The Impact of Carbon Emission On GCC's Oil and Gas Sector

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ABSTRACT

The world is currently facing a persistent issue known as global warming or climate change. Climate change is due to the ongoing temperature increase that is caused by gas emissions and human activities that heavily rely on non-renewable energies e.g., extraction of fossil fuels and gas. To achieve a sustainable economy and fight climate change, the world is making lifestyle changes that aim to minimize carbon emissions and prioritize renewable energies and new technologies.

The Gulf Cooperation Council (GCC) is known to have an economy that is heavily reliant on producing and exporting oil and natural gas. However, the oil and gas industries are the leading challenges of climate change. Thus, the reduction of greenhouse emissions will enforce the oil and gas industries in the GCC to shift towards sustainability.

Therefore, this research paper aims to study the impact of the carbon footprint on the GCC's oil and gas industry as well as its challenges and opportunities. The GCC has showcased practices and innovative strategies to move towards a sustainable approach in its industries. Therefore, to enable the GCC's gross domestic products to focus on cleaner energies that are environmentally friendly by 2050 (Al-Omari,2020). This study is based on secondary data to accommodate the projects, contributions of society, and sustainable approaches by the GCC countries in recent years and to study thoroughly the impact of this change on the oil and gas sectors using scholarly articles, journals, websites, books, etc.

Introduction

Nowadays the world is facing the most critical issue of humanity: global warming, which translates to the ongoing rising temperatures that are a threat to the sustainability of the world. In other words, the ongoing temperature increase is caused by greenhouse gas emissions and human activities that depend on non-renewable resources, mainly fossil fuels. Due to its impact on the planet, the world's focus for the upcoming years is to switch to a reduction in carbon footprint by utilizing renewable energies and new technologies (Al-Omari,2020).

The Gulf which includes: the Sultanate of Oman, the United Arabs Emirates, the Kingdom of Bahrain, Qatar, Saudi Arabia, and Kuwait heavily impacts global warming by being the leading contributor to greenhouse gas emissions. The GCC's contribution to greenhouse emissions is worth 4.6% due to its oil and gas production. (Gulf Petrochemicals and Chemicals Association. 2020). Thus, the gas and oil industry plays a huge role in the GCC's economy or GDP. Hence, the objective of this study is to analyze the impact of carbon footprint on the Gulf's oil and gas industry as well as the challenges and opportunities it presents (Al-Saleh,2019).

Problem Statement

The Gulf Cooperation Council (GCC), known for its heavy reliance on oil and gas production, faces a pressing challenge in addressing the impact of its carbon footprint on the global issue of climate change. As the leading contributor to greenhouse gas emissions in the region, the GCC's oil and gas industry plays a significant role in exacerbating global warming. To achieve sustainability and align with global efforts to combat climate change, the GCC must transition its industries towards cleaner and more environmentally friendly practices. However, this transition poses several challenges and opportunities that need to be thoroughly understood and addressed. Therefore, this research aims to analyze the impact of the carbon footprint on the GCC's oil and gas industry, while identifying the challenges and opportunities associated with adopting sustainable approaches. By studying the current practices, societal contributions, and innovative strategies implemented by GCC countries, this research will contribute to formulating effective measures to enable the GCC's oil and gas sectors to shift towards cleaner energies and achieve a sustainable economy by 2050.

Literature Review

As numerous studies suggested, the Gulf has been playing a role in reducing its carbon footprint and environmental impact. As Al Qahtani et al. (2018) stated, the oil and gas industry within the Gulf plays a huge role in greenhouse emissions. Thus, the oil and gas fields must mitigate emissions by using new methods towards sustainability.

Al-Saleh (2019) added that nations can attain a green economy by exploiting renewable energies at their disposal such as solar panels and wind. Indeed, due to the hot climate in the GCC, the development and utilization of solar energies can lead to an economic diversification that does not deeply rely on the oil and gas sector.

A study by the International Agency (IEA), in 2021 added that green hydrogen will be a great alternative when aiming for renewable energies. The green hydrogen is environmentally friendly since it does not release any carbon. The green hydrogen production can be explained in the following steps:

1. The use of renewable energies such as solar panels or wind to obtain electricity
2. The electricity is then used to power an electrolyzer with the help of water. The water aids in splitting the electricity into hydrogen and oxygen
3. The hydrogen is then purified to split hydrogen from impurities

In simple terms, it is hydrogen gas that is obtained by electrolysis when using wind and solar power. Therefore, this method aids in decarburizing areas that rely on fossil fuels. Additionally, it can have diverse use such as energy storage, fuel for automobiles, etc. However, the production of green hydrogen is very costly, therefore, imposes a major challenge in its implementation.

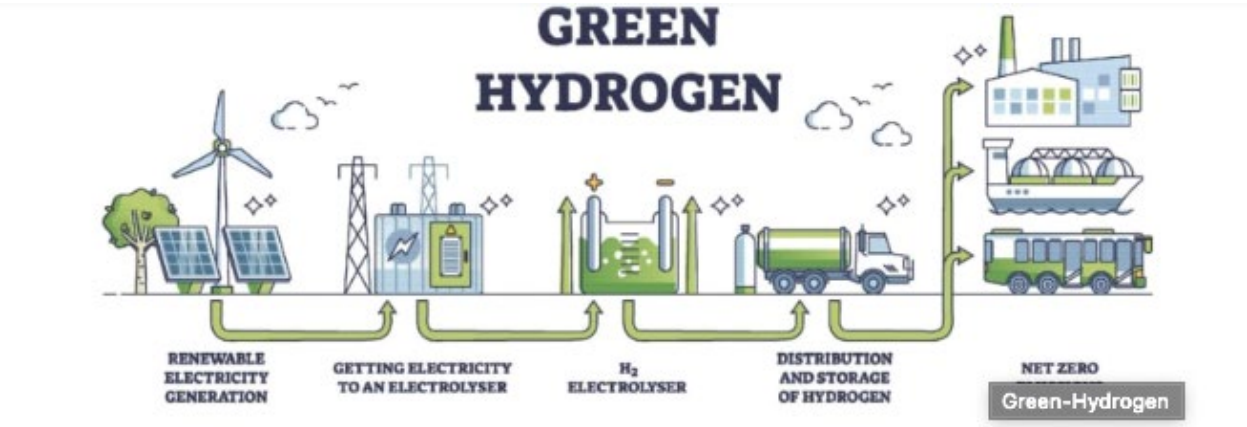

Figure 1. Green Hydrogen production

When it comes to addressing climate change, green hydrogen plays an important role in the following ways:

1. The production of green hydrogen does not emit any carbon as it is produced by renewable energies only, therefore it does not contribute to global warming.
2. By switching to green hydrogen, the world can see a decline in the use of natural gas which depends on non-renewable resources, mainly fossil fuels. Therefore, this new technique can be used in our everyday life such as m transportation.
3. The green hydrogen can always be stored if produced in mass, the storage of hydrogen can enable it to be converted into electricity.
4. Green hydrogen can be a replacement of fossil fuels, especially in industries such as the oil and gas, cement, and steel industries. Therefore, this will be a great alternative of reducing carbon footprint via green energy.

Due to its benefits and carbon reduction, the green hydrogen has gained interest in the GCC with the aim of diversifying its economy and reducing its carbon footprint. The weather in the GCC makes it favorable to implement the green hydrogen technology mainly with the use of solar power.

Three countries are leaning towards the implementation of green hydrogen, particularly, the Sultanate of Oman, Saudi Arabia and the United Arabs Emirates.

The Sultanate of Oman aims to use this technology for domestic and export matters since the country is very known for it use of solar energy resources. When it comes to Saudi Arabia, the country aims to be key player in the global hydrogen market by being a producer and exporter of the energy. On the other hand, the United Arabs Emirates is looking for ways to export energy and finding international partners.

Another study suggested that BP and the International Energy Agency (IEA) anticipate a net-zero model to limit global warming to 1.5°C, with a considerable rise in emerging clean energy and a decrease in hydrocarbons. Gulf Arab states have access to oil and gas reserves for the next 20-100 years and will continue to use hydrocarbons to supply energy needs in a net-zero future. Gulf governments have established high targets for carbon capture, hydrogen, and ammonia production, but their existing renewable energy generation capability falls far short of what is required to reach these ambitions. Despite possessing institutional framework and policies in place to minimize the effects of climate change, the Gulf states must greatly enhance their efforts to reach net zero (Global CCS Institute,2021).

Each Gulf state has set up panels or plans to address climate change and cut emissions, but only the Sultanate of Oman and the UAE have economy-wide policies in place to meet their net-zero targets. These measures must be coordinated with economic growth objectives and state budgets to reduce the socioeconomic repercussions of implementing various climate policies.

On the other hand, a study conducted by Thomas (2020) suggested that the Gulf countries should depend on other methods and technologies to detain and store carbon in the industries by using CCS. Therefore, the study highlighted the importance of Carbon Capture Storage (CSS) technology in the oil and gas industries within the GCC. The CSS technology is an invention that allows carbon reduction in three distinguished steps. First by detaining the carbon emissions produces in the oil and gas fields, then moving the emissions, and finally storing them underground.

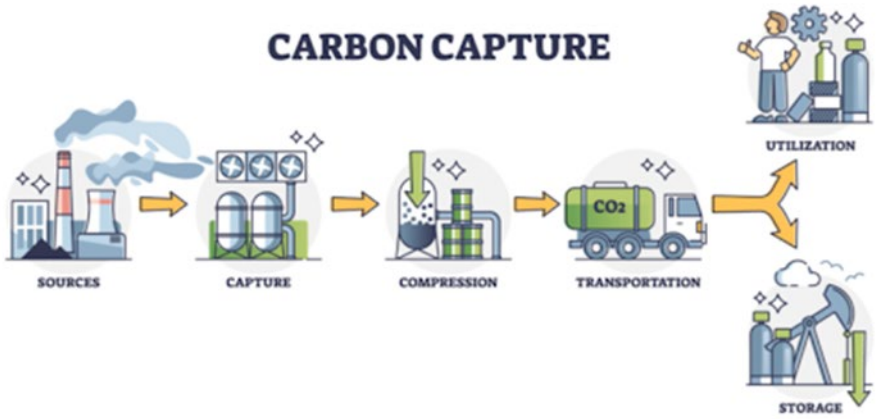

Figure 2. CSS technology

A study made by IRENA focused on another aspect of the carbon footprint of the GCC and oil and gas industry. The study highlighted that more than 60% of the greenhouse emission is due to the oil and gas industries in the Gulf itself. Therefore, if no initiatives are taken, emissions can rise to 75% in 2030. This study also supported Al-Omari et al. (2020) research by stating that the Carbon Capture Storage (CSS) technology is one of the best methods to reduce the carbon footprints in the Gulf. However, reducing the carbon footprints will lead to a reduction in oil and gas exporters which will heavily impact the GCC economies since they rely on the oil and gas industries.

On the other hand, all these challenges can lead to opportunities for the Gulf countries such as encouraging the use of cleaner energies and technologies that can diversify the GCC economies by creating diverse revenue streams. Also, the GCC is leading when it comes to CSS technology as the abandoned oil and gas industries, infrastructure, and knowledge in the Gulf are required for the CSS technology framework, development, and establishment.

Furthermore, the United Arabs Emirates (UAE) announced its plan to study and allocate resources to the implementation of Carbon Capture Storage (CSS) technology with the aim of capturing and storing carbon and safeguarding the environment. Thus, in his speech, Al Yafei explains the CCS method refers to the technique of capturing waste carbon dioxide from sources that generate it as a byproduct, such as power plants that rely on fossil fuels. During his speech, Al Yafei highlighted the importance of capturing carbon for the future and the upcoming generations.

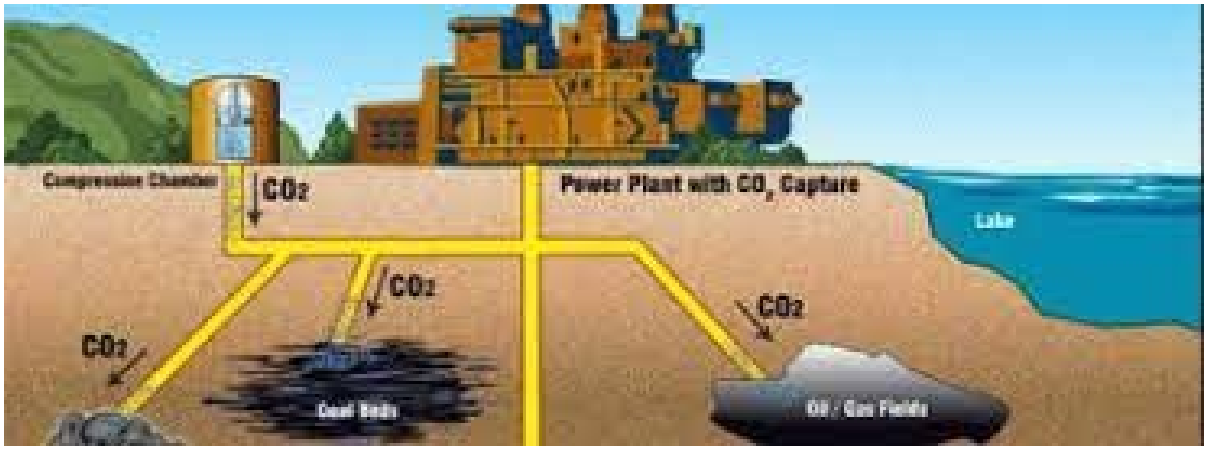

Figure 2. The CSS technology method explained

Methodology

This research paper was written with secondary data. A qualitative approach was conducted to analyze the impact of the carbon footprint on the GCC's oil and gas industry. Other forms of secondary data that have been used to conduct this study are credible and reliable journals as well as scholarly articles, websites, and books that have been reviewed or published in the last decade.

In order, to have adequate data and analyze different points of view of studies that have been made on this topic, a comparative analysis was used to evaluate the studies, mainly in the literature review.

Results

The results of this study show that the GCC is trying to shift to a sustainable economy that aims to reduce carbon emissions and go green by using renewable energies and new technologies.

The renewable energy in the GCC keeps increasing and reached 11.7 GW back in 2020 with the United Arabs Emirates leading followed by Saudi Arabi and the Sultanate of Oman.

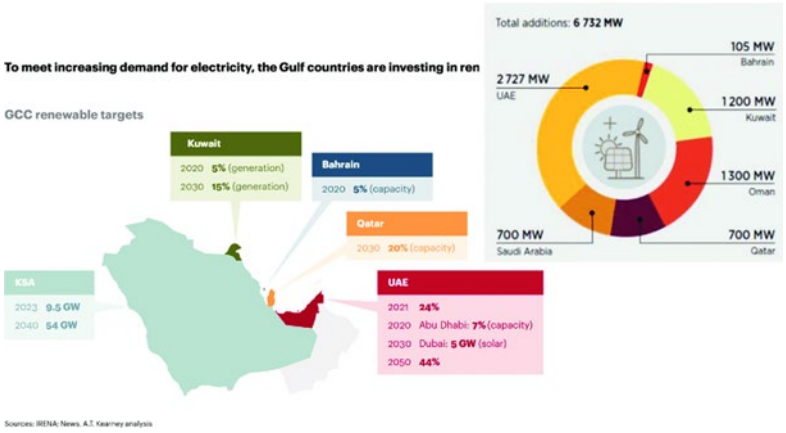

Figure 3. GCC countries renewable energy development plan by 2030

As previously mentioned, the Carbon Capture Storage (CSS) method is playing a huge role in reducing the carbon footprints within the Gulf and can be a great opportunity within the GCC due to its high number of oil and gas industries. In fact, in a report made by the Global CSS Institute (2021), several CCS projects are currently operating within the GCC countries with Saudi Arabia having the most.

Additionally, the reduction of greenhouse emissions within the GCC can represent opportunities, as the countries will have to explore different renewable energies that can diversify their economy. Also, with proper strategic planning and investment, the GCC can explore various ways to diversify its economy by focusing on other aspects that do not involve oil and gas or other types of energy (IRENA,2021).

On the other hand, the use of green hydrogen is the key to reducing carbon footprint, especially in the GGC. As previously stated, this technique will mainly aid the GCC greenhouse emission and play a key role in the efforts

of fighting global warming. Also, green hydrogen will enable the GCC to diversify its economy and attract foreign investors.

Conclusion

To conclude, the Gulf plays a significant role in greenhouse emissions as its economy deeply relies on the oil and gas industries. On the bright side, the countries are working towards building a better future by focusing on renewable energies and diversifying their economy. Thus, Each Gulf state has set up panels or plans to address climate change and cut emissions, but only the Sultanate of Oman and the UAE have economy-wide policies in place to meet their net-zero targets. Also, the GCC is switching towards CSS technology with Saudi Arabia on the lead.

Recommendations

After conducting this study, the following recommendations have been made:

- The GCC should focus on renewable energies like solar and wind energies which will enable the use and implementation of green hyrdrogen.
- All the countries in the GCC should start using CSS technology to reduce their greenhouse emissions.
- The Gulf should encourage its citizens to use renewable energies and public transportation to reduce its gas emissions.
- Implementing restrictive measures to use energy-efficient equipment and technology to streamline processes, recycle the energy unutilized, and save costs.
- Collaboration with other industry sectors such as energy and transportation industries to provide innovative solutions to use cleaner fuels, and efficient technologies, and raise awareness regarding environmental impact and renewable resources.

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