necessitate significant changes for oil companies and oil-producing countries (Fattouh et al., 2019). The aforementioned essay talks about the difficulties experienced by established businesses as they try to adapt to the new energy landscape, discusses the difficulties incumbents encounter when attempting to adjust to the energy shift and also talks about how important strategic planning and working together are for a successful transition (Fattouh et al., 2019).

Transitioning from fossil fuels to renewable energy sources has been a major challenge for many countries in recent years (Kern & Markard, 2016). Studies have shown that companies in the energy sector frequently make claims about their products and services, as well as their environmental impact and commitment to sustainability, which can influence consumer behavior and public policy (García-Sánchez & Martínez-Ferrero, 2018). A study of the top 50 oil and gas corporations, for example, discovered that climate change and carbon emissions were mentioned in 72% of their sustainability reports (Heede, 2014). However, some scholars have challenged these assertions as ambiguous and opaque, claiming that they may be used to greenwash the company's image rather than signaling a commitment to sustainability (Lyon & Montgomery, 2015).

García-Sánchez and Martínez-Ferrero (2018) investigated the accuracy of sustainability claims made by energy corporations in their study of corporate social responsibility in the energy sector. The authors discovered that several companies made ambiguous or deceptive representations regarding their sustainable efforts, which could contribute to consumer and policymaker confusion (García-Sánchez & Martínez-Ferrero, 2018). The necessity for accurate and transparent information to support consumer and policy decision-making has been underlined in studies on company claims in the energy industry, therefore, there is a need for

deeper investigation into the veracity of company claims in the energy sector because the statements are not always evident. (García-Sánchez & Martínez-Ferrero, 2018; Karasek et al., 2023). According to this research, firms in the energy sector frequently make claims about their environmental impact and dedication to sustainability, while some scholars have challenged these statements as ambiguous and lacking in transparency (Kivimaa & Kern, 2016). Karasek et al. (2023) investigated the veracity of energy efficiency claims made by enterprises in the European Union. According to the authors, some companies made inflated or inaccurate claims about their goods' energy efficiency, which could lead to consumer distrust and impede efforts to promote energy efficiency (Karasek et al., 2023).

2.2 Theory: Technological Innovation Systems

According to Markard & Truffer (2008), technological innovation system is a collection of networks of organizations and players that work together in a particular technological area to generate, disseminate, and use different iterations of new technology. The "claims-to-action" analysis links with the TIS theory by broadening the narrow scope of TIS through focusing beyond technological innovation to encompass broader socio-environmental and ethical dimensions. The TIS framework should consider integrating concepts from Environmental, Social, Governance (ESG) to capture the complexities of claims-to-action consistency.

According to Bergek et al. (2008), the TIS framework comprises of two main components; the static components and dynamic components. The static components include actors, networks, and institutions, while the dynamic components are system functions (Bergek et al., 2008). In the study by Negro et al. (2007), there are seven (7) categories of functions namely, entrepreneurial activities, knowledge development (learning), diffusion of knowledge via networks, search guidance, formation of market, mobilization of resources and creation of legitimacy/counteract resistance to change. This paradigm is predicated on the idea that each of the seven system functions are connected and must be considered to achieve optimal system performance as shown in figure 3 below (Hekkert et al., 2007). However, one may argue that the first function is supported by the other six functions as they are responsible for fostering an environment that will encourage entrepreneurial activity (Negro et al., 2007).

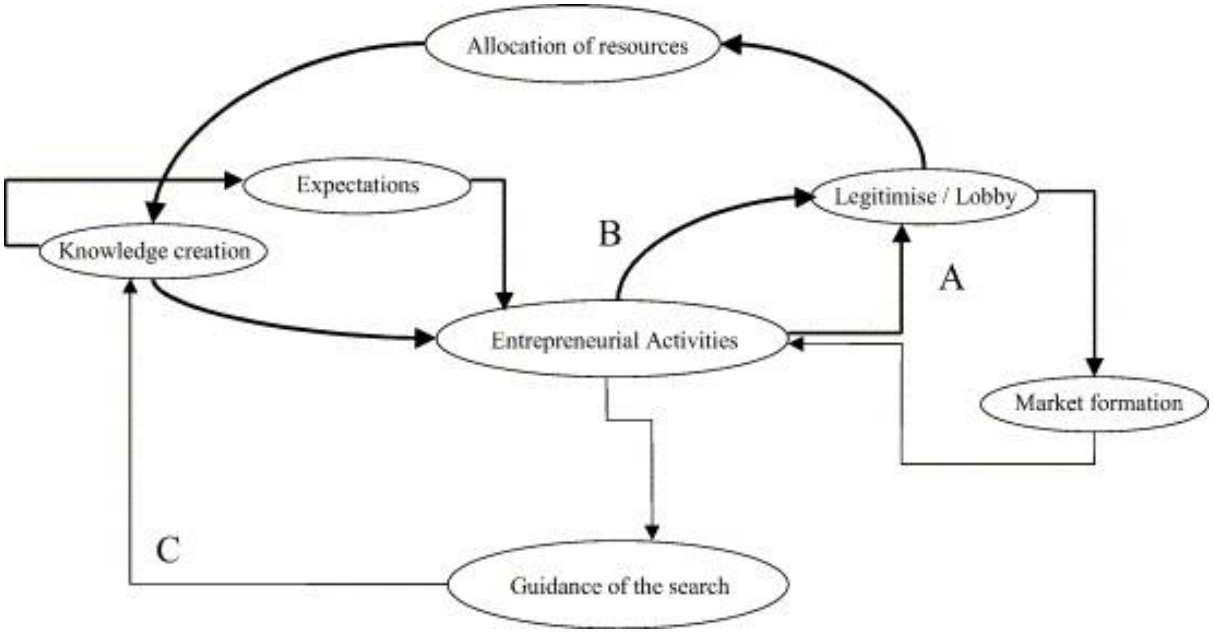


Figure 3 An illustration showing the seven categories of TIS Functions with the three motors of change (A, B, C) by Hekkert et al. (2007)

According to the research by Hekkert et al. (2007), an overview of the seven categories of the TIS system functions is elaborated below:

Entrepreneurial Activities Function: This function highlights the significance of active entrepreneurial activities in a fluid innovation system (Hekkert et al., 2007). This role may be observed in how these businesses assert to implement plans for the energy transition and new technologies in the framework of my investigation. These firms' entrepreneurship spirit is demonstrated by the harmony between their statements and their deeds. It's possible that a corporation is not as entrepreneurially active as it claims to be if it makes promises about investing in renewable technology but doesn't achieve anything noteworthy.

Knowledge Development Function: Learning processes are essential to the innovation process and are involved in knowledge development. Companies must learn new skills and modify their operations as they make the move to more sustainable energy systems (Hekkert et al., 2007). Under this function, the discrepancy between their stated learning and their actual learning might be investigated. A corporation may not have truly produced new knowledge if, for instance, it claims to have created a unique carbon capture process but does not demonstrate quantifiable reductions in its carbon footprint.

Knowledge Diffusion Function: This function, emphasizes the value of networks in the dissemination of knowledge. In order to bridge the gap between R&D, the government, competitors, and the market, networks play a critical role (Hekkert et al., 2007). How well these claims are communicated to the public constitutes to a company's openness and transparency. Insights into the organizations' information dissemination processes may be gained by contrasting their claims of partnerships, joint ventures, and collaborations with their actual networking activity. A disparity may indicate that a firm is not as network-embedded as it claims to be, which might hinder its capacity to innovate and migrate successfully.

Legitimacy Creation Function: Focuses on the role that advocacy coalitions may play in promoting the acceptance and legitimacy of new technology (Hekkert et al., 2007). This role is evident in the firms' attempts to win institutional and public support for their energy transition initiatives. When a corporation consistently follows through on its promises, it strengthens its legitimacy by displaying dependability and integrity to its stakeholders. This consistency fosters trust and improves the company's reputation, which can benefit its relationships with customers, employees, investors, and the general public. I can comprehend the firms' methods for creating legitimacy by contrasting their claimed acts with their environmental data.

Guidance of Search Function: The concept of search guidance, as a function refers to those parts of the innovation system that make it easier for technology users to see and understand what they want (Hekkert et al., 2007). This function may be carried out by a number of system elements, including business, the state, or the market. This entails engaging in a discourse regarding the trajectory of the educational process or the acquisition of knowledge (Hekkert et al., 2007).

Market Formation Function: This function entails the establishment of safeguarded environments for emerging technologies, as they frequently encounter challenges when competing against established technologies (Negro et al., 2007). This can be achieved either through the formation of temporary niche markets for specific applications of the technology or by creating a temporary competitive advantage through preferential tax regimes or minimum consumption quotas (Negro et al., 2007).

Allocation/Mobilization of Resources Function: The function of resource mobilization is crucial within the innovation system, as it requires the acquisition and allocation of both financial and human capital. These resources serve as fundamental inputs for all activities conducted within the system (Negro et al., 2007).

From the explanation above, the first four of the Technological Innovation System (TIS) functions namely: entrepreneurial activity, knowledge development, knowledge dissemination, and legitimacy creation were chosen because they best fit as a conceptual framework for analyzing the statements and actions of Saudi Aramco, Exxon Mobil, and Shell about the energy transition. The fact that this research only focuses on the alignment between the claims made by the companies under study, the actions that they take does not necessitate the use of the TIS's last three functions as described above.

It's not always simple to determine whether a company's claims or objectives line up with what it actually performs. Between a company's stated goals and its actual actions, there could be a discrepancy (Hekkert et al., 2007). Researchers, experts, and other stakeholders can learn more about what spurs or stifles innovation by examining these gaps, according to Hekkert et al. (2007), and they can also come up with practical solutions to encourage it. The discrepancy between intentions and actual behavior in the German biogas business was examined by Markard et al. (2016). The study traced the development and collapse of agricultural biogas' technological validity in Germany over the course of more than 20 years (1990–2012). The industry emerged as one of the major technologies in Germany's energy transition. However, it received harsh criticism, which has significantly reduced both public and political support. Theoretically explaining the institutional dynamics of technological innovation systems is one of the study's goals (Markard et al., 2016).

By analyzing the gap between individual aspirations and actual behavior, the study by Markard et al. (2016) aids in pinpointing the causes of creative block and generating viable remedies. Furthermore, Saudi Aramco, ExxonMobil, and Shell's reports can provide insights into various TIS components and their role in developing sustainable technologies. Bergek et al. (n.d.) highlight the challenges incumbent firms face when responding to technological discontinuities. Saudi Aramco, ExxonMobil, and Shell's implementation track record compared to their claims can be analyzed within this context. It would be interesting to investigate how these three oil giants have responded to technological disruptions and whether they have embraced or resisted new sustainable technologies. Bergek et al., (2008) has explored the intersection of TIS theory and studies on company claims in the energy sector, emphasizing the importance of understanding the influence of different stakeholders on energy transitions and the potential for companies to use sustainability claims for greenwashing. Analyzing Saudi Aramco, ExxonMobil, and Shell's TIS at different levels, such as the firm level, industry level, and wider socio-economic context and comparing them with each other,

could provide a comprehensive understanding of their transition claims towards sustainability (Markard et al., 2012).

This research can provide light on these three-energy company's TIS in promoting sustainable technology and assist in determining whether its implementation history matches its transition claims (Bergek et al., 2008). The study also leverages the Technological Innovation System (TIS) as a framework to dissect and evaluate the transformation processes of major energy corporations such as Saudi Aramco, ExxonMobil, and Shell in a global energy transition context.

To sum up, using the TIS framework as a heuristic, the framework can help evaluate Saudi Aramco, Exxon Mobil, and Shell's implementation history in relation to the creation of their transition claims. This examination can shed light on the viability and track record of Saudi Aramco, ExxonMobil, and Shell's transition promises. This study can also help analyze Saudi Aramco, ExxonMobil, and Shell's TIS and pinpoint the opportunities and challenges for the advancement of sustainable technology. The TIS framework can also provide insights into the broader systemic and institutional factors shaping the energy transition efforts of these corporations.

3 METHODOLOGY

This study's research approach combines desk research and case studies, both approaches have been used to discover information on strategies with actions and to learn more about technological innovation systems. It should be emphasized that a case study analysis approach aims to gain a thorough understanding of any number of items or processes that are limited by space and time. A limited number of research components, extensive data gathering and a carefully chosen strategic sample are the defining features of this method of research (Verschuren et al., 2010).

3.1 Case Selection

Intriguing case studies from Saudi Aramco, ExxonMobil, and Shell are available for analyzing the correlation between the expansion of their energy transition claims and the effectiveness of their implementation efforts. The shift to low-carbon energy systems is a general industry trend that is best represented by these three energy behemoths (Gryphon, 2017). Their varied experiences offer a study of how closely their actions match their claims, as well as insight into the difficulties and possibilities presented by this transition.

Saudi Aramco, ExxonMobil, and Shell are better categorized as "extreme" situations than as "typical" ones, as Seawright & Gerring (2008) would characterize representative examples within a wider group. An extreme example, according to Seawright & Gerring (2008), is a unique or exceptional occurrence that greatly deviates from the norm. The aforementioned businesses are exceptional in this context because of their tremendous financial resources, market sway, and size of operations.

It was purposeful to concentrate on these extreme examples. The size of these businesses' operations and their significant impact on the global energy market offer vital insights into the dominant strategies and practices in the industry. Furthermore, they set industry standards and raise expectations for other participants in the area with their reactions to international demands for energy transition and sustainability.

Investors, researchers, and decision-makers from all around the world are closely monitoring these oil companies' advancements in the development of low-carbon energy systems. Although the conclusions from these extreme situations might not directly apply to other

energy industry businesses, they provide important lessons regarding the advantages and disadvantages of implementing comprehensive energy transition programmes at the highest levels of company operation.

This thesis explores the claims and ESG (environmental) data of the three companies; Saudi Aramco, ExxonMobil and Shell for the 3-year period from 2019 to 2021. This decision was reached upon due to the availability of data for the aforementioned years. Aside from Shell, the other two companies Saudi Aramco and ExxonMobil had insufficient data for the period before 2019 and the period after 2021. Hence the choice of the selected period.

Table 1 A tabulated form of an overview Saudi Aramco, ExxonMobil, and Shell case selection

Topic	Description
Method	Extreme case
Company	Saudi Aramco, ExxonMobil, and Shell Plc
Purpose of the study	To represent companies transitioning to low-carbon energy systems and to compare Saudi Aramco, ExxonMobil, and Shell's implementation records to each other and those of other companies.
Objective	Saudi Aramco, ExxonMobil, and Shell's experience can provide insight into the transition to low-carbon energy systems.
Transition tactics	Investing in renewable energy, getting out of the fossil fuel business, environmental initiatives and carbon capture and storage

The value of Saudi Aramco, Exxon Mobil, and Shell in this study resides in their capacity to offer corroborating evidence to test or examine the mechanisms that can support or refute a particular notion. For instance, Shell bases its statements about its transition on a specific set of tactics, such as investing in renewable energy, getting out of the fossil fuel business, and carbon capture and storage (Shell, 2022b) . If Saudi Aramco, ExxonMobil, and Shell's strategies help their company reach their transition goals, experts will learn more about how

businesses can make the change to a more sustainable and low-carbon future. This may give insights and lessons that can be used by other companies and industries that are having the same kinds of problems. A brief description of the three oil and gas majors is given below.

Saudi Aramco

Description

Founded in Saudi Arabia in 1928, Saudi Aramco is now a multinational energy and petrochemical conglomerate. Saudi Aramco was initially founded in 1933 (Aramco, 2022). The oil industry is crucial to the Saudi Arabian economy as the world's biggest oil producer and exporter. Saudi Aramco is a government-owned company in the Kingdom of Saudi Arabia. It is a publicly traded corporation. The company operates in various nations and engages in worldwide exploration, production, refining, distribution, and marketing. Their mission is to contribute to the economic diversification of the kingdom by providing a steady supply of energy to promote global economic development (Aramco, 2022). The company aims to maximize profits from hydrocarbon resources and products while maintaining the highest ethical behaviour and environmental responsibility standards.

ExxonMobil Company

Description

ExxonMobil was founded in 1870. ExxonMobil was formed in 1999 due to a series of mergers and acquisitions by the firm. It was based in the USA and now has its headquarters in Irving, Texas (Exxonmobil, 2023). The company's global reach, with offices on six different continents. It does business in exploration, production, refining, and marketing in various countries. The company's ultimate goal is to become the world's preeminent supplier of energy and chemical goods, which is critical to fostering global prosperity, raising global living standards, and satisfying the globe's insatiable need for power (Exxonmobil, 2023). Its goal is to sustainably provide the energy and chemicals that power the global economy. The company's top priorities are safe and efficient exploration, production, and distribution of energy resources (Exxonmobil, 2023). The company operates in several facets of the energy sector, including oil and gas exploration and production, petroleum refining and marketing, and chemical manufacturing. The values of safety, environmental responsibility, and technical advancement inform the company's activities.

In 2022, the oil and gas giant ExxonMobil made headlines by declaring that it aimed to eliminate all greenhouse gas emissions by the year 2050. Their corporate approach seems to

now be more aligned with international efforts to tackle climate change, representing a significant shift toward energy transition (Exxonmobil, 2023). The corporation has recognized the need to address climate change fears.

The US Supreme Court dismissed ExxonMobil's and Chevron's appeals in the US climate lawsuit in April 2023, where plaintiffs claim that ExxonMobil and other fossil fuel producers concealed the dangers of global warming from the general public and contributed to the problem by emitting greenhouse gases (Mindock et al., 2023). Due to this judgment, cities, states, and environmental organizations brought several cases against significant oil giants that were permitted to go forward in lower courts (Mindock et al., 2023). ExxonMobil's activities and potential environmental effects have been the topic of much discussion and investigation. Because its operations include mining and burning fossil fuels, its detractors say the firm is mostly to blame for releasing greenhouse gases into the atmosphere (Mindock et al., 2023).

Shell

Description

The Shell Oil Company, or simply Shell, is a multinational corporation operating worldwide in the oil and gas industries. Shell PLC formerly, Royal Dutch Shell is one of the world's major oil firms, and Shell Oil Company is one of its subsidiaries (Shell Global, 2022). The firm was founded by Marcus Samuel in 1833 when he opened a store in London specializing in the sale of seashells. This venture gradually grew into an antiques and seashells import trading business. Shell PLC is now an Oil & Gas company headquartered in the United Kingdom (Shell Global, 2022). It has a considerable presence in Europe, the Americas, Asia, Africa, and Oceania, where it works in several nations. Shell's goal is to provide for the increasing global need for energy in a way that is both responsible and sustainable. Their mission is to deliver low-cost, dependable electricity while reducing their environmental footprint and preparing for a low-carbon future (Shell Global, 2023). Shell achieves its goals via technology advancement, operational efficiency, and social responsibility. The need to curb greenhouse gas emissions and meet the rising demand for renewable energy sources was not lost on the corporation. Under its energy transition plan, Shell pledges to eliminate all emissions from its energy operations by 2050 at the latest (Shell, 2021).

Shell's decision to change course was motivated by several considerations. First, there is a growing consensus that addressing climate change is a top priority for governments, investors, and the general public (Shell, 2021). Companies like Shell have been compelled to reevaluate their practices and realign with a low-carbon future due to the international agreement to keep global warming well below 2 degrees Celsius, as outlined in the Paris Agreement (Shell, 2021). Companies like Shell can now take advantage of the growing market for sustainable energy thanks to falling prices and improvements in renewable technology.

A Dutch environmental organization, Friends of the Earth, or Milieudefensie filed suit against Shell, claiming the oil giant's climate change-related actions breached Shell's duty of care and represented a danger to human rights in 2021 (Anjli Raval, 2021). The Dutch court sided with Milieudefensie in May 2021, issuing an injunction against Shell, demanding a 45 per cent reduction in carbon emissions from the company by 2030 compared to 2019 levels (Meredith, 2022). The company allegedly failed to connect its business model with the aims of the Paris Agreement. According to the complaint, it made false statements about its intentions to address climate change risks (Meredith, 2022). In the energy transition context, this case illustrates the rising scrutiny that fossil fuel businesses are under.

3.2 Data Collection

Data collection for the proposed research study came from secondary research. The secondary data of this research compares the claims Saudi Aramco, ExxonMobil, and Shell make in their sustainability and energy transition reports, with their Environmental data in order to gather information on how each company's implementation record relates to the development of their transition claims. Particularly, this study focuses on these three companies; Saudi Aramco, Exxon Mobil, and Shell because they are the three largest oil and gas companies in terms of revenue and location as they are each located in three different continents; Asia, USA, and Europe respectively, across the globe. This selection gives a different and broad perspective as well as a form of balance. This helps to understand the developments in the oil and gas industry's energy transition claims. ESG environmental data are statistics that businesses provide to show their dedication to sustainability and corporate responsibility. This will involve examining reviews on Saudi Aramco, ExxonMobil, and Shell’s environmental impacts in comparison with each company’s energy transition claims both individually and collectively (Raufflet et al., 2014).

ESG environmental data was gathered from Refinitiv Eikon ESG Environmental data. These resource offers thorough and somewhat trustworthy information on the ESG performance of businesses. I have paid close attention to the following signs in particular:

- Emissions of carbon and flaring: In this section, I looked at Saudi Aramco, ExxonMobil, and Shell's carbon emissions and flaring, and contrasted them with their stated goals and commitments to reducing carbon emissions.
- Investment in low-carbon energy sources: I also examined Saudi Aramco, ExxonMobil, and Shell's fossil fuel withdrawal, low-carbon programmes participation, technologies or initiatives towards lower carbon emissions and then compared it with their statements about doing so.
- Investment in renewable energy: I examined Saudi Aramco, ExxonMobil, and Shell's involvement and spending on renewable and contrasted it with their statements about switching to renewable energy sources.
- Environmental Initiative: Here, I looked at Saudi Aramco, ExxonMobil, and Shell's investment towards environmental remediation, partnerships', programmes, and the transition plan / timeframe, and compared it to the companies' assertions on their environmental initiatives.
- Carbon capture and storage / Carbon Capture, Utilization, and Storage: In this section, I looked through the three-year environmental ESG data of Saudi Aramco, ExxonMobil, and Shell's to know their investment in this technology in order to compare it to the companies' assertions on CCS or CCUS.

I analyzed Saudi Aramco, ExxonMobil, and Shell's annual reports, sustainability reports and energy transition progress reports as shown in table 2 below, in addition to gathering ESG environmental data to learn more about their transition claims and strategies. To ascertain whether they have been effective in putting their transition plans into action, I examined their claims and tactics and compared them to their Environmental data.

Table 2 Showing the different reports analyzed for each company's Energy Transition Claims

Company	**2019 Data Source**	**2020 Data Source**	**2021 Data Source**

Saudi Aramco	2019 Summary Annual Report	Saudi Aramco Annual Report 2020	Saudi Aramco Sustainability Report 2021
ExxonMobil	ExxonMobil Annual Report 2019	ExxonMobil Annual Report 2020	ExxonMobil 2021 Annual Report
Shell	Shell Sustainability Report, 2019	Shell Sustainability Report 2020	Shell Energy Transition Progress Report 2021

3.3 Data analysis

In order to look into the claims and deeds of Saudi Aramco, ExxonMobil, and Shell, the data analysis for this research was carried out utilizing a qualitative methods approach, integrating aspects of qualitative analysis. Here is a summary of the data analysis I performed:

Report Examination

An extensive qualitative examination of each company's annual and sustainability reports from 2019 to 2021 was done as the first part of the research. The parts addressing environmental measures, carbon emissions and flaring, Investment for renewable energy projects, low carbon investments, environmental initiatives and Carbon Capture, Utilization, and Storage (CCUS) caught my interest in particular.

I gathered pertinent data with a focus on the firms' claims or statements on their activities, goals, and commitments towards sustainability and energy transition by methodically underlining significant passages pertaining to these themes. In order to retain an unbiased perspective, I scrutinized developments throughout the course of the three years as I compared these statements to the information supplied in the reports. For further investigation, instances where the statements made by the firms and the facts, they presented did not match up were carefully documented.

Environmental Data Analysis

Using the Environmental, Social, and Governance (ESG) data from the Refinitiv Eikon database, I looked through the environmental data of Saudi Aramco, ExxonMobil and Shell with the various or different categories and selected the data pertaining to my research for 2019 to 2021. This analysis encompassed an examination of these companies across five distinct aspects for the 3-year period as explained bellow:

- Carbon emissions: In other to get the environmental data points on carbon emissions, I looked at categories such as target emissions, CO2 emissions into scope 1, 2, and 3, the measurement of CO2 emissions in terms of revenue per million dollars, absolute emissions within scope 1 and 2, as well as the emissions intensity within these scopes.
- Lower emissions investment: I looked at the data on responsible usage of products with regards to their environmental impact, as well as the disengagement from fossil fuel-related activities.
- Methane and Flaring Reduction: There was no category on methane environmental data, so I only focused on flaring gases category.
- Investments in renewable resources: I looked through categories such as environmental innovation category, renewable/clean energy products, total renewable energy, total renewable energy used, purchased, and produced.
- Environmental initiatives: Categories including environmental restoration initiatives, environmental investment initiatives, transition plan time horizon coverage, transition plan offsets were focused on.
- CCUS: I searched through Refinitiv Eikon ESG and environmental data site but could not find any category on Carbon Capture and Storage (CCS). Therefore, CCUS of the three businesses' environmental data cannot be studied in this research.

I copied the tables with all the pertinent information for each business, making comparison and analysis simple and created a personal spreadsheet for my analysis. I tracked the changes in this data from 2019 to 2021, looked for any noteworthy trends or patterns, and compared the environmental performance of each firm to that of the others.

Claims-to-Action Consistency

I created a "Claims-to-Action Consistency" study using the qualitative information from the reports and the quantitative information from the ESG environmental measures. This was accomplished by contrasting the claims made by the businesses in their reports with the

information found in their ESG environmental ratings. The gaps between claimed promises and actual progress were identified and further scrutinized for any contradictions or inconsistencies.

Using this extensive data analytic technique, I was able to analyze and contrast the corporations' statements, reports, and consistency across time, providing a thorough analysis of their claims of contributions to the energy transition. A fair and thorough examination of both the stories these corporations provide, and their effects was made possible by the qualitative methodology.

3.4 Positionality

Being a Nigerian, I have personally witnessed the effects of the top oil and gas majors' operations on the environment and society. This energy-related personal experience may have an impact on how I view the company's policies and how they affect the community at large. Additionally, having a professional energy story that focuses on the technical side of the oil sector and any potential environmental and health concerns connected to it, owing to my academic background in microbiology and work as a Health, Safety, and Environment officer.

Having acquired the skills needed to evaluate Saudi Aramco, ExxonMobil and Shell's transition claims and their potential effects on society and the environment owes to a master's program in environmental and energy management. However, the personal and professional energy experiences could also influence the topics, methods, and conclusions of this study. To make sure that the research is critical and reflexive, and conclusions are fair and objective, it is crucial to be conscious of these biases.

In general, my viewpoint is multifaceted and impacted by personal and professional energy experiences as Saudi Aramco, ExxonMobil and Shell's implementation track record and transition claims are investigated. Recognizing these factors is crucial which seeks for objectivity in this research.

4 RESULTS

In the following section I am going to answer my main research with my two sub questions. I will first list and explain Saudi Aramco's claims regarding the energy transition for the three-year period of 2019 to 2021, then I will discuss the company's environmental history using ESG environmental data from Refinitiv eikon and compare the claims to the company's environmental data. The process would be repeated for ExxonMobil and Shell. Lastly, I will then compare the claims of all three companies to their environmental data.

4.1 Saudi Aramco Energy Transition Claims

4.1.1 Investment in Lower-Emission Initiatives and Carbon Intensity Reduction

In Aramco's 2019 annual report, to tally up all of the Scope 1 and Scope 2 greenhouse gas emissions that the business is responsible for; create relevant KPIs and find actions that might additionally decrease the low carbon intensity of the system: and facilitate required reporting based on industry standards, the company asserts that it has set up a programme to manage GHG emissions. According to the company, its Scope 1 and Scope 2 GHG emissions in 2018 were 46.6 and 14.7 million metric tons of CO2e, while its Scope 1 and Scope 2 GHG emissions in 2019 decreased to 44.7 and 13.2 million metric tons of CO2e, respectively (Saudi Aramco, 2019).

Aramco declared the following greenhouse gas emissions in its 2020 annual report after the company expanded its reporting boundaries for GHG emissions in 2019 to include affiliates under its operational control, such as SASREF, Motiva, and ARLANXEO. Scope 1 emissions were 52.0 in millions of metric tonnes of CO2 equivalent, scope 2 emissions were 19.0 in millions of metric tonnes of CO2 equivalent, and upstream carbon intensity was 10.4 in millions of metric tonnes of CO2 equivalent/boe, different from what was published in its 2019 annual report. Upstream carbon intensity in 2020 is disclosed to be 10.5 in millions of metric tonnes of carbon dioxide equivalent per barrel of oil equivalent (kg CO2 e/boe), with Scope 1 emissions totaling 49.1 in millions of metric tonnes of CO2 equivalent and Scope 2 emissions totaling 17.9 in millions of metric tonnes of CO2 equivalent. (Saudi Aramco, 2020).

In Aramco's 2021 sustainability report, it recorded its Scope 1 emissions (in million tons of CO2e) at 52.3, a rise of 4% from the previous year, which Aramco attributed to the start-up of the Fadhili Gas facility. Its Scope 2 emissions (in million tons of CO2e) were reported to be 15.5 and reduced by 14% from the prior year as a result of a switch in electricity consumption derived from external sources compared to that generated by a company-owned power generation facility. Aramco asserts that it would continue to hold a dominant position in the industry in terms of upstream carbon intensity (kg of CO2e/boe), having the lowest worldwide average among big producers of oil and gas in 2021 at 10.7 kg of CO2 equivalent per barrel of oil equivalent (boe). It goes on to say that the minor increase from 2020 was caused by an increase in the proportion of gas produced overall as well as the greater carbon intensity footprint of gas production in relation to oil production (Saudi Aramco, 2021).

Under expansion of Low Carbon Solutions, according to Saudi Aramco, a Low Carbon Solutions (LCS) business unit was established in early 2021 to assist in reducing emissions from our operations and advance vital technical solutions for reducing emissions, including carbon capture and storage, hydrogen, biofuels, ground-breaking energy-efficient procedures, advanced energy-saving materials, and other technologies. The three sectors of the economy that are highly energy-intensive and pose significant challenges in decarbonization, namely manufacturing, electricity production, and transportation, require implementing these technologies to mitigate emissions effectively. It goes on to say that the business is working on technology that reduce emissions, such as direct air capture, which uses cutting-edge materials to remove CO2 from the environment (Saudi Aramco, 2021).

4.1.2 Methane and Flaring Reduction

According to Saudi Aramco (2019), the Company asserts its commitment to mitigating the environmental impact of its operations and assets in 2019. To achieve this goal, the Company has implemented several measures, including the deployment of flare gas recovery systems, initiatives to enhance energy efficiency, programmes to detect and repair leaks, and an assessment of the feasibility of utilizing carbon dioxide in diverse applications, such as enhanced oil recovery. Furthermore, the Master Gas System (MGS), responsible for supplying gas to the Kingdom's electric generating facilities and its rapidly growing petrochemical

industry, experienced a notable increase as indicated in its 2019 annual report. It is argued that the development of the MGS has not only contributed to the promotion of national economic growth but has also effectively mitigated the Company's environmental impact and greenhouse gas (GHG) emissions associated with flaring (Saudi Aramco, 2019).

In a manner consistent with its reporting of greenhouse gas (GHG) emissions, the organization has expanded its coverage of flaring activities in the year 2019 to encompass SASREF, Motiva, and ARLANXEO. This expansion has led to a modification in the reported flaring intensity for the year 2019, measured in standard cubic feet per barrel of oil equivalent (scf per boe), from 5.54 to 5.88. Based on the findings presented in the report, it was observed that a decline in output resulted in an increase in the flaring intensity1 (standard cubic feet per barrel of oil equivalent) to a value of 5.95 in the year 2020. Conversely, the upstream methane intensity4 (%) remained unchanged at a level of 0.06. (Saudi Aramco, 2020).

It mentions a commitment to OGCI near zero upstream methane intensity by 2030, 2019 commitment to World Bank Zero Routine Flaring by 2030, LDAR (Leak Detection and Repair) Program and UAV and satellite methane detection (Saudi Aramco 2021). The company asserts that because of its continued efforts to reduce leaks and emissions, its 2021 flaring intensity was lower than its 2020 performance. It went on to say that the amount of gas that was flared reduced from 26,9951 million standard cubic feet (mmscf) in 2020 to 25,8252 mmscf in 2021, accounting for less than 1% of the production of raw gas (Saudi Aramco, 2021).

4.1.3 Renewable Energy Investments

Aramco claims in its 2019 annual report that it is installing renewable energy systems in corporate and industrial properties, including production wells and bulk units. For instance, the company set up the first wind turbine in the Kingdom at the Turaif Bulk Plant in January 2017. The company also states that it has set up a 10.5 MW power-generating solar panel system for parking lots that spans an area of 100,000 square meters (Saudi Aramco, 2019).

According to the firm, it is assisting in the development of efficient, cost-effective, and low-emitting transportation propulsion systems, including Mobile Carbon Capture (MCC), alternative engine topologies, new combustion techniques, and low-impact fuels. Aramco asserts that it made a big advancement toward sustainable hydrogen use in 2020 by shipping the first shipment of blue ammonia to Japan for use in zero-carbon power production (Saudi Aramco, 2020).

To maximize the capacity of its hydrogen and ammonia plants in Jubail, it further declares it is already working to study market potential, demand, and future volumes (Aramco Sustainability Report 2021). In support of the KSA National Renewable Program, the business claims to have invested in 12 gigawatts (GW) of solar and wind projects, as well as affiliate investments in renewables (Motiva, Arlanxeo, and SASREF) and to have bought Renewable Energy Certificates (REC). It says that in 2021 it acquired a 30% stake in the 1.5 GW Sudair solar PV project, the first phase of which is scheduled to start generating electricity in the second half of 2022. Moreover, the organization mentions it has procured certificates attesting to its utilization of renewable energy sources and perpetually seeks fresh prospects to invest in sustainable initiatives (Saudi Aramco, 2021).

4.1.4 Environmental Initiative and Carbon Capture, Utilization, and Storage (CCUS)

According to Aramco, the company is actively engaged in research and development activities pertaining to cutting-edge technologies. These technologies include novel thermal and catalytic crude-to-chemicals processes, in addition to one-of-a-kind solutions for carbon capture, utilization, and storage (CCUS) for both stationary and mobile sources. (Saudi Aramco, 2019).

Aramco claims to have made progress on its CO2 Enhanced Oil Recovery initiative, which aims to sequester CO2 and improve oil recovery, as well as the development of TeraPOWERS, a next-generation reservoir and basin simulator that enhances reservoir management. It still uses cutting-edge techniques to make chemicals straight from oil, such as developing thermal and catalytic crude-to-chemicals technology (Saudi Aramco, 2020).

According to Saudi Aramco, it has identified important resources and performed feasibility studies to develop efficient Carbon Capture, Utilization, and Storage (CCUS) solutions. By capturing carbon dioxide emissions and using or storing them underground, they intend to minimize greenhouse gas emissions, according to their report (Saudi Aramco, 2021). These assertions, however, are a part of a wider discussion about whether CCUS could be deployed quickly enough to considerably reduce greenhouse gas emissions, as well as its viability and efficacy on a global scale (Saudi Aramco, 2021).

While reiterating its dedication to the energy transition, Aramco has continued to draw attention to advancements in the domain of exploring oil and gas. For example, it lists the creation and testing of autonomous underwater vehicles meant to automate the collecting of seismic data as well as the use of GeoTracks technology, which it claims enhances the resolution and accuracy of basin and reservoir models (Saudi Aramco, 2021).

But it's crucial to approach these claims with skepticism. It is crucial to take Aramco's assertions about its goals, necessary resources, and innovative technology for what they are: assertions. Even if they might suggest a dedication to environmental stewardship, they should be critically examined in light of the more significant scientific and political concerns surrounding CCUS technology and the future of fossil fuels. It would be crucial to offer more details and evidence to back up these claims and assess how effectively they relate to the greater goal of a sustainable energy transition.

4.2 Saudi Aramco Environmental Data

Overview

For the fiscal year ending in December 2021, the ESG score for Saudi Arabian Oil Co (2222.SE), an Oil & Gas firm headquartered in Saudi Arabia, was 42.96 (Grade: C+) out of a total of 100 percent which translates to an average score, as seen in figure 4. below. Figure 5 shows Saudi Aramco had a consistent C+ score from 2019 to 2021, although, the company’s environmental pillar score which was a B- from 2019 to 2020 declined to a C+ in 2021. Refinitiv derives this ESG score by combining the relative importance of several measures of environmental performance, social responsibility, and corporate governance (Revinitiv, 2023)

The firm has received an ESG score of 40.20 (C+) on average over the previous five years, with a median value of 43.36. These ratings represent how the firm does compare to its competitors regarding ESG factors. The average score for the Environmental pillar was C+ (53.66 out of a 100), while the number of conflicts surrounding the corporation is relatively low, with a score of 77.56 with lower grade of A- in 2020-2021 compared to a higher grade A+ achieved in 2019 as seen in figure 5 below. The firm's market capitalization was used to normalize the score. In figure 6, the company ranks 155 out of 266 amongst its oil and gas peers globally relating to Saudi Aramco's ESG score (Refinitiv, 2023).

Figure 4 Saudi Arabian Oil Co ESG score Summary for the year end December 2021 (Refinitiv, 2023).

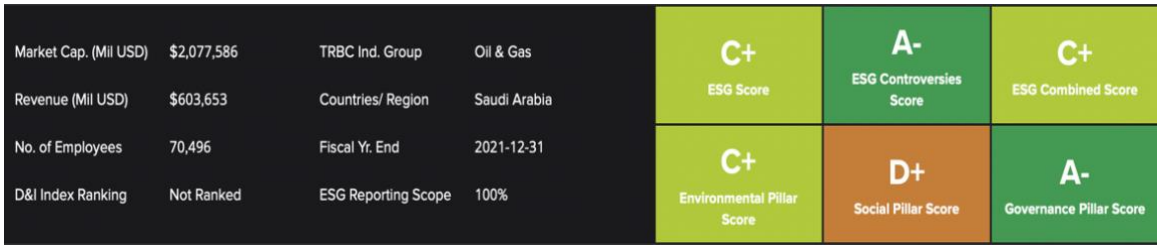
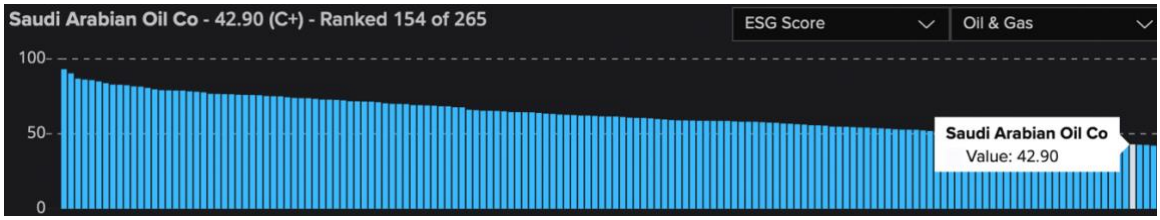


Figure 5 Saudi Arabian Oil Co ESG score Summary for 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Period Status	Complete	Complete	Complete
ESG Combined Score	C+	C+	C+
ESG Score (Weight: 100.0%)	C+	C+	C+
Environmental Pillar Score (Weight: 34.5%)	B-	B-	C+
Social Pillar Score (Weight: 42.0%)	D	D	D+
Governance Pillar Score (Weight: 23.5%)	A-	A-	A-
ESG Controversies Score	A+	A+	A-

Figure 6 Saudi Arabian Oil ranked 155 amongst Oil & Gas Companies Worldwide (Refinitiv, 2023).



4.2.1 Carbon Emissions and Flaring

Saudi Aramco has publicly stated its intention to reduce its carbon footprint in light of the growing awareness of the need to manage carbon emissions. It can be seen in figure 7 below that fulfilling its emissions claims for 2021 is true in target emissions which means the company set targets or objectives to be achieved on emission reduction (in scope are the short-term or long-term reduction target to be achieved on emissions to land, air or water from business operations), while that of 2020 and 2019, false meaning the company did not meet up to expectation (Refinitiv, 2023). Saudi Aramco's total carbon equivalent emissions per millions revenue ($) appear to have decreased each year from 2019 to 2021 accordingly as seen in figure 8. Even though the company had a constant decrease in its 2019 to 2021 total CO2 emissions, its emissions intensity for the year 2020 appeared to have risen from the previous year 2019 with a decrease in 2021 as shown in figure 8 and 9.

Figure 10 shows scope 1 and 2 absolute emissions score of 7.61% between the years 2020 and 2021 and a slight decrease from 7.61% to 7.37% between the years 2019 and 2020 and a major decrease from 7.37% to 1.79% between the years 2018 and 2019. On the other hand, the company's scope 1 and 2 emissions intensity 2021-2020 dropped significantly with a positive score of -38.25% but tremendously rose by 54.11% between the years 2019 and 2020 and showed a decrease of 10.86% between the years 2018 and 2019 as shown in figure 11.

Figure 7 Saudi Aramco's Emissions Target for 2019 to 2020 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Targets Emissions	FALSE	FALSE	TRUE
Emission Reduction Target Percentage	--	--	100.00%
Emission Reduction Target Year	--	--	2050

Figure 8 Saudi Aramco's CO2 Emissions and Flaring for 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Biodiversity Impact Reduction	TRUE	TRUE	TRUE
Estimated CO2 Equivalents Emission Total	62,400,000.00	67,000,000.00	72,100,000.00
CO2 Estimation Method	Reported	Reported	Reported
Total CO2 Emissions / Million in Revenue $	189.24	291.56	180.22
CO2 Equivalent Emissions Total	62,400,000.00	67,000,000.00	72,100,000.00
CO2 Equivalent Emissions Direct, Scope 1	52,000,000.00	49,100,000.00	55,000,000.00
CO2 Equivalent Emissions Indirect, Scope 2	10,400,000.00	17,900,000.00	17,100,000.00
CO2 Equivalent Emissions Indirect, Scope 3 T...	--	--	--
CO2 Equivalent Emissions Indirect, Scope 3	--	--	--
Carbon Offsets/Credits	--	--	--
Emissions Trading	FALSE	FALSE	FALSE
Cement CO2 Equivalents Emission	--	--	--
Climate Change Commercial Risks Opportunit...	TRUE	TRUE	TRUE
Flaring Gases To Revenues USD in million	--	--	--
Flaring Gases	--	--	--

Figure 9 Saudi Aramco's Absolute Emissions and Emissions Intensity 2019 -2021 (tonnes CO2e/$M) (Refinitiv, 2023).

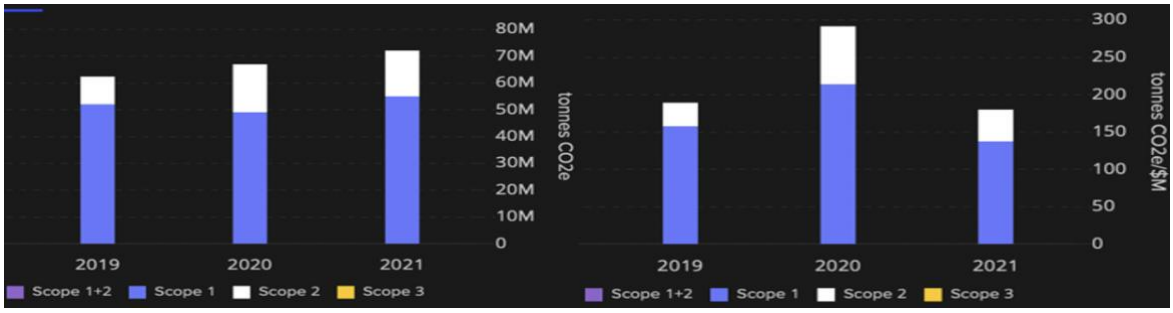


Figure 10 Saudi Aramco's Absolute Emissions 2018-2019 to 2020-2021 (%) (Refinitiv, 2023).

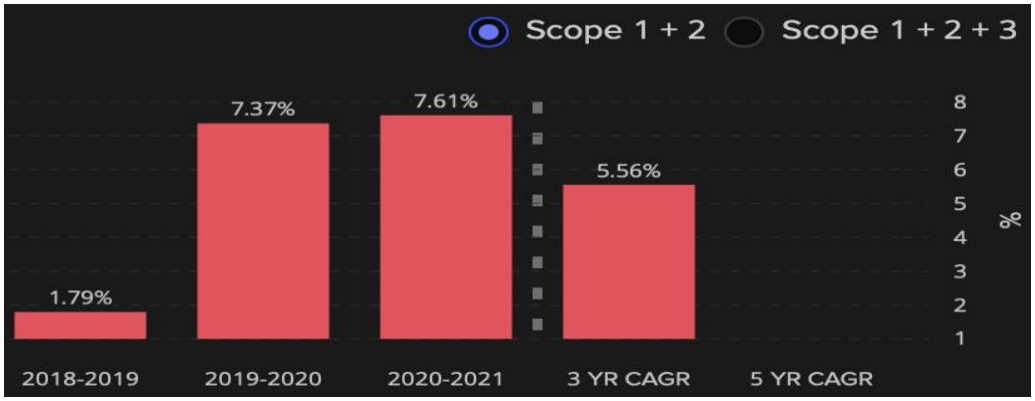
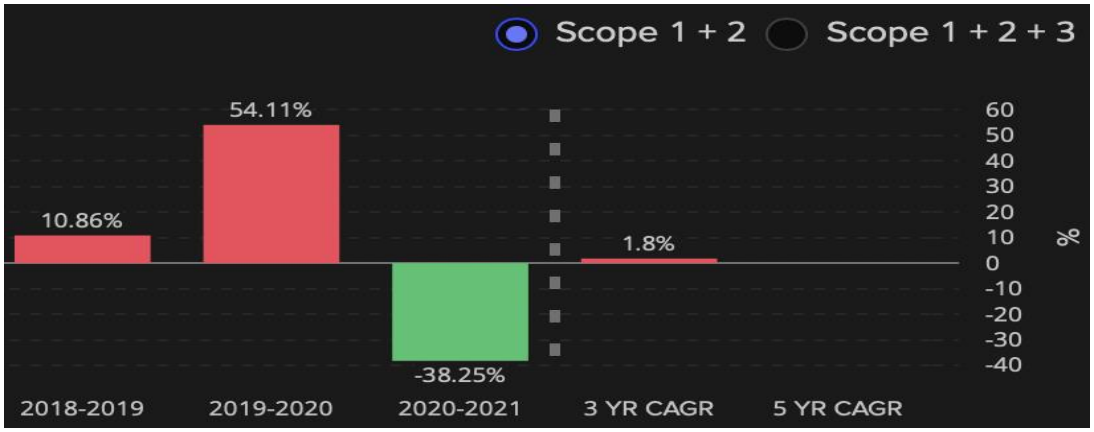


Figure 11 Saudi Aramco's Emissions Intensity 2018-2019 to 2020-2021 (%) (Refinitiv, 2023).

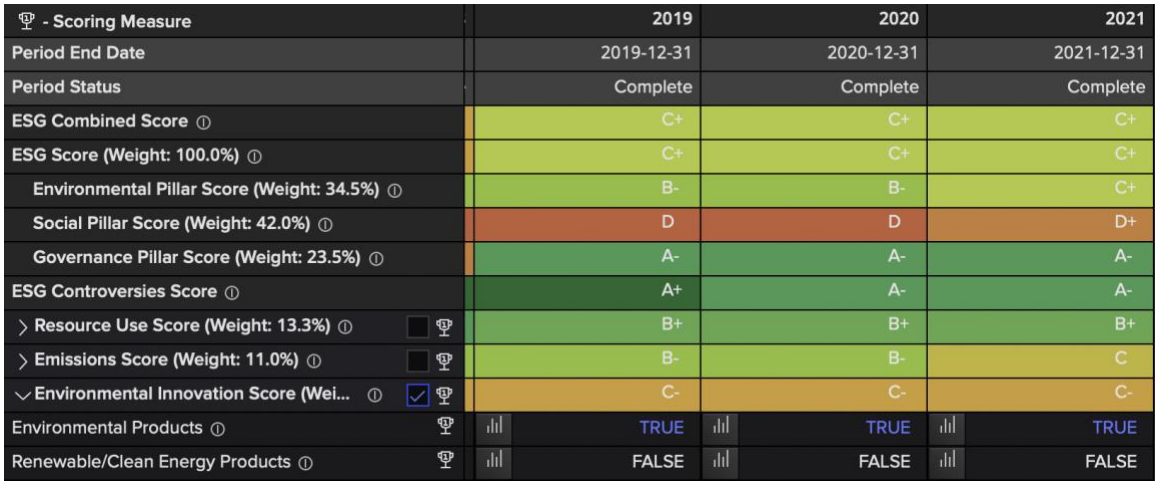


4.2.2 Investment in Renewable Energy

Saudi Aramco has indicated an interest in diversifying its energy portfolio by investing in renewable sources, recognizing the worldwide trend toward this kind of energy (Revinitiv, 2023). Aramco maintains a constant score of grade C- for the period of 2019 to 2021 in the environmental innovation category (score reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products) as seen in figure 12 below.

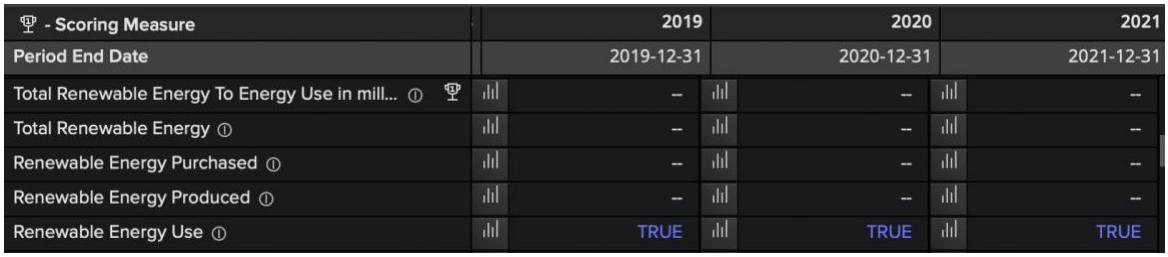
However, it is given a "false" all through 2019 to 2021 as shown in figure 12 and 13 under the "renewable/clean energy products" category, which assesses whether the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power) and in scope, includes data on the financing of renewable energy projects as well as if a utility company is deriving at least 25% of the power produced or revenue from clean technologies or energy. This means Saudi Aramco did not deliver on its renewable energy investment claims, according to refinitiv. Data regarding Aramco's total renewable energy to energy use in millions, total renewable energy, renewable energy purchased and produced are not available as seen in figure 13.

Figure 12 Saudi Aramco's Renewable Energy Involvement Assessment (Refinitiv, 2023).



- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Period Status	Complete	Complete	Complete
ESG Combined Score	C+	C+	C+
ESG Score (Weight: 100.0%)	C+	C+	C+
Environmental Pillar Score (Weight: 34.5%)	B-	B-	C+
Social Pillar Score (Weight: 42.0%)	D	D	D+
Governance Pillar Score (Weight: 23.5%)	A-	A-	A-
ESG Controversies Score	A+	A-	A-
Resource Use Score (Weight: 13.3%)	B+	B+	B+
Emissions Score (Weight: 11.0%)	B-	B-	C
Environmental Innovation Score (Wei...	C-	C-	C-
Environmental Products	TRUE	TRUE	TRUE
Renewable/Clean Energy Products	FALSE	FALSE	FALSE

Figure 13 Saudi Aramco's Renewable Energy Assessment (Refinitiv, 2023).



- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Total Renewable Energy To Energy Use in mill...	--	--	--
Total Renewable Energy	--	--	--
Renewable Energy Purchased	--	--	--
Renewable Energy Produced	--	--	--
Renewable Energy Use	TRUE	TRUE	TRUE

4.2.3 Investment in Low-Carbon Sources

Saudi Aramco claims it recognizes the need to invest in low-carbon energy sources to combat climate change and lower emissions. Because of its smaller carbon impact, the corporation reports it is putting more emphasis on natural gas. The incorporation of natural gas into the energy mix has the potential to improve its sustainability.

Saudi Aramco maintains a "true" from 2019 to 2021 as seen in figure 14, under the "product environmental responsible use" category, which means the company reports about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use, that is, any product or service that reduces the negative impact (less emission, pollution, noise, etc) on the environment, according to refinitiv. In the fossil fuel divestment category, Saudi Aramco got a false from 2019 to 2021 meaning the company has a public commitment to divest from fossil fuel shown in figure 14 (Refinitiv, 2023b).

Figure 14 Saudi Aramco's Product Environmental Responsible Use (Less Carbon Emissions) (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Nuclear	FALSE	FALSE	FALSE
Labeled Wood	FALSE	FALSE	FALSE
Organic Products Initiatives	FALSE	FALSE	FALSE
Take-back and Recycling Initiatives	FALSE	FALSE	FALSE
Product Environmental Responsible Use	TRUE	TRUE	TRUE
GMO Products	FALSE	FALSE	FALSE
Agrochemical Products	--	--	TRUE
Agrochemical 5 % Revenue	FALSE	FALSE	TRUE
Animal Testing	FALSE	FALSE	FALSE
Animal Testing Cosmetics	FALSE	FALSE	FALSE
Animal Testing Reduction	FALSE	FALSE	FALSE
Renewable/Clean Energy Products	FALSE	FALSE	FALSE
Water Technologies	FALSE	FALSE	FALSE
Sustainable Building Products	FALSE	FALSE	FALSE
Fossil Fuel Divestment Policy	FALSE	FALSE	FALSE

4.2.4 Environmental Initiative

Saudi Aramco has shown an interest in the research, development, and implementation of environmental initiatives because of their potential for reducing carbon emissions. The company in 2019 had a "false", it received a "true" in year 2020 and 2021 in the environmental restoration initiatives category as seen in figure 15 below. This means it partially reported on company-generated initiatives to restore the environment, such as restoration, rehabilitation, clean up and remediation activities, (in this case its environmental remediation programmes, research and development) (Refinitiv, 2023).

Figure 15 also shows Aramco acquired sustained a "false in "environmental investments initiatives" for year 2019, 2020 and 2021 respectively. This means the company did not report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities (investments made in new technologies to increase future opportunities like treatment of emissions, installation of cleaner technologies) as it claimed. On environmental partnerships, it bagged a "true" in 2019 and 2020 but a "false" in 2021. This means the company delivered on its environmental partnership claims in 2019 and 2020 only (Refinitiv, 2023).

Aramco obtained a “false” in 2019 to 2021 as shown in figure 16 leading to the conclusion that for transition plan time horizon coverage, the company did not show its transition plan covered the short-term time horizon (next 5 years), medium term time horizon (next 5-15 years) and the long-term time horizon (after the next 15 years). Finally in the transition plan offsets category had a “false” from 2019 to 2021, therefore the company failed to clarify the role and type of offsets/negative emission technologies in its transition plan (Refinitiv, 2023).

Figure 15 Saudi Aramco’s Environmental Assessment 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Environmental Restoration Initiatives	FALSE	TRUE	TRUE
Staff Transportation Impact Reduction	FALSE	FALSE	FALSE
Accidental Spills To Revenues USD in million	0.00	0.00	--
Accidental Spills	0.00	0.00	--
Environmental Expenditures Investments	FALSE	FALSE	FALSE
Environmental Expenditures	--	--	--
Environmental Provisions	SAR 937,000,000....	SAR 940,000,000....	SAR 824,000,000....
Environmental Investments Initiatives	FALSE	FALSE	FALSE
Self-Reported Environmental Fines To Revenu...	--	--	--
Self-Reported Environmental Fines	--	--	--
Environmental Partnerships	TRUE	TRUE	FALSE

Figure 16 Saudi Aramco’s Environmental Assessment 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Climate Related Risks Assessment Process	FALSE	FALSE	FALSE
Transition Plan Financial Planning	FALSE	FALSE	FALSE
Transition Plan Scope 3 Emissions	FALSE	FALSE	FALSE
Transition Plan Time Horizon Coverage	FALSE	FALSE	FALSE
Transition Plan Offsets	FALSE	FALSE	FALSE

4.2.5 Carbon Capture and Storage (CCS)

There was no data or category on Carbon Capture Utilization and Storage (CCUS) / Carbon Capture Storage (CCS) for this company on the Refinitiv Eikon platform.

4.3 ExxonMobil Energy Transition Claims

4.3.1 Investment in Lower-Emission Initiatives and Upstream Carbon Intensity

ExxonMobil asserts that its dedication to managing operating emissions, producing cleaner, more cutting-edge goods, doing fundamental research into cutting-edge technology solutions, and participating in climate policy talks all contribute significantly to reducing climate risks (Exxonmobil 2019). The company claims that over the past 20 years, it has spent close to $10 billion on technology and programs to cut emissions, leading to extremely effective operations that have prevented or reduced more than 400 million tons of CO2-equivalent emissions (Exxonmobil 2019).

ExxonMobil claimed to be the world leader in capturing carbon in its annual report for the year 2020. The company also claimed to be the first corporation to have absorbed more than 120 million tonnes of CO2 since 1970 (ExxonMobil, 2020).

According to the company, it is creating solutions that target the industries with the biggest emissions by utilizing its extensive scientific knowledge. ExxonMobil asserts that it collaborates with top academic institutions, research organizations, and commercial businesses on lower-carbon energy alternatives. It states that in order to advance CCS, biofuels, and other emission-reducing technologies, the company signed agreements in 2019 with the National Labs of the US Department of Energy, the Indian Institutes of Technology (Bombay and Madras), and private sector firms Global Thermostat and Mosaic Materials (Saudi Aramco, 2021).

4.3.2 Methane and Flaring Reduction

The company says it has started field trials of eight cutting-edge methane detection systems, including satellite and aerial surveillance monitoring, at about 1,000 sites in Texas and New Mexico in order to significantly minimize methane emissions (ExxonMobil, 2019).

The company anticipated reaching the emission reduction targets set in 2018 by year's end of 2020. These included a 25 percent decrease in flaring compared to 2016 levels and a 15 percent decrease in methane emissions. With the help of these efforts, the business anticipates achieving its objective to reduce methane emissions by 15% and flaring by 25% from 2016 levels by 2020 (ExxonMobil, 2020).

ExxonMobil claims to have carried out more than 23,000 leak surveys on more than 5.2 million equipment at more than 9,500 production sites since beginning its campaign to minimize methane emissions across its unconventional activities in the United States (ExxonMobil, 2021).

4.3.3 Renewable Energy Investments

ExxonMobil's strategic focus on renewable energy in the long term appears to be primarily directed towards the advancement of advanced biofuels derived from cellulosic biomass and algae. According to the company, the development of advanced biofuels sourced from cellulosic biomass and algae, with a particular focus on meeting the demands of commercial vehicles and petrochemical sectors, has made significant progress (ExxonMobil, 2019).

In comparison to today's heavy-duty transportation fuels, biofuels, such as those made from algae, have the potential to offer the necessary energy density in a liquid form and cut greenhouse gas emissions by more than 50%. The company asserts that it is still making progress and investing in research to turn cellulosic biomass and algae into liquid fuels (biofuels) for the transportation industry (ExxonMobil, 2020).

According to ExxonMobil, it produces around 1.3 million metric tons of hydrogen annually and is considering additional strategic investments to expand up this lower-emission energy technology (ExxonMobil, 2021). It states that they are expanding their selection of biofuels to meet consumer demand and aid in society's decarbonization of the transportation industry. It asserts that its majority-owned affiliate, Imperial Oil Limited, is moving forward with plans to

produce renewable diesel at its Strathcona refinery. This production is anticipated to be around 20,000 barrels per day, and it could reduce emissions in the Canadian transportation sector by about 3 million metric tons annually (ExxonMobil, 2021).

4.3.4 Environmental Initiative and Carbon Capture, Utilization, and Storage (CCUS)

In 2019, the organization delineated its strategic focus on implementing and investing in carbon capture and storage (CCS) as its near-term goals for a low-carbon future. Simultaneously, the corporation sets its sights on long-term aspirations, which encompass conducting research endeavours to enhance the economic feasibility of CCS in power generation and industrial applications (ExxonMobil, 2019).

Additionally, the company reported that its annual carbon capture capability in 2020 amounted to around 9 million tonnes. This capacity is equivalent to approximately 40% of the total anthropogenic CO2 emissions generated by approximately 2 million cars on an annual basis. (ExxonMobil, 2020).

According to ExxonMobil's 2021 sustainability highlight report, the company claims to possess over three decades of experience in developing and implementing carbon capture and storage (CCS) technology, positioning itself as a global frontrunner in this field. The corporation has additionally indicated its contemplation of various opportunities to enhance its capacity and has disclosed its ownership of an equity investment in around 20% of the worldwide carbon dioxide capture capacity. In 2020, ExxonMobil demonstrated its continued dominance in the industry by unveiling plans to advance ten noteworthy projects focused on carbon capture and storage. The business projects that its carbon capture and storage hub located in Houston will be able to capture and securely store about 100 million metric tonnes of carbon dioxide by 2040. (ExxonMobil, 2021).

4.4 ExxonMobil Environmental Data

Overview

For the fiscal year ending in December 2021, the ESG score for ExxonMobil (XOM.N), an Oil & Gas company headquartered in the United States of America, was 75.59 (Grade: A-) out of a total of 100 percent which translates to an above average score, as seen in figure 17. below. Figure 18. shows ExxonMobil had an ESG score weight of grade B+ in 2019 and consistent grade A- from 2020 to 2021, while the company had a sustained higher environmental pillar score of grade A from 2019 to 2021. Refinitiv derives this ESG score by combining the relative importance of several measures of environmental performance, social responsibility, and corporate governance (Refinitiv, 2023b).

The firm has received an ESG score of 75.77 on average over the previous five years, with a median value of 75.59. These ratings represent how the firm does compare to its competitors regarding ESG factors. The average score for the Environmental pillar is A (35.51 out of a 100), while the high number of conflicts surrounding the corporation is relatively high resulting in a very low controversy score of 1.92 (grade D-). The firm's market capitalization was used to normalize the score. In figure 19, the company ranks 29 out of 266 amongst its oil and gas peers globally relating to Saudi Aramco's ESG score (Refinitiv, 2023b).

Figure 17 ExxonMobil ESG score Summary for the year end December 2021 (Refinitiv, 2023b).

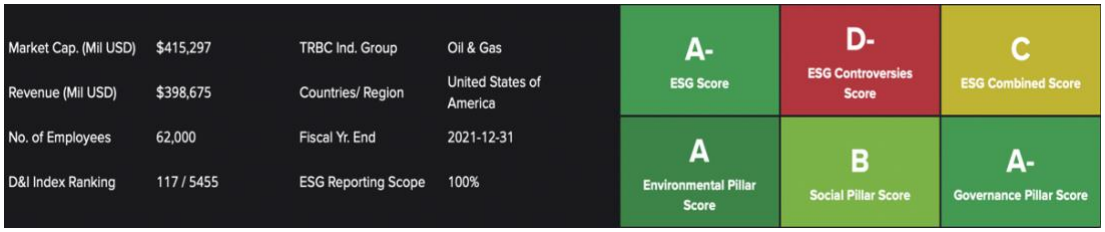
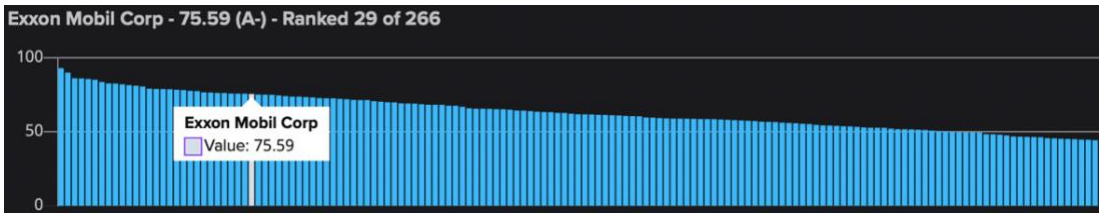


Figure 18 ExxonMobil ESG score Summary for the year end December 2021 (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Period Status	Complete	Complete	Complete
ESG Combined Score	C	C+	C
ESG Score (Weight: 100.0%)	B+	A-	A-
Environmental Pillar Score (Weight: 34.5%)	A	A	A
Social Pillar Score (Weight: 42.0%)	A-	B+	B
Governance Pillar Score (Weight: 23.5%)	C+	A-	A-
ESG Controversies Score	D-	D	D-

Figure 19 ExxonMobil rank 26 amongst 266 Oil & Gas Companies Worldwide (Refinitiv, 2023).



4.4.1 Carbon Emissions and Flaring

It can be seen in figure 20 below that fulfilling its emissions claims/targets from 2019 to 2021 is "true" which means the company got better at setting targets or objectives to be achieved on emission reduction (in scope are the short-term or long-term reduction target to be achieved on emissions to land, air or water from business operations) over the years (Refinitiv,2023). Figure 21 shows no data on ExxonMobil's flaring gas emissions from year 2019 to 2021.

ExxonMobil's 2021 scope 1, 2 and 3 CO2 emissions (tonnes CO2e) are 92M, 7M and 532M respectively which totals 631M; its 2020 scope 1, 2 and 3 CO2 emissions (tonnes CO2e) include 92M, 7M and 540M which equals to 639M in total; its 2019 CO2 emissions (tonnes CO2e) data only showed scope 1 and 2 in figure 22. and were 92M and 9M which sum up to 110M that year. The company's emissions intensity (tonnes CO2e/$M) for the year 2019 included only scope 1 and 2 which were 379.524 and 35.214 accordingly and totaled 414.738 tonnes CO2e/$M. Its 2020 scope 1, 2 and 3 (tonnes CO2e/$M) had a huge increase and were respectively as follows: 515.193, 39.199 and 3,026.956 with a total of 3,581.348; there was a reduction in the company's 2021 emissions intensity scope 1, 2 and 3 (tonnes CO2e/$M) as follows: 332.5, 25.299 and 1,915.487 respectively which equaled to a total number of 2,273.286 as shown in figure 23 (Refinitiv, 2023b).

Figure 24 shows scope 1 and 2 absolute emissions score for 2020 against 2021 was not reported, 2019 against 2020 had a percentage of -6.6 and 2018 against 2019 was -3.63%. On the other hand, the company's scope 1 and 2 emissions intensity 2021 against 2020 was reported as -35.46% but tremendously rose to 33.67% between the years 2019 and 2020 and showed a decrease of 5.32% between the years 2018 and 2019 as shown in figure 24.

Figure 20 ExxonMobil's CO2 Emissions for 2019 to 2021 (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Emissions Score (Weight: 11.0%)	A	A	A
Policy Emissions	TRUE	TRUE	TRUE
Targets Emissions	TRUE	TRUE	TRUE
Emission Reduction Target Percentage	--	100.00%	100.00%
Emission Reduction Target Year	--	2050	2030
Biodiversity Impact Reduction	TRUE	TRUE	TRUE
Estimated CO2 Equivalents Emission Total	106,000,000.00	99,000,000.00	99,000,000.00
CO2 Estimation Method	Reported	Reported	Reported
Total CO2 Emissions / Million in Revenue $	414.74	554.39	357.80
CO2 Equivalent Emissions Total	106,000,000.00	99,000,000.00	99,000,000.00
CO2 Equivalent Emissions Direct, Scope 1	97,000,000.00	92,000,000.00	92,000,000.00
CO2 Equivalent Emissions Indirect, Scope 2	9,000,000.00	7,000,000.00	7,000,000.00
CO2 Equivalent Emissions Indirect, Scope 3 T...	--	3,023.96	1,915.49
CO2 Equivalent Emissions Indirect, Scope 3	--	540,000,000.00	530,000,000.00
Emissions Trading	TRUE	TRUE	TRUE

Figure 21 ExxonMobil's Historic CO2 Emissions Performance (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Emission Reduction Target Year	--	2050	2030
Biodiversity Impact Reduction	TRUE	TRUE	TRUE
Estimated CO2 Equivalents Emission Total	106,000,000.00	99,000,000.00	99,000,000.00
CO2 Estimation Method	Reported	Reported	Reported
Total CO2 Emissions / Million in Revenue $	414.74	554.39	357.80
CO2 Equivalent Emissions Total	106,000,000.00	99,000,000.00	99,000,000.00
CO2 Equivalent Emissions Direct, Scope 1	97,000,000.00	92,000,000.00	92,000,000.00
CO2 Equivalent Emissions Indirect, Scope 2	9,000,000.00	7,000,000.00	7,000,000.00
CO2 Equivalent Emissions Indirect, Scope 3 T...	--	3,023.96	1,915.49
CO2 Equivalent Emissions Indirect, Scope 3	--	540,000,000.00	530,000,000.00
Carbon Offsets/Credits	--	--	--
Emissions Trading	TRUE	TRUE	TRUE
Cement CO2 Equivalents Emission	--	--	--
Climate Change Commercial Risks Opportunit...	TRUE	TRUE	TRUE
Flaring Gases To Revenues USD in million	--	--	--
Flaring Gases	--	--	--

Figure 22 ExxonMobil's Absolute Emissions and Emissions Intensity 2019 -2021 (tonnes CO2e/$M) (Refinitiv, 2023b).

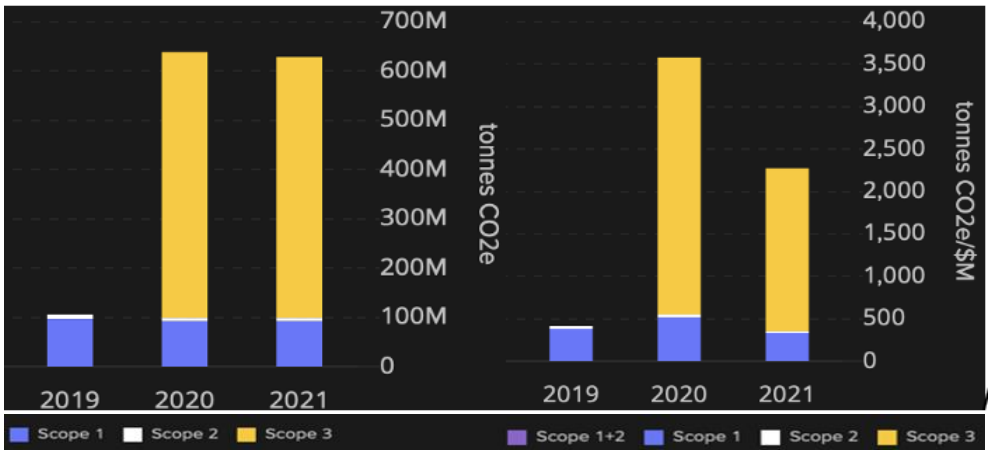


Figure 23 ExxonMobil's Absolute Emissions 2018-2019 to 2020-2021 (%) (Refinitiv, 2023b).

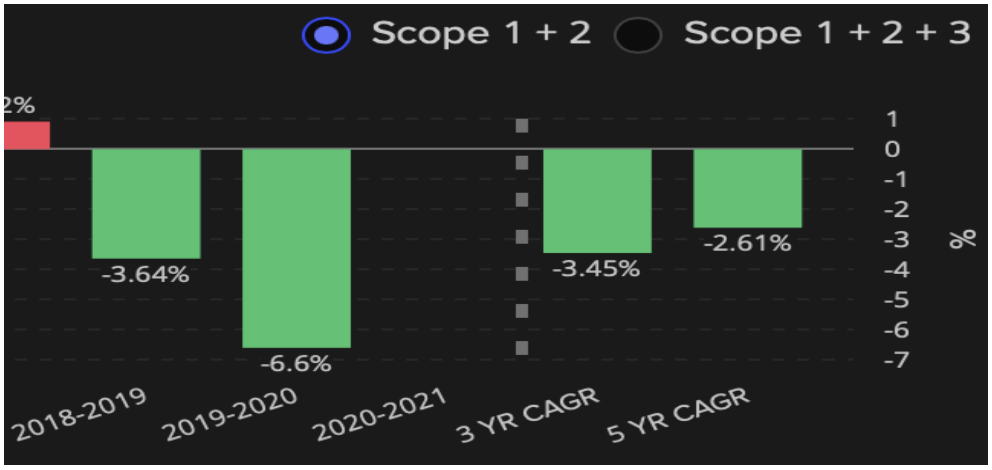
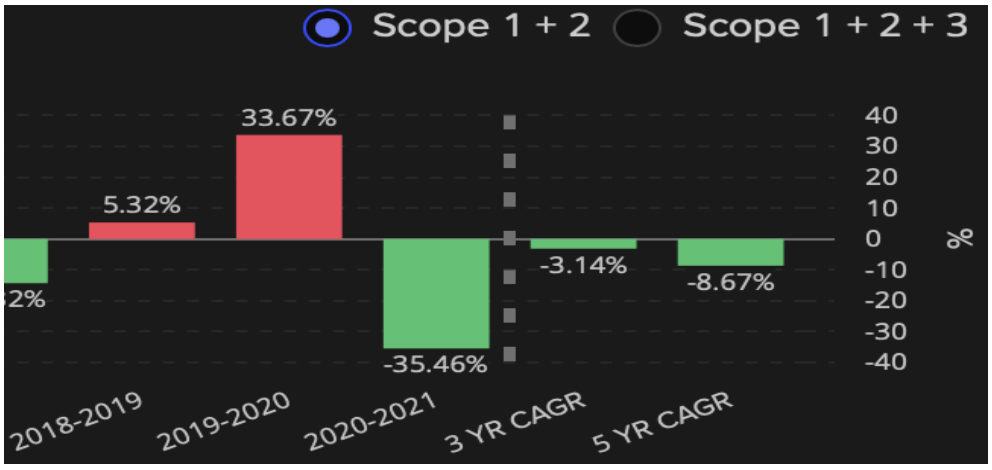


Figure 24 ExxonMobil's Emissions Intensity 2018-2019 to 2020-2021 (%) (Refinitiv, 2023b).



4.4.2 Investment in Renewable Energy

ExxonMobil seems to have not invested much money into renewable energy, although they have been researching things like algae-based fuels and advanced biofuels. ExxonMobil maintains a very good constant grade of A- (a high score of 79) for the period of 2019 to 2021 in the environmental innovation category (score reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products) as seen in figure 25. Below (Refinitiv, 2023b).

Furthermore, it is given a "true" all through 2019 to 2021 as shown in figure 25 under the "renewable/clean energy products" category, which assesses whether the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power) and in scope, includes data on the financing of renewable energy projects as well as if a utility company is deriving at least 25% of the power produced or revenue from clean technologies or energy. But the company had a "false" on renewable energy use all through 2019 to 2021, and data regarding ExxonMobil's total renewable energy to energy use in millions, total renewable energy, renewable energy purchased and produced are not available as seen in figure 26. It can therefore be deduced that ExxonMobil partly delivered on its renewable energy investment claims, according to Refinitiv.

Figure 25 ExxonMobil's Renewable Energy Involvement Assessment (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Period Status	Complete	Complete	Complete
ESG Combined Score	C	C	C
ESG Score (Weight: 100.0%)	B+	A-	A-
Environmental Pillar Score (Weight: 34.5%)	A	A	A
Social Pillar Score (Weight: 42.0%)	A-	B+	B
Governance Pillar Score (Weight: 23.5%)	C+	A-	A-
ESG Controversies Score	D-	D-	D-
Resource Use Score (Weight: 13.3%)	A+	A+	A
Emissions Score (Weight: 11.0%)	A	A	A
Environmental Innovation Score (Wei...	A-	A-	A-
Environmental Products	TRUE	TRUE	TRUE
Renewable/Clean Energy Products	TRUE	TRUE	TRUE

Figure 26 ExxonMobil's Renewable Energy Assessment (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Renewable Energy Use Ratio	--	--	--
Renewable Energy Supply	--	--	--
Total Renewable Energy To Energy Use in mill...	--	--	--
Total Renewable Energy	--	--	--
Renewable Energy Purchased	--	--	--
Renewable Energy Produced	--	--	--
Renewable Energy Use	FALSE	FALSE	FALSE

4.4.3 Investment in Low-Carbon Sources

ExxonMobil says it has prioritized increasing production and infrastructure for natural gas due to its potential as a transitional fuel that may aid in mitigating carbon emissions (Refinitiv, 2023b). ExxonMobil maintains a "true" from 2019 to 2021 as seen in figure 27, under the "product environmental responsible use" category, reflects the company reports about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use, that is, any product or service that reduces the negative impact (less emission, pollution, noise, etc.) on the environment, according to Refinitiv. Figure 27 shows ExxonMobil's "product environmental responsible use" increase of "true" for each year 2019 to 2021. In the fossil fuel divestment category, ExxonMobil got a false from 2019 to 2021 meaning the company has a public commitment to divest from fossil fuel (Refinitiv, 2023b).

Figure 27 ExxonMobil's Product Environmental Responsible Use and Fossil Fuel Divestment (Less Carbon Emissions) (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Organic Products Initiatives	FALSE	FALSE	FALSE
Take-back and Recycling Initiatives	FALSE	FALSE	FALSE
Product Environmental Responsible Use	TRUE	TRUE	TRUE
GMO Products	FALSE	FALSE	FALSE
Agrochemical Products	--	--	TRUE
Agrochemical 5 % Revenue	FALSE	FALSE	FALSE
Animal Testing	FALSE	TRUE	TRUE
Animal Testing Cosmetics	FALSE	FALSE	FALSE
Animal Testing Reduction	FALSE	FALSE	FALSE
Renewable/Clean Energy Products	TRUE	TRUE	TRUE
Water Technologies	FALSE	FALSE	FALSE
Sustainable Building Products	FALSE	FALSE	FALSE
Fossil Fuel Divestment Policy	FALSE	FALSE	FALSE

4.4.4 Environmental Initiative

ExxonMobil mentioned its efforts of making CCS technology its focus by collaborating and engaging in CCS and environmental initiatives to speed up the adoption of technology that capture and store CO2 emissions from manufacturing and electricity production. The company from 2019 to 2021 had a “true” in the environmental restoration initiatives category as seen in figure 28 below. This means it reported on company-generated initiatives to restore the environment, such as restoration, rehabilitation, clean up and remediation activities, (in this case its CCS programmes, research, and development) (Refinitiv, 2023b)..

ExxonMobil acquired sustained a “true” in “environmental investments initiatives” for year 2019 to 2021. This means the company did report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities (investments made in new technologies to increase future opportunities like treatment of emissions, installation of cleaner technologies) as it claimed. On environmental partnerships, it bagged a “true” from 2019 to 2020 but a “false” in 2021. This means the company delivered on its CCS environmental partnership claims in 2019 and 2020 only (Refinitiv, 2023b).

In figure 29, ExxonMobil obtained “false” from 2019 to 2021 leading to the conclusion that for transition plan time horizon coverage, the company did not show its transition plan covered the short-term time horizon (next 5 years), medium term time horizon (next 5-15 years) and the long-term time horizon (after the next 15 years). Finally in the transition plan offsets category, it had a “false” all through 2019 to 2021, this shows the company failed to clarify the role and type of offsets/negative emission technologies in its transition plan (Refinitiv, 2023b).

Figure 28 ExxonMobil's Environmental Initiative Assessment 2019 to 2021 (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Environmental Restoration Initiatives	TRUE	TRUE	TRUE
Staff Transportation Impact Reduction	FALSE	FALSE	FALSE
Accidental Spills To Revenues USD in million	0.00	0.00	0.00
Accidental Spills	7.70	1.90	21.30
Environmental Expenditures Investments	TRUE	TRUE	TRUE
Environmental Expenditures	$5,200,000,000.00	$4,500,000,000.00	$5,200,000,000.00
Environmental Provisions	$290,000,000.00	$263,000,000.00	$146,000,000.00
Environmental Investments Initiatives	TRUE	TRUE	TRUE
Self-Reported Environmental Fines To Revenu...	3.91	5.60	--
Self-Reported Environmental Fines	$1,000,000.00	$1,000,000.00	--
Environmental Partnerships	TRUE	TRUE	TRUE

Figure 29 ExxonMobil's Environmental Initiative Assessment 2019 to 2021 (continued) (Refinitiv, 2023b).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Downstream scope 3 emissions use of sold P...	--	340,000,000.00	330,000,000.00
Climate Related Risks Assessment Process	FALSE	FALSE	FALSE
Transition Plan Financial Planning	FALSE	FALSE	FALSE
Transition Plan Scope 3 Emissions	FALSE	FALSE	FALSE
Transition Plan Time Horizon Coverage	FALSE	FALSE	FALSE
Transition Plan Offsets	FALSE	FALSE	FALSE

4.4.5 Carbon Capture and Storage

There was no data or category on Carbon Capture Utilization and Storage (CCUS) / Carbon Capture Storage (CCS) for this company on the Refinitiv Eikon platform.

4.5 Shell Energy Transition Claims

4.5.1 Investment in Lower-Emission Initiatives and Upstream Carbon Intensity

In 2019, Shell established an objective to reduce its Net Carbon Footprint by a range of 2-3% by the year 2021, in comparison to the baseline of 2016. The company asserts its objective is to reduce its Net Carbon Footprint by predominantly augmenting the proportion of environmentally friendly products in its variety of offerings to customers, including natural gas, biofuels, electricity, and hydrogen. According to the company, its total carbon dioxide

equivalent (CO2e) emissions for 2019 are estimated to be 1,646 million tonnes CO2e. These emissions were calculated using Shell's Net Carbon Footprint value and the estimated total delivered energy derived from the portfolio average intensity value. This figure represents a decrease from the higher value of 1,731 million tonnes CO2e recorded in 2018. (Shell, 2019).

When it comes to greenhouse gas emissions, Shell claims that it has developed and put in place a comprehensive information system for controlling CO2 and energy that supports its facilities, for example, by analyzing real-time data to highlight maintenance needs and monitor performance. It claims that in 2019, its direct GHG emissions reduced from 71 million tonnes of CO2 equivalent in 2018 to 70 million tonnes. It asserts that divestments which occurred in places like the UK, Iraq, Malaysia, Argentina, Canada, and Norway were the primary causes of the drop, which were largely offset by the start-up of the Prelude floating liquefied natural gas project in Australia. According to the corporation, its direct and indirect GHG emissions from imported energy decreased to 80 million tonnes CO2 equivalent in 2019 from 82 million tonnes CO2 equivalent in 2018 (Shell, 2019).

Under decarbonizing energy use by sector, shell claims to have contributed to the development of a variety of sector-specific programs under the Mission Possible Platform (a joint project of the World Economic Forum and the Energy Transitions Commission that focuses on building partnerships to enable the heavy industry and heavy-duty transport sectors to achieve net-zero carbon emissions). For instance, Shell joined the Getting to Zero shipping coalition, which was launched by the Global Maritime Forum and intends to find a way to bring a commercially viable net-zero emissions ship into service by 2030, after it was unveiled at the UN Climate Summit in New York in 2019 (Shell, 2019).

According to Shell, the Net Carbon Footprint of the company in the year 2020 was reported to be 75 gCO2e/MI, which indicates a decrease of 4% compared to the previous year, 2019. In the year 2020, a notable factor contributing to the decline can be attributed to reduced energy use and a rise in power sales, both in terms of absolute quantity and the proportion of the energy mix supplied by Shell. According to Shell, there was a decrease in the average emissions intensity of the power it sold compared to previous years, contributing to the total decline. The energy intensity for oil and gas production in the Upstream and Integrated Gas divisions of Shell experienced an increase from 1.07 GJ per tonne in 2019 to 1.14 GJ per tonne of production in 2020, excluding liquefied natural gas and gas-to-liquids. This outcome can be

attributed, at least in part, to the joint venture between NAM in the Netherlands, in which Shell holds a 50% ownership interest. As a consequence, there has been a decrease in output from the Groningen gas field, which is considered a lower energy intensity asset. Additionally, the data incorporated the energy consumption associated with contractor transport (Shell, 2020).

Shell claims that as part of its partnership with others, it is backing government attempts to cut carbon emissions in each industry sector, including those that are difficult to decarbonize, including transport by road and air. For instance, a partnership between Shell and Amazon Air called for Shell to supply up to six million gallons of jet fuel that is environmentally beneficial (Shell Sustainability Report, 2020). According to Shell, there was a decrease in its direct greenhouse gas (GG) emissions from 70 million tonnes of carbon dioxide equivalent (CO2e) in 2019 to 63 million tonnes in 2020. The report elucidates that the decline can be attributed to divestitures in Canada and the USA, reduced operational capacity of facilities due to decreased demand resulting from the Covid-19 pandemic, and the underutilization of the Prelude floating liquefied natural gas installation in Australia during the year 2020. Furthermore, the organization reveals that its greenhouse gas (GHG) emissions in 2020, namely those resulting from direct (scope 1) and indirect (scope 2) sources, which are associated with imported energy, amounted to 72 million tonnes of carbon dioxide equivalent. This figure represents a decrease from the previous year, where emissions reached 80 million tonnes of carbon dioxide equivalent in 2019 (Shell, 2020).

Shell reported a reduction in its Scope 1 and 2 emissions by 18% and a decrease in the net carbon intensity of its energy products sold by 2.5% by the conclusion of 2021, in comparison to the figures recorded in 2016. Furthermore, the firm claims that it has enhanced the energy efficiency of its assets. For instance, Shell asserts that it has successfully executed a project at the QGC natural gas plant in Australia with the objective of reducing the energy consumption associated with gas compression (Shell, 2021). According to Shell, in 2021, its net carbon intensity grew from the previous year by 2.7% to 77 gCO2e/MJ. The company asserts that an adjustment in technique was made to identify the carbon intensity of its electrical sales more precisely, which is why there was an increase in emissions (Shell, 2021).

4.5.2 Methane and Flaring Reduction

In 2019, Shell reported that the overall methane intensity of its assets associated with gas sales was 0.08%, while assets not involved in gas sales exhibited a methane intensity of 0.01%. In 2019, the intensity of methane emissions varied between less than 0.01% and 1.3%. Moreover, it was noted that there was an increase in flaring, resulting in the release of 5.9 million tonnes of carbon dioxide equivalent in the year 2019, as compared to 5.2 million tonnes in the previous year of 2018 (Shell, 2019). According to the Shell 2019 Sustainability Report, it was observed that Shell's operated gas portfolio, encompassing liquefied natural gas and GTL, accounted for slightly over 50% of the company's overall methane emissions. Shell has subsequently initiated collaborative efforts with its partners to gain insights into the methane emissions originating from non-operated projects. Shell's recent disclosure reveals that its methane emissions in 2019 amounted to 91 thousand tonnes, exhibiting a slight decrease from the previous year's figure of 92 thousand tonnes. This reduction can be attributed, at least in part, to the company's divestments in regions such as Iraq and Canada. According to Shell's 2019 report, methane emissions constituted a proportion of less than 5% of the company's total greenhouse gas emissions in terms of CO2-equivalent. The report further indicates that the majority, specifically over 60%, of Shell's reported methane emissions in 2019 were attributed to flaring and venting activities. (Shell, 2019).

The company claims to have conducted a thorough assessment of potential sources of leaks at four different facilities with the aim of improving the precision of identification and disclosure. In accordance with Shell's (2019) findings, an extensive assessment was carried out at the Pearl GTL facility in Qatar, which is managed by Qatar Shell GTL Ltd (QSGTL). The purpose of this assessment was to detect and address any possible methane emissions by thoroughly examining 33,000 components. Based on available reports, it has been observed that a QGC site in Australia, which is operated by Shell, has effectively executed strategies to enhance the efficiency of maintenance operations pertaining to its extensive network of 2,600 wells. According to the corporation's report, the implementation of the initiative resulted in a reduction in the duration of maintenance activities, thereby leading to a decrease in the release of methane into the Earth's atmosphere. According to the Shell 2019 Sustainability Report, it was stated by Shell that the implementation of this particular technique modification resulted

in a reduction of approximately 4,000 tonnes of methane emissions during the period from July to December 2019. Based on the report provided by the company, it was observed that assets associated with marketed gas exhibited an average methane intensity of 0.06% in the year 2020. Conversely, assets lacking marketed gas demonstrated a comparatively lower average methane intensity of 0.01%. According to Shell (2019), the methane emissions intensity in the year 2020 varied across a spectrum of values, ranging from less than 0.01% to 0.6% (Shell, 2020).

According to Shell, the total methane emissions for the year 2020 amounted to 67 thousand tonnes, which represents a decrease from the previous year's emissions of 91 thousand tonnes. This reduction can be attributed in part to divestments made by Shell, particularly in Canada and the United States, as well as a decrease in flaring activities. In terms of CO2-equivalent emissions, Shell's methane emissions constituted a proportion of less than 5% of their total greenhouse gas (GHG) emissions. Notably, the act of flaring and venting contributed to over 60% of the methane emissions reported by the company in the year 2020. According to the report by Shell (2020), there was a decrease in total flaring from 5.9 million tonnes of carbon dioxide equivalent in 2019 to 3.8 million tonnes in 2020 (Shell, 2020).

According to Shell, there was a decrease in total methane emissions from its operations in 2021, with a reduction of 18% to 55,000 tonnes compared to the previous year's emissions of 67,000 tonnes. According to Shell, the practice of routine flaring resulting from its Upstream operations witnessed a decrease to 0.2 million tonnes of hydrocarbons in 2021, as compared to the previous year's figure of 0.3 million tonnes. However, the company asserts that its total flaring escalated from 0.8 million tonnes to 1.0 million tonnes as a result of non-routine flaring, predominantly stemming from operational challenges encountered in Nigeria. According to Shell's report in 2021, the total absolute emissions amounted to 1.4 gigatonnes (Shell, 20201).

4.5.3 Renewable Energy Investments

Shell seems to have more elaborate claims under hydrogen, wind and solar renewable energy which are discussed below:

Hydrogen**:** Shell claimed to be helping to construct the infrastructure required for hydrogen to reach its full potential. It states that in Germany, via its involvement with H2 Mobility Germany

joint venture, it collaborated with investors and the authorities to establish a nationwide network of roughly hundred hydrogen refueling stations, with eighty-two presently public, forty of which were at retail outlets of Shell. The statement further indicated that in the United Kingdom, a collaborative effort was on between Shell and ITM Power, a company specializing in electrolysers, to establish hydrogen fuel accessibility at six Shell retail sites. As per the statement provided by the corporation, hydrogen is produced at the location itself utilizing sustainable energy sources (Shell, 2019). Additionally, the company announced plans to establish three additional refueling stations dedicated to accommodating heavy-duty hydrogen fuel-cell trucks in collaboration with its partners. One of the aforementioned stations will utilize hydrogen derived from biogas (Shell, 2019).

In the United States, Shell received a grant of $40.8 million from the California Energy Commission in 2020. This grant was allocated to enhance three existing Shell hydrogen stations and facilitate the installation of hydrogen refueling infrastructure at 48 Shell retail stations. According to Shell (2020), the business asserts that it currently operates a total of nine hydrogen refueling stations in the state of California as of the conclusion of the year 2020.

Shell asserts its membership in the Hydrogen Council, an assemblage of chief executive officers who are actively working towards enhancing recognition of hydrogen's importance in the transition towards a low-carbon energy framework. Shell reported an expansion in its hydrogen business, with efforts focused on augmenting capacity, making substantial investments in infrastructure, and advocating for the adoption of hydrogen in various industrial sectors. The company additionally claimed to have implemented two electrolysers: a proton exchange membrane (PEM) electrolyser with a capacity of 10 MW in Germany, which stands as the largest of its kind in Europe, and a 20 MW electrolyser in China, which held the title of the world's largest at the time. According to reports, the electrolysers have the capacity to generate an annual production of 3,000 tonnes and 1,300 tonnes of decarbonized hydrogen, respectively. Furthermore, the company asserted its commitment to developing an initial assortment of biofuels specifically designed for maritime vessels. Moreover, Rotterdam, located in the Netherlands, witnessed the inaugural bio-LNG bunkering trial in 2021, as reported by Shell (2021).

Wind: In its 2019 report, Shell announced its intention to expand its wind power operations to meet the growing demand for renewable energy. As of the end of 2019, Shell claims its share

of the total installed capacity from onshore and offshore wind sources amounted to 290 megawatts (MW), with an additional 2,196 MW currently under development (Shell, 2019).

The 2020 sustainability report of Shell asserts the expansion of its wind power initiatives. It revealed that as of the conclusion of 2020, Shell possessed a stake of 290 megawatts (MW) in the overall installed capacity derived from onshore and offshore wind sources. Additionally, Shell has an additional 2,861 MW in progress for future development. According to Shell (2020), the corporation mentions its ownership of wind power assets across various countries, encompassing offshore locations in the Netherlands and the United States and onshore sites within the United States. According to Shell, the company possesses a 20% ownership stake in the Blauwwind Consortium, an entity engaged in constructing the Borssele Ill and IV wind farms situated along the coast of the Netherlands. Shell further states that Blauwwind commenced its power generation operations in 2020, contributing renewable electricity to the Dutch grid. The power station possesses a total capacity of 731.5 MW, as indicated by Shell's agreement to purchase and exchange 50% of the electricity generated (Shell, 2020).

According to Shell (2020), the company expressed its commitment to ongoing investments in floating wind technologies. As part of this initiative, Shell has acquired EOLFI, a renowned French renewable energy producer specializing in developing and implementing floating wind power projects. According to the Shell Sustainability Report of 2020, Shell asserts its significant ownership in TetraSpar, with a reported ownership stake of 46.2%. TetraSpar is currently engaged in constructing a pioneering floating wind demonstration project off the shores of Norway. According to Shell (2020), the company disclosed its collaboration with CoensHexicon, a specialist in floating wind technology, to undertake a project aimed at delivering 800 MW of floating wind power to South Korea in the initial stage of its development (Shell, 2020).

In its 2021 energy transition progress report, Shell identified itself as a prominent player on a global scale in the advancement of floating wind farms. The company highlighted its involvement in various stages of development, encompassing prototypes, pilot farms, and commercial-scale projects in France, Ireland, Norway, Scotland, and South Korea (Shell, 2021).

Solar: Solar: According to Shell's 2019 sustainability report, it has invested in companies that offer cutting-edge off-grid, or distributed, energy access solutions that can be scaled up, such as solar mini-grids and solar housing systems that can give customers the dependable, affordable electricity they need. It states that Orb Energy, which offers solar energy solutions in India and Africa, primarily to small and medium-sized businesses like factories, schools, and hospitals, was acquired by Shell New Energies in 2019 for a minority stake (Shell, 2019). The company announced that it had acquired a 49% stake in ESCO Pacific, one of Australia's most prominent solar asset management and development companies. Additionally, it stated that 414 MW of solar energy had been installed as of the end of 2019 and 442 MW were still being built (Shell, 2019).

In 2020, Shell claimed that by making investments in the development and management of long-term commercial and industrial solar projects as well as at its own facilities, it is increasing the capacity of its solar power generation. At the end of 2020, Shell reported having 674 megawatts (MW) of installed solar power capacity, with 1,053 MW still being built (Shell Sustainability Report, 2020).

Shell asserts to have acquired a 49% stake in Cleantech Solar, a Singapore-based company that manages 145 MW of installed capacity, has 178 MW of capacity committed to it or under development, and serves commercial and industrial clients in South-East Asia and India. It also claimed that by purchasing Savion, a US-based solar and energy storage company, Solar-Konzept Italia, an Italian solar specialist, and WestWind, an Australian wind specialist, it has increased its capacity for renewable generation (Shell, 2021).

4.5.4 Environmental Initiative and Carbon Capture and Storage (CCS)

According to Shell, the OGCI launched an initiative in 2019 to facilitate substantial investments in CCUS. One of the primary objectives of this initiative is to achieve a twofold increase in the global carbon dioxide storage capacity by the year 2030. This initiative aimed to facilitate the decarbonization of industrial hubs on a global scale, focusing on China, Norway, the Netherlands, the United Kingdom, and the United States (Shell, 2019). According to the statement, it had been asserted that in 2019, a one-year pilot initiative in Vienna, Austria, was effectively completed. The objective of this project was to extract carbon dioxide (CO2) from the exhaust emissions of a biomass power plant, resulting in the capture of approximately

0.7 tonnes of CO2 daily. According to Shell (2019), the company is currently developing and field-testing novel measurement equipment (designed to continuously assess the carbon uptake within a natural ecosystem) in collaboration with the University of Exeter in the United Kingdom.

In 2020, Shell reported that the government granted the final investment decision for the Northern Lights CCS project. This project aims to transport carbon dioxide (CO2) from various industrial sites to a facility on Norway's western coast. The carbon dioxide (CO2) will subsequently be directed towards a subterranean reservoir approximately 3,000 meters below the ocean floor, where it will be securely and durably sequestered. Shell asserts that its Quest Carbon Capture and Storage (CCS) project will have effectively sequestered and securely stored over 5.5 million metric tonnes of carbon dioxide (CO2) by the conclusion of 2020. This achievement is attributed to the project's commencement in 2015. According to the statement, the Gorgon CCS project (the most significant global carbon capture and storage (CCS) operation), operated by Chevron with a 25% interest from Shell, commenced its operations in August 2019 and successfully stored over 4 million tonnes of carbon dioxide by the conclusion of 2020 (Shell (2020).

Shell's projected operational costs and investment in carbon capture and storage (CCS) potential for 2021 are estimated to amount to approximately $146 million. In 2021, the company reported that its share of captured and stored carbon dioxide (CO2) amounted to 0.4 million metric tonnes. Based on the 2021 energy transition report released by Shell, it is projected that the Quest CCS facilities in Canada (operational since 2015), in which Shell holds a 10% ownership stake, will have effectively sequestered, and stored over 6.5 million tonnes of carbon dioxide by the conclusion of 2021. The company states the Gorgon CCS project in Australia, in which Shell holds a 25% stake and is operated by Chevron, commenced its operations in August 2019. According to Shell, as of the conclusion of 2021, the project had successfully sequestered over 5 million tonnes of carbon dioxide making Gorgon the most extensive carbon capture and storage (CCS) initiative on a global scale (Shell, 2021).

4.6 Shell's Environmental Data

Overview

For the fiscal year ending in December 2022, the ESG score for Shell (SHEL.L), an Oil & Gas company headquartered in the United Kingdom, was a very high score of 92.94 (grade A+) out of a total of 100 percent which translates to an above average score, as seen in figure 14 below (Refinitiv, 2023a). However, in the previous year (2021) which is the starting focus year for this research, Shell obtained an even higher ESG score of 93.23 (grade A+) but a lower 2021 ESG combined score (an overall company score based on the reported information in the environmental, social and corporate governance pillars (ESG Score) with an ESG Controversies overlay) of 46.93 (grade C+) shown in Figure 30 and 31.

Figure 32. shows Shell had an ESG score of a grade A in 2019 and consistent 100% A+ from 2020 to 2021, while the company had a sustained environmental pillar score of an A from 2019 to 2021. Refinitiv derives this ESG score by combining the relative importance of several measures of environmental performance, social responsibility, and corporate governance (Refinitiv, 2023).

The firm has received an ESG score of 90.82 on average over the previous five years, with a median value of 92.88 (A+) in year 2022. These ratings represent how the firm does compare to its competitors regarding ESG factors. Figure 32 shows Shell maintained a grade A score for the Environmental pillar from 2019 to 2021, while due to number of conflicts surrounding the corporation it consistently earned a controversy score of D- from year 2019 to 2021. The firm's market capitalization was used to normalize the score. In figure 33, the company ranks first position (number 1) amongst its oil and gas peers globally, relating to Shell's ESG score (Refinitiv, 2023).

Figure 30 Shell's ESG score Summary for the year end December 2022 (Refinitiv, 2023).

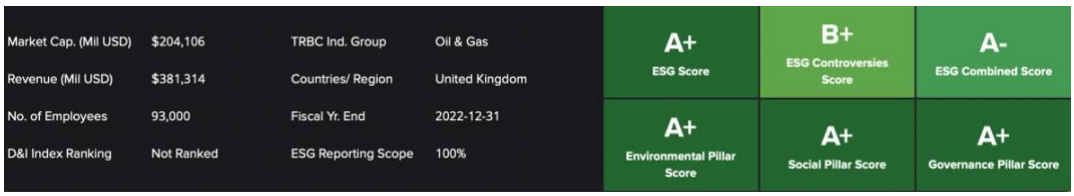


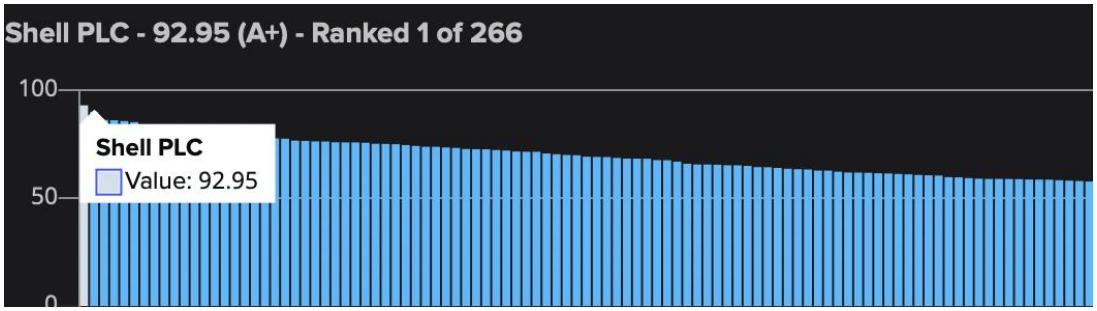
Figure 31 Shell's Year-Over-Year ESG Performance 2022 and 2021 (Refinitiv, 2023).

Pillar	Category	FY2022	FY2021	Y/Y Change	Score Weight	Attribution
Summary	ESG Score	92.94	93.22	(0.28)	100.0%	-0.3
Env.	Resource Use	99.82	95.44	4.38	13.3%	0.6
Env.	Emissions	99.17	97.84	1.33	11.0%	0.1
Env.	Env. Innovation	77.23	79.00	(1.77)	10.2%	-0.2

Figure 32 Shell's Historic Performance (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Period Status	Complete	Complete	Complet
ESG Combined Score	C+	C+	B-
ESG Score (Weight: 100.0%)	A	A+	A+
Environmental Pillar Score (Weight: 34.5%)	A	A+	A
Social Pillar Score (Weight: 42.0%)	A-	A+	A+
Governance Pillar Score (Weight: 23.5%)	A+	A+	A+
ESG Controversies Score	D-	D-	D

Figure 33 Shell ranked Number 1 amongst 266 Oil & Gas Companies Worldwide (Refinitiv, 2023).



4.6.1 Carbon Emissions and Flaring

With a consistent emission score of an A+, Shell's target emissions from 2019 to 2021 can be seen in figure 34 below to be "true" which means the company got better at setting targets or objectives to be achieved on emission reduction (in scope are the short-term or long-term reduction target to be achieved on emissions to land, air or water from business operations) over the years (Refinitiv, 2023). Shell's 2019 scope 1, 2 and 3 CO2 emissions (tonnes CO2e) were 70M, 11M and 1,551M respectively. Its 2020 CO2 emissions (tonnes CO2e) scope 1, 2 and 3 reduced to 63M, 10M and 1,304 million respectively. Its 2021 CO2 emissions (tonnes

CO2e) data for scope 1, 2 and 3 further reduced to 60M, 9M and 1,299M respectively as shown in figure 34 and 35.

Additionally, the company's total CO2 emissions per millions in revenue in dollars for 2019 equaled 234.87, increased massively to 404.34 in 2020 and decreased to 263.86 in 2021. The total CO2 equivalent emissions in 2019 had a figure of 81M, reduced to a figure of 73M in 2020 and in 2021 reduced further to 69M, as shown in figure 35.

Figure 35 shows Shell's total flaring gas emissions score from 2019 to 2021 had a steady decrease at figures 7.7M, 4.9M and 3M accordingly. was not reported, 2019-2020 had a percentage of -6.6 and 2018-2019 was -3.63%. On the other hand, the company's flaring gases to revenues USD in millions had an amount of 22.33 in 2019 which increased to 27.14 in 2020 and then decrease to 11.47 in 2021 (Refinitiv, 2023b).

Figure 34 Shell's CO2 Emissions for 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Emissions Score (Weight: 11.0%)	A+	A+	A+
Policy Emissions	TRUE	TRUE	TRUE
Targets Emissions	TRUE	TRUE	TRUE
Emission Reduction Target Percentage	25.00%	2.00%	50.00%
Emission Reduction Target Year	2025	2021	2030
Biodiversity Impact Reduction	TRUE	TRUE	TRUE
Estimated CO2 Equivalents Emission Total	81,000,000.00	73,000,000.00	69,000,000.00
CO2 Estimation Method	Reported	Reported	Reported
Total CO2 Emissions / Million in Revenue $	234.87	404.34	263.86
CO2 Equivalent Emissions Total	81,000,000.00	73,000,000.00	69,000,000.00
CO2 Equivalent Emissions Direct, Scope 1	70,000,000.00	63,000,000.00	60,000,000.00
CO2 Equivalent Emissions Indirect, Scope 2	11,000,000.00	10,000,000.00	9,000,000.00
CO2 Equivalent Emissions Indirect, Scope 3 T...	4,497.26	7,222.66	4,967.42
CO2 Equivalent Emissions Indirect, Scope 3	1,551,000,000.00	1,304,000,000.00	1,299,000,000.00
Carbon Offsets/Credits	2,700,000.00	4,300,000.00	6,400,000.00

Figure 35 Shell's Historic CO2 Emissions Performance (Refinitiv, 2023).

- Scoring Measure	2022	2021	2020	2019
Period End Date	2022-12-31	2021-12-31	2020-12-31	2019-12-31
Emissions Score (Weight: 11.0%)	A+	A+	A+	A+
Policy Emissions	TRUE	TRUE	TRUE	TRUE
Targets Emissions	TRUE	TRUE	TRUE	TRUE
Emission Reduction Target Percentage	50.00%	50.00%	2.00%	25.00%
Emission Reduction Target Year	2030	2030	2021	2025
Biodiversity Impact Reduction	TRUE	TRUE	TRUE	TRUE
Estimated CO2 Equivalents Emission Total	59,000,000.00	69,000,000.00	73,000,000.00	81,000,000.00
CO2 Estimation Method	Reported	Reported	Reported	Reported
Total CO2 Emissions / Million in Revenue $	154.73	263.86	404.34	234.87
CO2 Equivalent Emissions Total	59,000,000.00	69,000,000.00	73,000,000.00	81,000,000.00
CO2 Equivalent Emissions Direct, Scope 1	51,000,000.00	60,000,000.00	63,000,000.00	70,000,000.00
CO2 Equivalent Emissions Indirect, Scope 2	8,000,000.00	9,000,000.00	10,000,000.00	11,000,000.00
CO2 Equivalent Emissions Indirect, Scope 3 T...	3,078.83	4,967.42	7,222.66	4,497.26
CO2 Equivalent Emissions Indirect, Scope 3	1,174,000,000.00	1,299,000,000.00	1,304,000,000.00	1,551,000,000.00
Carbon Offsets/Credits	5,800,000.00	6,400,000.00	4,300,000.00	2,700,000.00
Emissions Trading	TRUE	TRUE	TRUE	TRUE
Climate Change Commercial Risks Opportunit...	TRUE	TRUE	TRUE	TRUE
Flaring Gases To Revenues USD in million	9.97	11.47	27.14	22.33
Flaring Gases	3,800,000.00	3,000,000.00	4,900,000.00	7,700,000.00

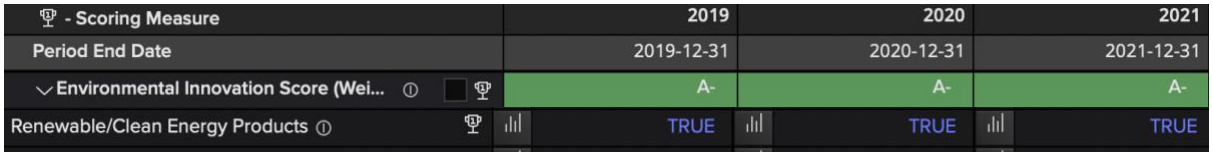
4.6.2 Investment in Renewable Energy

Shell seems to be committed to a shift to greener energy and has made significant investments in renewable energy sources such as wind, solar, and biofuels. Shell maintains a very good constant grade of A- through 2019 to 2021 but with a high score of 80.15 in 2019, a slightly lower score of 79.21 to 2020 and a whole score of 79 in 2021, in the environmental innovation category (score reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed products) as seen in figure 36. Below (Refinitiv, 2023b).

Furthermore, it is given a "true" all through 2019 to 2021 as shown in figure 37, under the "renewable/clean energy products" category, which assesses whether the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power) and in scope, includes data on the financing of renewable energy projects as well as if a utility company is deriving at least 25% of the power produced or revenue from clean technologies or energy (Refinitiv, 2023b). This means Shell delivered on its renewable energy investment claims, according to Refinitiv. Data regarding Shell's total renewable energy to energy use in millions score was not provided in 2019 but had an amount of 7,028.82 in 2020 and 9,256.93 in 2021, the figure for 2019 total renewable energy was also not provided but 6.498 million was recorded in 2020 and 7.938 million reported in 2021 (Refinitiv, 2023b). The figures for Shell's renewable energy purchased from 2019 to 2021 were

reported at 5.400 million, 6.480 million and 7.920 million respectively. In 2019, there was no data provided for renewable energy produced by Shell, while in 2020 and 2021 it was a constant amount of 18,000 as seen in figure 37.

Figure 36 Shell's Renewable Energy Involvement Assessment (Refinitiv, 2023).



- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Environmental Innovation Score (Wei...	A-	A-	A-
Renewable/Clean Energy Products	TRUE	TRUE	TRUE

Figure 37 Shell's Renewable Energy Assessment (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Total Renewable Energy To Energy Use in mill...	--	7,028.82	9,256.93
Total Renewable Energy	--	6,498,000.00	7,938,000.00
Renewable Energy Purchased	5,400,000.00	6,480,000.00	7,920,000.00
Renewable Energy Produced	--	18,000.00	18,000.00
Renewable Energy Use	TRUE	TRUE	TRUE
Green Buildings	FALSE	FALSE	FALSE

4.6.3 Investment in Low-carbon Sources

Shell seems to have been putting money into cleaner energy sources like natural gas, which produces far less carbon dioxide than either coal or oil. Shell maintains a "true" from 2019 to 2021 as seen in figure 38, under the "product environmental responsible use" category, reflects the company reports about product features and applications or services that will promote responsible, efficient, cost-effective, and environmentally preferable use, that is, any product or service that reduces the negative impact (less emission, pollution, noise, etc.) on the environment, according to Refinitiv. In the fossil fuel divestment category, Shell got a false from 2019 to 2021 meaning the company has a public commitment to divest from fossil fuel (Refinitiv, 2023b).

Figure 38 Shell's Product Environmental Responsible Use and Fossil Fuel Divestment (Less Carbon Emissions) (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Organic Products Initiatives	FALSE	FALSE	FALSE
Take-back and Recycling Initiatives	FALSE	FALSE	FALSE
Product Environmental Responsible Use	TRUE	TRUE	TRUE
GMO Products	FALSE	FALSE	FALSE
Agrochemical 5 % Revenue	FALSE	FALSE	FALSE
Animal Testing	TRUE	TRUE	TRUE
Animal Testing Cosmetics	FALSE	FALSE	FALSE
Animal Testing Reduction	TRUE	TRUE	TRUE
Renewable/Clean Energy Products	TRUE	TRUE	TRUE
Water Technologies	FALSE	FALSE	FALSE
Sustainable Building Products	FALSE	FALSE	FALSE
Fossil Fuel Divestment Policy	FALSE	FALSE	FALSE

4.6.4 Environmental initiatives

Shell acknowledges the value of carbon capture and storage in the fight against global warming. The company in 2019 had a "true" all through 2019 to 2021 in the environmental restoration initiatives category as seen in figure 39 below. This means it reported on company-generated initiatives to restore the environment, such as restoration, rehabilitation, clean up and remediation activities, (e.g., CCS programmes, research, and development) (Refinitiv, 2023b). Shell acquired sustained a "true" from 2019 to 202 which means the company did report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities (investments made in new technologies to increase future opportunities like treatment of emissions, installation of cleaner technologies) as it claimed. On environmental partnerships, it attained a "true" from 2019 to 2021. This means the company delivered on its CCS environmental partnership claims in 2019 and 2020 only (Refinitiv, 2023b).

Shell obtained "false" in 2019 to 2021 leading to the conclusion that for transition plan time horizon coverage, the company did not show its transition plan covered the short-term time horizon (next 5 years), medium term time horizon (next 5-15 years) and the long-term time horizon (after the next 15 years). Finally in the transition plan offsets category has a "false" all through 2019 to 2021 as seen in figure 40 below which shows the company failed to clarify the role and type of offsets/negative emission technologies in its transition plan (Refinitiv, 2023b).

Figure 39 Shell's Environmental Initiative Assessment 2019 to 2021 (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Environmental Restoration Initiatives	TRUE	TRUE	TRUE
Staff Transportation Impact Reduction	FALSE	TRUE	TRUE
Accidental Spills To Revenues USD in million	0.00	0.00	0.00
Accidental Spills	18.25	13.87	24.45
Environmental Expenditures Investments	TRUE	TRUE	TRUE
Environmental Expenditures	$223,000,000.00	$223,000,000.00	$522,000,000.00
Environmental Provisions	$1,197,000,000.00	$1,197,000,000.00	$1,225,000,000.00
Environmental Investments Initiatives	TRUE	TRUE	TRUE
Environmental Partnerships	TRUE	TRUE	TRUE

Figure 40 Shell's Environmental Initiative Assessment 2019 to 2021 (continued) (Refinitiv, 2023).

- Scoring Measure	2019	2020	2021
Period End Date	2019-12-31	2020-12-31	2021-12-31
Transition Plan Financial Planning	FALSE	FALSE	FALSE
Transition Plan Scope 3 Emissions	FALSE	FALSE	FALSE
Transition Plan Time Horizon Coverage	FALSE	FALSE	FALSE
Transition Plan Offsets	FALSE	FALSE	FALSE
Financial Exposure To Transition Risk	FALSE	FALSE	FALSE
Financial Exposure To Physical Risk	FALSE	FALSE	FALSE

4.6.5 Carbon Capture & Storage

There was no data on Carbon Capture Utilization and Storage (CCUS) / Carbon Capture Storage (CCS) for this company on the Refinitiv Eikon platform.

5 DISCUSSION

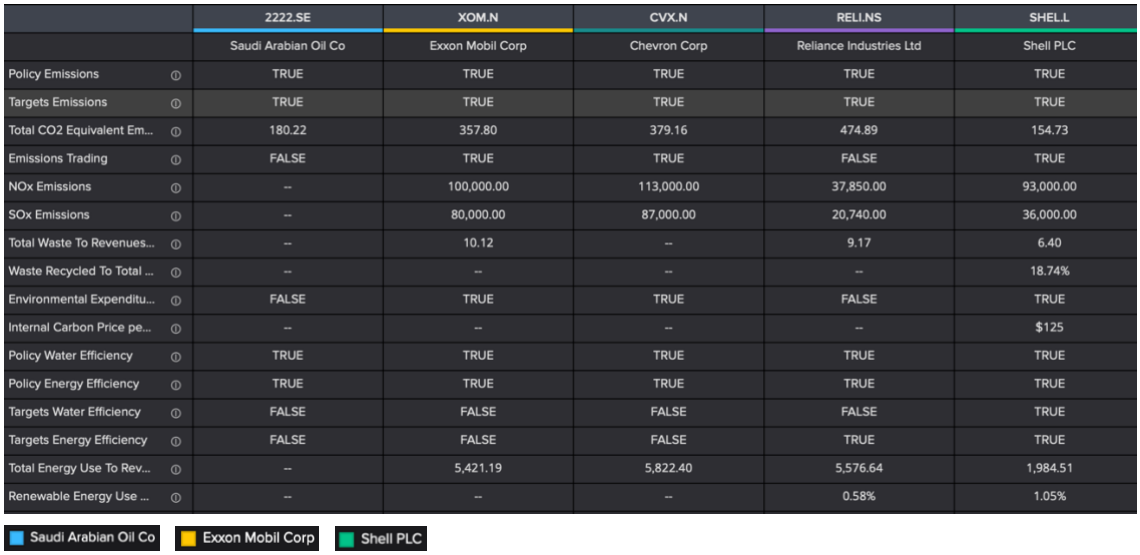
5.1 Comparison Between the Three Oil and Gas Majors' Refinitiv Environmental Data

Data Presentation and Observations

1. **Carbon Emissions and flaring**: Shell has demonstrated a commitment to lower carbon emissions compared to Saudi Aramco and ExxonMobil, as seen by its initiatives to buy products with low carbon footprints and cut back on overall CO2 emissions. To achieve these reductions, they employ various methods. Saudi Aramco seems to follow up after Shell given its efforts to cut down carbon emissions despites inconsistencies. Shell appears to have to lowest total CO2 emissions, followed by Saudi Aramco and then ExxonMobil coming least by having the highest number of emissions as seen in figure 41 below. While ExxonMobil is concentrating its efforts on natural gas as a transition fuel, only Shell has data on its flaring according to Refinitiv.
2. **Investment in Low-Carbon Sources**: The three businesses have all shown a desire to make investments in low-carbon energy sources. Their reports about the features of their goods and applications or services that have less negative environmental impact and their openness in the move away from fossil fuel use demonstrates the companies' commitments in investment in low-carbon energy sources.
3. **Investment in Renewable Energy**: With a significant emphasis on wind, solar, and biofuels, Shell appears to be leading the way in terms of renewable energy investment. It consistently receives a "true" grade in the renewable/clean energy categories and received a high rating for environmental innovation as a result.
4. **Environmental initiatives**: In an effort to lessen the environmental impact of their operations, ExxonMobil and Shell have both demonstrated a commitment to environmental initiatives. Both businesses have consistently reported on environmental investment and restoration initiatives, and partnerships to improve the environment.

   Saudi Aramco seems to fall short in environmental commitments due to its inconsistencies all through the given three-year period. Shell has shown a commitment to be environmentally friendly by actively participating in a number of significant initiatives as they have continually been engaged in this field, securely absorbing and storing millions of tonnes of CO2.

Figure 41 Saudi Aramco, ExxonMobil and Shell Comparison (Refinitiv, 2023).

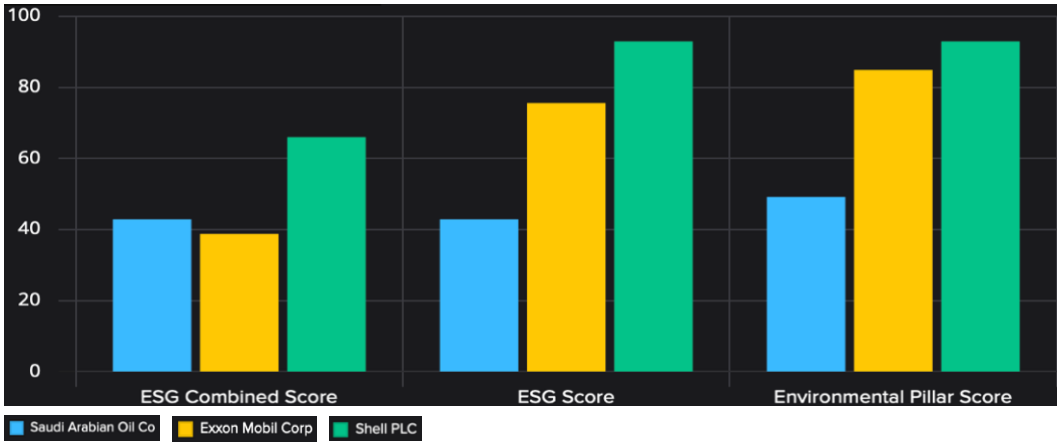


	2222.SE	XOM.N	CVX.N	RELI.NS	SHEL.L
	Saudi Arabian Oil Co	Exxon Mobil Corp	Chevron Corp	Reliance Industries Ltd	Shell PLC
Policy Emissions	TRUE	TRUE	TRUE	TRUE	TRUE
Targets Emissions	TRUE	TRUE	TRUE	TRUE	TRUE
Total CO2 Equivalent Em...	180.22	357.80	379.16	474.89	154.73
Emissions Trading	FALSE	TRUE	TRUE	FALSE	TRUE
NOx Emissions	--	100,000.00	113,000.00	37,850.00	93,000.00
SOx Emissions	--	80,000.00	87,000.00	20,740.00	36,000.00
Total Waste To Revenues...	--	10.12	--	9.17	6.40
Waste Recycled To Total ...	--	--	--	--	18.74%
Environmental Expenditu...	FALSE	TRUE	TRUE	FALSE	TRUE
Internal Carbon Price pe...	--	--	--	--	$125
Policy Water Efficiency	TRUE	TRUE	TRUE	TRUE	TRUE
Policy Energy Efficiency	TRUE	TRUE	TRUE	TRUE	TRUE
Targets Water Efficiency	FALSE	FALSE	FALSE	FALSE	TRUE
Targets Energy Efficiency	FALSE	FALSE	FALSE	TRUE	TRUE
Total Energy Use To Rev...	--	5,421.19	5,822.40	5,576.64	1,984.51
Renewable Energy Use ...	--	--	--	0.58%	1.05%

Shell appears to be ahead of Saudi Aramco and ExxonMobil in all categories as seen in figure 41.

5. **Carbon Capture & Storage (CCS)**: Although all three companies had commitments to carbon capture, utilization, and storage (CCUS), it was not possible to make a comparison due to the absence of environmental data in the Refinitiv database regarding this specific category.
6. **Transition Planning**: The transition planning of both businesses seems to be lacking in several respects. Saudi Aramco and Shell have not revealed a distinct transition plan that addresses the short, medium, and long term in their claims but only ExxonMobil did. However, all three business received "false" ratings in the "transition plan time horizon coverage and offset" category from 2019 to 2021 which calls for major concerns.
7. **ESG Scores**: It's important to note that throughout time, Shell has consistently outperformed ExxonMobil in terms of ESG Scores. ExxonMobil and Saudi Aramco, in contrast to Shell, earned lower ratings, suggesting a possible lag in their ESG efforts. The fact that Shell consistently performs well among its oil and gas competitors demonstrates its dedication to sustainability. Shell in particular has consistently scored highly on the environmental pillar, demonstrating its commitment to and advancements in environmental sustainability in figure 42 and 43 below. Shell also tops its peer group in terms of ESG ratings, which reflects its innovative sustainability initiatives.

Figure 42 ESG score Summary for Saudi Aramco, ExxonMobil, and Shell (Refinitiv, 2023).



Overall, among the three firms, Shell looks to be the most pro-active and devoted to environmental sustainability and the switch to greener energy sources. Although ExxonMobil and Saudi Aramco have shown some effort, they fall short in terms of consistency and detailed action plans. Although a full comparison is difficult due to the limited data on emissions reduction objectives provided by ExxonMobil and Saudi Aramco on Refinitiv. A summarized statistics for all three firms are shown in the graphic below.

Figure 43 Environmental Assessment for Saudi Aramco, ExxonMobil and Shell (Refinitiv, 2023).

	2222.SE	XOM.N	SHEL.L
	Saudi Arabian Oil Co	Exxon Mobil Corp	Shell PLC
Company Market Cap (...	$2,084,204	$433,612	$200,433
Total Revenue (Mil USD)	$603,240	$398,675	$381,314
ESG Combined Score	42.87	38.76	65.99
ESG Score	42.87	75.59	92.94
Environmental Pillar Sc...	49.16	84.90	92.94
Social Pillar Score	18.78	66.10	91.75
Governance Pillar Score	76.60	78.86	95.07
ESG Controversies Score	77.56	1.92	39.04

5.2 Claims-To-Action Consistency (Comparing their claims from 2019 to 2021 with their actions/environmental data)

Saudi Aramco 2019 to 2021 Claims-to-Action Consistency:

From 2019 through 2021, Saudi Aramco continuously recorded a "true" in the category for renewable/clean energy use and false in renewable/clean energy products, contradicting their assertions that they are growing their investments in these sources. Despite their investments, their overall CO2 emissions (measured in tonnes CO2e) for scope 1 and 2 significantly rose from 2019 to 2020, which raises concerns about their ability to manage carbon emissions. Their dedication to proactive investments to mitigate future environmental hazards and seize new possibilities is not completely demonstrated by the fact that their environmental investment projects have stayed inconsistent over the years. Also, the fact that they had a lot of missing data in most categories of concern may suggest claims-to-action inconsistencies.

ExxonMobil 2019 to 2021 Claims-to-Action Consistency:

ExxonMobil had a lot of consistency in dedication to low-carbon emissions and renewable energy sources but has sustained a "true" rating for environmental restoration & investments initiatives, and partnerships from 2019 to 2021. The company having a lot of missing data in most categories of concern seems to depict lack of openness and transparency. Consequently, the organization received a "false" rating for each of the three years in the categories of transition plan time horizon coverage and transition plan offsets. This is a disconnect between their assertions that they are aiming for a sustainable transition and the absence of specific strategies for the short, medium, and long terms. Another discrepancy in ExxonMobil's transition strategy is the failure to make clear the function and nature of offsets/negative emission technology.

Shell 2019 to 2021 Claims-to-Action Consistency:

Shell showed more transparency and consistency between their statements and actions than Saudi Aramco and ExxonMobil. The corporation disclosed its emissions from flaring, and data indicated a consistent drop from 2019 to 2021. This stood out among the three businesses and showed a stronger commitment to disclosure. As a result of continued efforts to lessen environmental costs and responsibilities for consumers, Shell likewise maintained a constant score in the environmental innovation area. Although Shell consistently showed a public commitment to divest from fossil fuel, the company received a "false" for transition plan time horizon coverage and transition plan offsets, identical to ExxonMobil, suggesting that their transition plans lacked clarity.

The data shows various degrees of consistency in terms of action, despite the fact that all three corporations have made claims about their dedication to renewable energy and ecologically beneficial practices. Shell appears to have the highest degree of openness and dedication to disclosing lower carbon emissions and investment, flaring, renewable energy resource investments and environmental measures. All businesses, however, have room for improvement, particularly in terms of being more transparent about their transition plans and the place that offsets play in their environmental policies.

5.2.1 Claims-To-Action Consistency of all Three Companies: Saudi Aramco, ExxonMobil, and Shell

Saudi Aramco, ExxonMobil, and Shell Saudi Aramco, ExxonMobil, and Shell were analyzed over a span of three years (2019 to 2021) in five categories: Carbon Emissions (target emissions, scope 1, 2 and 3 CO2 emissions, CO2 emissions in revenue per million dollars, scope 1 and 2 absolute emissions, scope 1 and 2 emissions intensity) and Lower Emissions Investment (product environmental responsible use, fossil fuel divestment category), Methane and Flaring Reduction, Renewable Resource Investment (environmental innovation category, renewable/clean energy products, total renewable energy, total renewable energy used, purchased and produced), Environmental initiatives (environmental restoration initiatives, environmental investment initiatives, transition plan time horizon coverage, transition plan offsets) and Carbon Capture, Utilization, and Storage (CCUS) as seen in table 3 below.

Table 3 Comparison of the Three companies' Claims from 2019 to 2021 with their Environmental data

	Saudi Aramco	**ExxonMobil**	**Shell**
Carbon Emissions and Lower Emissions Investment	Despite a decrease in total carbon emissions per millions revenue $ reported, other CO2 data had inconsistencies, suggesting actions may not	A slight increase in carbon emissions, indicating actions not aligning with investment claims.	Reported a consistent decrease in carbon emissions, reflecting their claims of lower emission investments.

	align with lower emissions investment claims.		
Methane and Flaring Reduction	No data provided, leaving their claims unverified.	No data provided, leaving their claims unverified.	Reported a consistent decrease in flaring, supporting their claims.
Renewable Resource Investment and Development	Data indicates no definite and consistent commitment to renewable energy sources, contradicting their claims.	No concrete evidence found to validate their claims of investment and development.	Data supports their claims of a consistent focus on renewable resource investment and development.
Environmental initiatives	Claims of environmental initiatives and investment but lack of specific data to support with a lot of inconsistencies	Claims of environmental initiatives and investment but lack of specific data to support.	Provided data related to environmental initiatives and investment, indicating an alignment between claims and actions.
CCUS	Though they had claims on CCUS there was no data on CCUS on Refinitiv Eikon, therefore no comparison could be made.	Though they had claims on CCUS there was no data on CCUS on Refinitiv Eikon, therefore no comparison could be made.	Though they had claims on CCUS there was no data on CCUS on the Refinitiv Eikon, therefore no comparison could be made.

When comparing Shell, ExxonMobil, and Saudi Aramco, Shell comes out as having the best environmental performance due to a close correlation between its statements and deeds. Shell appears to have shown its proactive attitude to the energy transition by providing its environmental data for consistent reductions in carbon emissions, emphasis on low-carbon sources investments, flaring, specific ongoing investments in renewable energy and consistent environmental initiatives and investments all through 2019 to 2021. ExxonMobil and Saudi

Aramco, in contrast, show some dedication in a few areas but fall short in terms of consistency and openness.

There are several potential explanations or causes of the consistencies and inconsistencies observed in the comparison of claims-to-action consistency among Saudi Aramco, ExxonMobil, and Shell:

- Due to previous contentious issues, Shell may have undertaken a reassessment of its dedication to the reduction of emissions. Anjli Raval (2021) and Meredith (2022) have noted that Shell has experienced a succession of legal proceedings, which may have prompted the company to critically reassess its approaches and prioritize environmentally sustainable operational pathways in other to lessen its negative environmental impacts and stay out of further legal disputes. While litigations faced by the other companies may not have moved them compared to the way it may have moved Shell.
- It is possible Shell has a better environmental implementation system which ensures that the organizational goals and objectives are effectively transformed into tangible actions and measurable outcomes. Therefore, important strategic planning and working together are for a successful transition (Fattouh et al., 2019). Berry and Randinelli (1998) talks about the importance of good environmental planning and implementation in an organization. This could have aided the company in seemingly aligning its claims with actions. On the other hand, Saudi Aramco and ExxonMobil may not have good or effective management system within the company.
- It is also likely that Shell appears to have greater alignment regarding its "claims-to-action" because the firm is faster than other corporations in producing transition reports or data and also has more comprehensive data on the refinitive eikon platform, making for easier assessment purposes. Saudi Aramco and ExxonMobil may have implemented most of their claims but are just slow in presenting their environmental data publicly.
- Shell may potentially possess a consumer base that exhibits a greater inclination towards environmentally conscious practices. Consequently, it is reasonable for the corporation to prioritize a transition from conventional fuel and products to sustainable energy sources and environmentally friendly products. (Shell Global, 2023). Saudi Aramco and ExxonMobil may not have as much green customer base their peer, Shell.

- Finally, it is possible Saudi Aramco and ExxonMobil had challenges in meeting up to their claims or shifting towards sustainable energy. Fattouh et al. (2019) talks about the difficulties experienced by established businesses as they try to adapt to the new energy landscape and discusses the difficulties incumbents encounter when attempting to adjust to the energy shift. Therefore, transitioning to a low-carbon economy could necessitate significant changes for oil companies and oil-producing countries (Fattouh et al., 2019).

It is good to note that to completely determine the scope of these firms' pledges and activities, further analysis is essential. However, these results underline the need of continued initiatives to change the energy environment and inspire other oil and gas firms to emulate Shell.

5.3 Connection with TIS Theory

1. **Function of Entrepreneurial Activities**: In the context of TIS, entrepreneurial activities relate to the initiatives taken by businesses to make new investments, launch new initiatives, or launch new strategies. It is evident from the Refinitiv comparison that all three firms are claiming entrepreneurial initiatives towards sustainable energy transitions, including GHG emissions reduction, investment in renewable resources, and environmental initiatives. The claims-to-action consistency, however, shows that Shell is the most entrepreneurially engaged firm since it is the only one that consistently showed actions that matched its claims across all categories.
2. **Function of Knowledge Development**: This function deals with the growth and dissemination of knowledge as well as learning processes. According to the Refinitiv comparison, all three businesses acknowledge the significance of switching to sustainable energy sources, demonstrating some level of knowledge growth. Shell, however, once more distinguishes out when it comes to reporting and openness, with their activities demonstrating a deeper commitment to information sharing and advancement.
3. **Function for Creating Legitimacy**: This function deals with the societal acceptability and suitability of new technology or procedures. Companies must prove their support for sustainable practices by their activities in addition to their claims if they want to be taken seriously. Shell's statements and deeds are most consistent, demonstrating a

dedication to establishing legitimacy. However, Saudi Aramco and ExxonMobil's efforts to establish credibility may be hampered by the fact that some of their statements lack supporting evidence.

4. **Function of Knowledge Diffusion**: The factors influencing the actions and preferences of system actors are described by the search direction function. Even while all businesses assert that they are pursuing sustainability, the coherence of their claims to their behaviour shows that they have different levels of dedication. The most congruent display of promises and deeds is made by Shell, indicating a marked shift in the pursuit for sustainability.

These results point to the need of openness, reporting, and consistency in claims and deeds for effective system change in TIS. It further emphasizes the necessity for all system participants to work towards consistency between their claims of sustainability and their actions. This may indicate that TIS should also take into account "claims-to-action consistency" as an extra factor. This can work as a quantifiable sign of dedication to the declared search orientation and may have an impact on other functions, such as knowledge growth, knowledge diffusion, entrepreneurial endeavours, and legitimacy building.

6 CONCLUSION

With a focus on their initiatives from 2019 to 2021, I conducted a thorough review of the promises made regarding climate action by Saudi Aramco, ExxonMobil, and Shell, three major oil and gas firms. I assessed the claims-to-action consistency of these businesses using the Refinitiv Eikon environmental data. I also looked at these findings via the context of the Technological Innovation System (TIS).

According to the findings of this study, Saudi Aramco, ExxonMobil, and Shell all made significant claims regarding carbon emissions, lower emissions investments, methane and flaring, renewable resource investments and developments, environmental initiatives, and carbon capture, utilization, and storage. When analyzing the statements made by three corporations between 2019 and 2021, it was seen that Shell exhibited the most clearly articulated and detailed assertions regarding their energy transition efforts. ExxonMobil was observed following Shell, with Saudi Aramco trailing after.

The statistics provided by Refinitiv Eikon were quite helpful in gaining a knowledge of the environmental performance of Saudi Aramco, ExxonMobil, and Shell. It gave essential insights into the activities and performance of the corporations with regard to their commitments to environmental sustainability and energy transition. Shell's sustained decline in carbon emissions is consistent with their claims of investments in lower emissions, whereas Saudi Aramco and ExxonMobil's minor decrease and increase in carbon emissions contradicts their investment claims. Only Shell confirmed its claims on flaring by consistently reporting less flaring, but none of the three companies had environmental data on methane. Saudi Aramco and Shell's commitment to investing in and developing renewable resources is corroborated by their openly accessible data. However, ExxonMobil still needs to provide corroborating evidence or take concrete measures to support its claims regarding investments in renewable energy, as evidenced by the absence of environmental statistics. Shell presented data demonstrating precise and regular investments in environmental initiatives, demonstrating a correlation between words and actions. In comparison, ExxonMobil and Saudi Aramco have few or no specific details. CCS claims couldn’t be assessed due to lack data on the Refinitiv platform.

This research showed that the three corporations' statements about climate action and actual performance varied significantly. The firm Shell stood out as having the most consistent “claims-to-action”, the most thorough reporting, and the highest degree of activity in line with their promises of taking climate action. ExxonMobil and Saudi Aramco, on the other hand, have gaps in their provided statistics, raising concerns about the consistency of their claims and deeds.

The study on TIS reveals that transparency, reporting, and consistency between claims and actions are essential for successful system transformation, which adds a new component to the TIS architecture called "claims-to-action consistency". However, the TIS theory requires a comparative analysis framework that aids it in analyzing differences in organizational culture, communication strategies, stakeholder engagement, and response to environmental challenges.

7 Limitations

Despite the use of sources and indicators that appear to be trustworthy, there are a number of limitations to the data gathering for this issue. First, as ESG environmental data is self-reported by the company, it might not always correctly represent the company's deeds. This may result in overreporting positive impact" and "underreporting negative impact. ESG environmental statistics may not accurately reflect the complexity of a company's environmental and social implications, and their utility as a proxy for sustainability performance is debatable, which can make it somewhat challenging to evaluate and contrast a company's sustainability performance fairly. Researchers may not receive a complete view of a company's sustainability activities and impacts if ESG environmental statistics are not thorough enough. This can result in erroneous evaluations of sustainability performance and possibly false conclusions. (Nwoke, 2019; Raufflet et al., 2014).

Second, there are limitations on the availability of complete and comparable environmental data, in particular. It is challenging to make trustworthy conclusions regarding a company's sustainability performance because of data gaps and inconsistencies in environmental reporting. Environmental data is frequently changing, therefore it may not necessarily be an accurate reflection of the current state of affairs (Jenkins & Yakovleva, 2006).

More also, while Saudi Aramco, ExxonMobil, and Shell have begun to address the need to transition to more sustainable energy sources, there may be an inherent bias in the data reflecting this focus to make themselves look good publicly by overreporting positive impact" and "underreporting negative impact in their energy transition reports, further limiting its reliability. Additionally, language barriers may be present due to the multinational nature of these companies' operations, making it difficult to collect and interpret data from multiple sources.

Finally, this research only looks at the top three energy companies in terms of revenue; Saudi Aramco, ExxonMobil, and Shell, in order to have a more thorough grasp of claims vs actions in the energy field other companies less similar to Saudi Aramco, ExxonMobil, and Shell for example, in terms of size (both small and big businesses), revenue (huge and very little financial capabilities and returns), etc., should also be researched on and their claims compared to resultant actions. These limitations were accounted for when collecting and analyzing data for this research.

Extreme instances are one of the several case study kinds that may be used in research, according to Seawright and Gerring (2008). Extreme cases are ones that are out of the ordinary or unique in some manner. They differ greatly from the usual and are distinguished by their originality. Due to their tremendous financial capacity and magnitude, Saudi Aramco, ExxonMobil, and Shell qualify as extreme instances for the purposes of this study.

It is vital to understand that these conclusions might not apply to the typical oil and gas corporation, even while analyzing these extreme situations might provide insightful information about their particular plans and practices for the energy transition and sustainability. Smaller businesses may experience various possibilities and problems as they make the journey to more sustainable operations. As a result, it is advised that future study include a wider variety of instances, spanning businesses of all sizes and revenue levels, to gain a deeper knowledge of the energy transition in the context of a larger sector.

Despite the current study's breadth being constrained by its emphasis on these extreme examples, it nonetheless provides insightful data. We may learn about the best practices and business strategies of organizations that have a big impact on the global energy market by studying these industry titans. Additionally, it is useful in demonstrating how these powerful actors respond to external demands for sustainability and the energy transition, therefore establishing benchmarks and expectations for the rest of the sector.

Lastly, the use of Refinitiv Eikon as an environmental data source had its short comings because they rely on the data companies submit on the platform. Also, there was a category or data needed in my research, such as Carbon Capture Utilization and Storage and Methane, that was not found on the Refinitiv platform, even though each company had claims on them.

8 RECOMMENDATIONS

Study Suggestions: To further understand the claims-to-action consistency across many industries, future study might concentrate on a larger range of businesses and industries. Additionally, there is room for a thorough investigation of the elements that affect businesses' choices to disclose or hide particular environmental data.

Policy Recommendations:

Government Policies: In order to increase business openness on climate action, governments may play a significant role. Comprehensive environmental reporting requirements that must be followed may be enforced, ensuring that businesses disclose all of their sustainability efforts. Another disincentive for information non-disclosure or deception might be penalties for non-compliance.

Companies should strive to maintain complete openness in their sustainability reporting, according to company policies. They should have a policy of thorough reporting that addresses every area of their environmental effect. In order to confirm the veracity of their statements, businesses should also implement independent audits of their sustainability reports.

The study's findings highlight the significance of corporate sustainability claims and activities and emphasis the necessity of openness and accuracy in reporting. For businesses, decision-makers, and other stakeholders dedicated to expediting the shift to a sustainable energy future, the findings provide insightful information.

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