



# Sustainable Development in the Oil and Gas Sector: Considering Economic, Environmental and Social Aspects

Ekrem Alagoz<sup>1\*</sup>

<sup>1</sup>Turkish Petroleum Corporation (TPAO), R&D Department, Sogutozu Nizami Gencevi Street No:10, 06510 Cankaya, Ankara, Turkey

## INFORMATION

### Article history

Received 06 June 2023

Revised 17 June 2023

Accepted 17 June 2023

### Keywords

Sustainability

Energy transition

Carbon neutrality

Green technologies

Stakeholder engagement

### Contact

\*Ekrem Alagoz

[ealagoz@tpao.gov.tr](mailto:ealagoz@tpao.gov.tr)

## ABSTRACT

Although the oil and gas sector is vital to the growth of the world economy, it also faces severe environmental and social problems. Achieving sustainability in the sector necessitates striking a balance between economic, environmental, and social factors. The oil and gas industry's struggles to adopt sustainable practices are covered in this manuscript's overview of sustainability in that sector. It explores how industry can be more sustainable in terms of the economy, environment, and society, and it highlights ways to do this. The paper also explores the value of reporting on sustainability efforts and offers examples of sustainable business strategies in action. The final section of the manuscript examines the future of sustainability in the oil and gas sector, covering new trends and problems, chances for innovation and teamwork, and a call to action for stakeholders in the sector to prioritize sustainability.

## 1. Introduction

Recent years have seen a rise in interest in the concept of sustainability as environmental and social challenges have received more attention. As the oil and gas sector deals with several environmental and social issues, sustainability has become a crucial factor. The International Energy Agency (IEA) estimates that the oil and gas sector is to blame for over 70% of the world's greenhouse gas emissions (International Energy Agency, 2019) (Fig. 1).

The industry has also come under fire for how it affects indigenous peoples and local communities (Kolb, 2020). The oil and gas business has advanced toward adopting sustainable practices despite these obstacles. Initiatives to lower greenhouse gas emissions, boost energy effectiveness, and encourage social responsibility have been put in place by several businesses (IPIECA, 2019). To achieve sustainability in a company, nevertheless, one must balance economic, environmental, and social considerations. The oil and gas business faces many difficulties in implementing sustainable

practices, which are highlighted in this paper's review of sustainability in the sector. The article looks at the industry's economic, environmental, and social sustainability factors and offers tactics for encouraging sustainable behavior. The article also explores the significance of sustainability reporting and offers case studies of businesses putting sustainable strategies into practice.

## 2. Economic Considerations

The oil and gas sector is important to the development of the global economy, employment creation, and energy security (Nash, 2019). The industry also generates substantial revenue for governments through taxes and royalties (Bartlett et al., 2020). However, the industry's economic importance is often at odds with sustainability considerations.

Balancing economic growth with sustainability requires a shift towards sustainable economic practices in the industry. One strategy is to promote the development of renewable energy sources, such as wind and solar power, which can



reduce the industry's reliance on fossil fuels (Bartlett et al., 2020). Another approach is to improve the efficiency of energy production and reduce waste, which can lower costs and improve profitability (Schiebahn et al., 2020; Jang et al.,

2021). Additionally, the industry can promote sustainable practices by engaging with stakeholders, including local communities, investors, and regulators, to build trust and foster collaboration (Barnett et al., 2019).

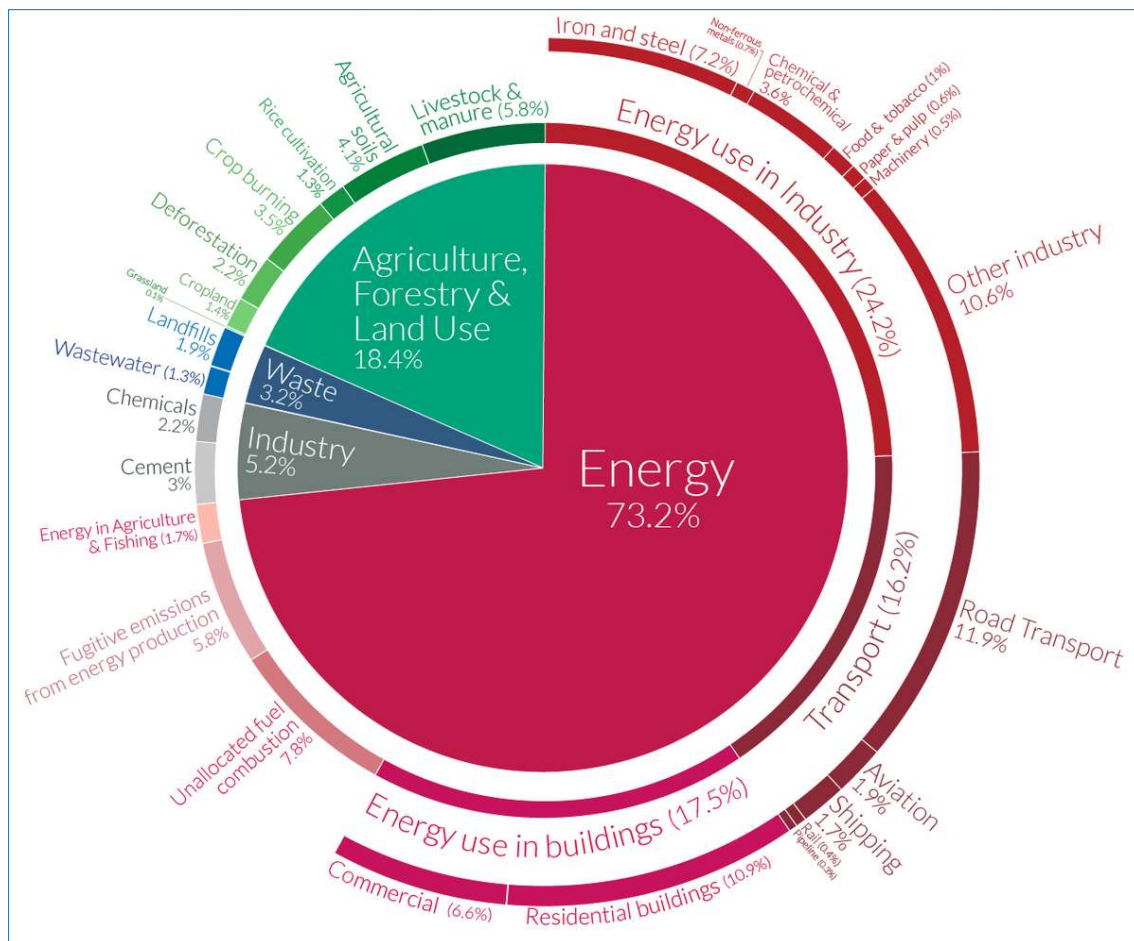


Fig. 1. Global greenhouse gas emissions by sector (Ritchie and Roser, 2020)

Overall, promoting sustainable economic practices in the oil and gas industry requires a long-term perspective that considers both economic and sustainability objectives. By balancing these objectives, industry can continue to contribute to global economic development while also promoting sustainability.

### 3. Environmental Considerations

The oil and gas industry has a significant environmental impact, including greenhouse gas emissions, air and water pollution, and land degradation (Sawant et al., 2019). To reduce this impact, the industry has developed various technologies and practices (Alagoz et al., 2023). One technology for reducing environmental impact is carbon capture and storage (CCS), which captures carbon dioxide emissions from fossil fuel combustion and stores it underground (Holloway et al., 2021) (Fig. 2). Another approach is to improve the efficiency of energy production by using advanced technologies such as combined heat and power (CHP) and cogeneration, which can reduce greenhouse gas emissions and energy waste (Farid et al., 2020).

A significant part of encouraging sustainability in the oil and gas sector is played by regulatory frameworks. For instance, the Emissions Trading System (ETS) of the European Union has established a market for carbon emissions, which encourages businesses to cut their greenhouse gas emissions (Mallapragada et al., 2021).

Similar rules have been put in place by the US Environmental Protection Agency (EPA) to lessen industry-related air and water pollution (Neff et al., 2018). Overall, adopting cutting-edge technologies, putting in place regulatory frameworks, and fostering cooperation between business, government, and other stakeholders to promote sustainable practices are all necessary to lessen the environmental impact of the oil and gas industry.

### 4. Social Considerations

Local communities are significantly impacted by the oil and gas industry in terms of employment prospects, community growth, and cultural and social shifts (Boiral and Gendron, 2011). However, the sector may also have detrimental social effects, including the eviction of native populations and

health risks for both employees and locals (Riberiro et al., 2020). To address these issues and promote sustainable social practices, the industry has implemented various strategies. For example, companies can engage in meaningful consultation and collaboration with local communities to understand their needs and concerns (Lacey et al., 2020). Additionally, companies can provide social benefits such as job training, education, and healthcare services to communities (van der Linde et al., 2017). Several companies have implemented sustainable social practices in their operations (Fig. 3).

For instance, Chevron has established partnerships with local communities to promote economic development, education, and health in Nigeria and Angola (Chevron, 2021). Similarly, Total has implemented a social responsibility program in Uganda, which includes community engagement, education, and healthcare initiatives (Total, 2021). Overall, promoting sustainable social practices in the oil and gas industry requires meaningful engagement with local communities and a commitment to social responsibility from industry stakeholders.

## 5. Sustainability Reporting

Companies in the oil and gas sector must use sustainability reporting as a vital tool to inform stakeholders about their performance in these areas (Branco et al., 2018). The

reporting promotes stakeholder participation, accountability, and decision-making about sustainable practice.

The Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) are two examples of reporting frameworks and standards used in the sector for sustainability reporting (Buchholtz and Carroll, 2012). These frameworks give businesses instructions on how to report on sustainability concerns that are pertinent to their operations and guarantee that reporting is consistent and comparable.

However, companies in the oil and gas industry face various challenges in sustainability reporting, such as the lack of standardized metrics and the difficulty in measuring and reporting on certain sustainability issues (Fernández-Guadaño et al., 2019).

Companies also face challenges in engaging with stakeholders and ensuring the accuracy and reliability of reported information. To address these challenges, best practices for sustainability reporting in the industry include stakeholder engagement, materiality assessment, verification of data, and integration of sustainability into business strategy (Delmas and Toffel, 2011). These practices can enhance the credibility and usefulness of sustainability reporting for stakeholders and support the company's overall sustainability performance.

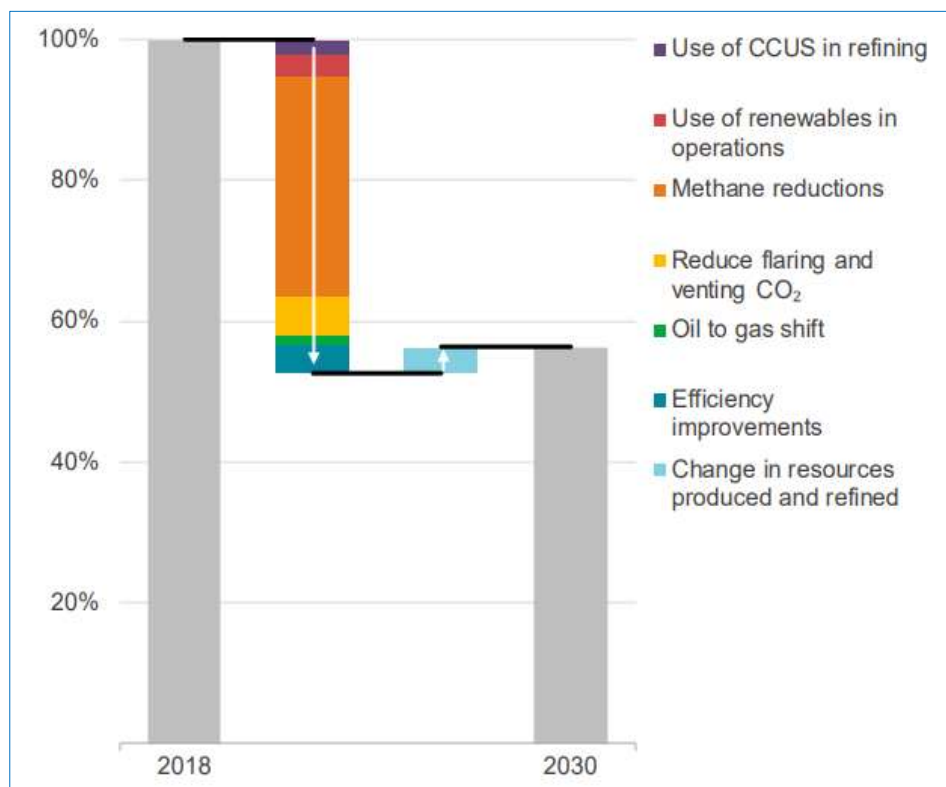


Fig. 2. Changes in the Sustainable Development Scenario's oil and natural gas activities' average worldwide emissions intensity (IEA, 2021)

## 6. Case Studies

Several companies in the oil and gas industry have implemented sustainable practices to balance economic growth with environmental and social considerations. A

prime example is the Company Equinor, which has set ambitious targets for reducing greenhouse gas emissions, investing in renewable energy sources, and engaging with locals (Equinor, 2021).

Another example is the Shell company, which has developed technologies for reducing emissions and minimizing environmental impact, such as carbon capture and storage and renewable energy production (Shell, 2021). Shell also engages with stakeholders and implements social programs to address community concerns and support local development.

These and other case studies demonstrate the effectiveness of sustainable practices in achieving economic, environmental, and social goals in the oil and gas industry. For instance, implementing sustainable practices can reduce costs, enhance reputation, and support long-term business viability while reducing environmental impact and improving social outcomes.

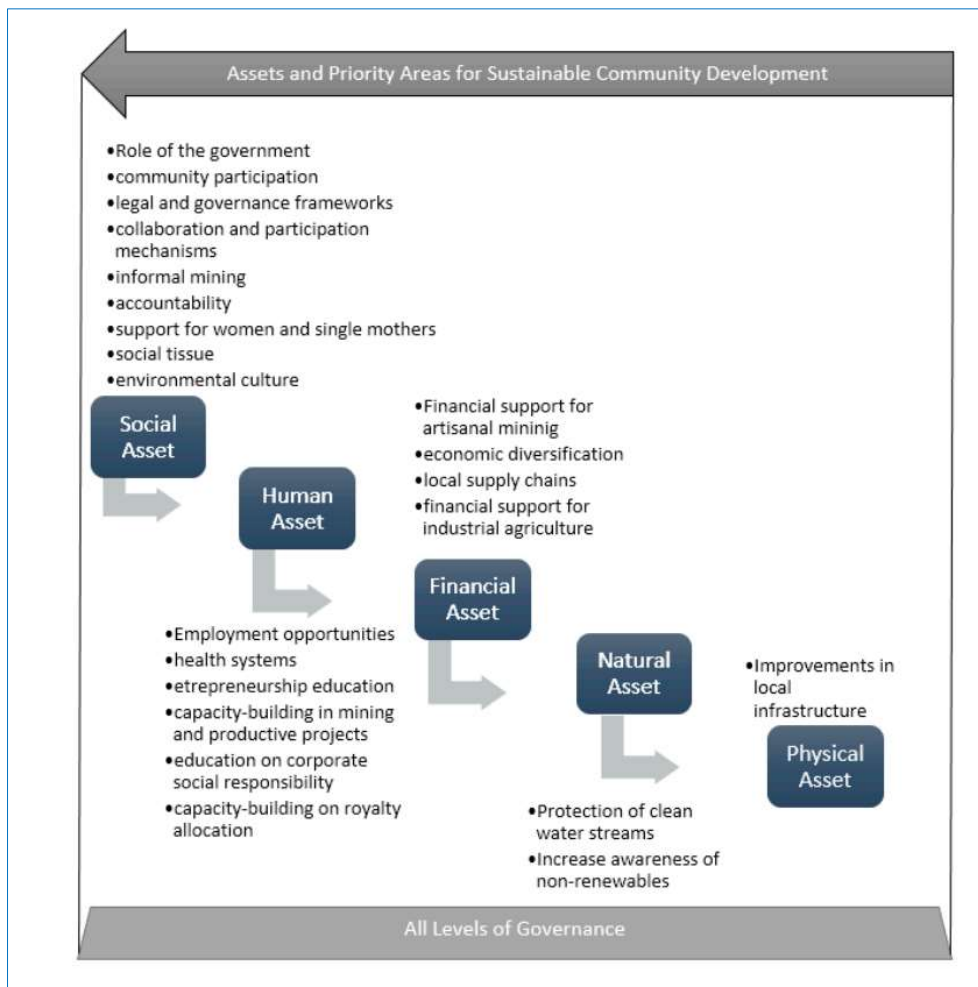


Fig. 3. Sustainable Community Development through Collaborative Governance in Resource Regions (Franco et al., 2018)

However, challenges still exist in implementing sustainable practices, such as the complexity of transitioning to low-carbon energy sources and the need for collaboration across the industry and with other stakeholders. Nevertheless, case studies can provide valuable insights and lessons learned for companies seeking to adopt sustainable practices in the industry.

### 7. Future of Sustainability in the Oil and Gas Industry

The future of sustainability in the oil and gas industry presents both emerging trends and challenges that require industry stakeholders to prioritize sustainability in their strategies and operations. One emerging trend is the increasing demand for low-carbon energy sources and renewable energy technologies, which creates opportunities for innovation and collaboration across the industry. Another challenge is the need for industry to address its impact on

biodiversity, including deforestation and habitat destruction, which can have significant environmental and social consequences.

Additionally, the industry needs to address the social impacts of its operations on local communities and ensure that their interests and concerns are taken into account. To address these challenges, industry stakeholders can prioritize sustainability in their strategies and operations by setting ambitious targets, investing in sustainable technologies, engaging with stakeholders, and reporting on sustainability performance.

Collaboration across the industry and with other stakeholders, such as governments and civil society, is also critical to achieving sustainable practices and addressing emerging challenges.

In conclusion, the future of sustainability in the oil and gas industry requires industry stakeholders to prioritize sustainability in their strategies and operations. By addressing emerging trends and challenges, investing in

sustainable technologies, and collaborating with other stakeholders, industry can contribute to a sustainable energy future while balancing economic, environmental, and social considerations.



Fig. 4. The sustainability reporting process (IPIECA, 2020)

## 8. Conclusion

In conclusion, the oil and gas industry play a crucial role in the global economy (Abes et al., 2021; Ifrene et al., 2022; Irofti et al., 2022; Khetib et al., 2022) but also poses significant challenges to sustainability. It is important for industry stakeholders to balance economic growth with environmental and social considerations to achieve sustainable practices. This paper has discussed the economic, environmental, and social considerations of sustainability in the oil and gas industry, including strategies for promoting sustainability, technologies for reducing environmental impact, regulatory frameworks, and social impact on local communities. The paper also discussed the importance of sustainability reporting and presented case studies of companies implementing sustainable practices in the industry. Lastly, the paper outlined emerging trends and challenges and called for action from industry stakeholders to prioritize sustainability. Achieving sustainable practices in the oil and gas industry requires collaborative efforts and innovative solutions, and it is crucial for the industry to prioritize sustainability for a more sustainable future.

## References

- Alagoz E., Alnasser F., Ozkan Y., Dundar E.C., Shiriye J., 2023. Overview of Closed-Loop Enhanced Geothermal Systems. *International Journal of Earth Sciences Knowledge and Applications* 5 (1), 158-164.
- Abes, A., Irofti, D., Ifrene, G. E., Rasouli, V., Djemai, S., 2021. The Impact of Geometric Attributes of Fractures on Fluid Flow Characteristics of Reservoir: A Case Study in Alrar Field, Algeria. In 55<sup>th</sup> US Rock Mechanics/Geomechanics Symposium, OnePetro. <https://onepetro.org/ARMAUSRMS/proceedings/ARMA21/All-ARMA21/ARMA-2021-1803/468185>.
- Barnett, M. L., King, A. A., O'Rourke, D., 2019. Globalization and the sustainability of large-scale farming in Latin America. *Proceedings of the National Academy of Sciences* 116 (10), 4382-4387.
- Boiral, O., Gendron, Y., 2011. Sustainability reports as simulacra? A counter-account of A and A+ GRI reports. *Accounting, Auditing & Accountability Journal* 24 (8), 1037-1070.
- Branco, M.C., Curto, J.D., Eugénio, T., 2018. Sustainability reporting and assurance: A historical analysis and future outlook. *Journal of Cleaner Production* 172, 3505-3521.
- Carroll, A.B., Brown, J.A., Buchholtz, A.K., 2012. *Business and Society: Ethics, Sustainability, and Stakeholder Management*. Cengage Learning. Channel Center Street Boston, MA 02210 USA.
- Chevron, 2021. Social investments in Angola and Nigeria. Retrieved from <https://www.chevron.com/countries/>.
- Delmas, M.A., Toffel, M.W., 2011. Stakeholders and environmental management practices: An institutional framework. *Business & Society* 50 (1), 103-129.
- Equinor, 2021. Climate ambitions. Retrieved from <https://www.equinor.com/en/how-and-why/climate-ambitions.html>.
- Franco, I.B., de Oliveira, J.A.P., Ali, S.H., 2018. Peace with Hunger: Colombia's Checkered Experience with Post-Conflict Sustainable Community Development in Emerald-Mining Regions. *Sustainability* 10, 504. <https://doi.org/10.3390/su10020504>.
- Farid, M.M., Hamad, M.A., Nizami, A.S., 2020. Integrated hydrogen, power and CO<sub>2</sub> capture (HYPOCC) systems for decarbonizing the oil and gas sector: A review. *Renewable and Sustainable Energy Reviews* 123, 109779.
- Fernández-Guadaño, J., Fernández-Méndez, C.M., León, C.J., 2019. Sustainability reporting in the oil and gas industry: Trends and challenges. *Sustainability Accounting, Management and Policy Journal* 10 (2), 168-193.

- Ifrene, G.E., Irofti, D., Khetib, Y., Rasouli, V., 2022. Shear Waves Anisotropy and Image Logs Integration for Improved Fracture Characterization. In 56<sup>th</sup> US Rock Mechanics/Geomechanics Symposium, OnePetro. <https://doi.org/10.56952/ARMA-2022-0319>.
- International Energy Agency, 2019. Global CO<sub>2</sub> emissions in 2018. Retrieved from <https://www.iea.org/reports/global-co2-emissions-in-2018>.
- Irofti, D., Ifrene, G.E., Pu, H., Djemai, S., 2022. A Multiscale Approach to Investigate Hydraulic Attributes of Natural Fracture Networks in Two Tight Sandstone Fields, Ahnet, Algeria. In 56th US Rock Mechanics/Geomechanics Symposium. OnePetro. <https://doi.org/10.56952/ARMA-2022-0450>.
- Khetib, Y., Ling, K., Ifrene, G.E.H., Allam, L., Omar, B., Aoun, A.E., 2022. Experimental and Simulation Investigation of Severe Slug Flow Attenuation Using a Dampening Pipe Volume. Available at: <https://ssrn.com/abstract=4236231> or <http://dx.doi.org/10.2139/ssrn.4236231>.
- Kolb, M., 2020. Oil and gas industry and indigenous peoples: A complex relationship. *Energy Policy* 142, 111505.
- IPIECA, 2019. Sustainability in the oil and gas industry: An IPIECA perspective. Retrieved from <https://www.ipieca.org/resources/sustainability-in-the-oil-and-gas-industry-an-ipieca-perspective/>.
- IPIECA, 2020. Sustainability reporting guidance for the oil and gas industry. [https://www.api.org/-/media/files/ehs/climate-change/ipieca\\_sustainability-guide-2020.pdf](https://www.api.org/-/media/files/ehs/climate-change/ipieca_sustainability-guide-2020.pdf).
- Ritchie, H., Roser, M., Rosado, P., 2020. CO<sub>2</sub> and Greenhouse Gas Emissions. Published online at OurWorldInData.org. Retrieved from: <https://ourworldindata.org/co2-and-greenhouse-gas-emissions>.
- Nash, J., 2019. Economic growth and the oil and gas industry. In Proceedings of the 3<sup>rd</sup> International Conference on Business, Management and Economics, Bali, Indonesia.
- Bartlett, R.V., Wang, Y., Knapp, K.C., 2020. The economic and fiscal contributions of the US oil and natural gas industry. *Energy Policy* 137, 111119.
- Jang, H., Yoo, S.H., Lim, K., 2021. Renewable energy transition in oil and gas companies: Comparative analysis of current status and future prospects. *Energy Policy* 148, 111957.
- Schiebahn, A., Laubenstein, C., Ganswindt, M., 2020. A review of resource efficiency practices in the oil and gas industry. *Journal of Cleaner Production* 273, 123086.
- Sawant, S., Wadnerkar, P., Mukherjee, A., 2019. Environmental impact of oil and gas exploration: A review. *Journal of Cleaner Production* 208, 1299-1308.
- Holloway, S., Shannon, M., Padgett, J., 2021. An overview of carbon capture and storage technology: Background, status, and future trends. *Energy and Environmental Science* 14 (2), 684-724.
- IEA, 2021. Net zero by 2050. <https://www.iea.org/reports/net-zero-by-2050>.
- Lacey, J., Palmi, M., Phillips, R.A., 2020. Communities and corporations: Addressing the social impact of resource development. *Journal of Cleaner Production*, 268, 122247.
- Mallapragada, D.S., David, S., Sivaraman, D., Borah, P., 2021. European Union's Emissions Trading System: An overview and perspectives. *Journal of Cleaner Production* 287, 125186.
- Neff, R.A., Breyer, C., Herzog, H.J., Lipman, T., 2018. The social cost of carbon and the shadow price of investment: Policy tools for responsible fossil fuel investment. *Energy Policy*, 122, 444-450.
- Ribeiro, H., Schaeffer, R., de Souza, R.R., 2020. The impacts of oil and gas activities on local communities in Brazil: A systematic review of the academic literature. *Energy Research & Social Science* 67, 101507.
- van der Linde, C., Castaldi, C., Horsfield, B., 2017. Engaging with communities: The contribution of oil and gas companies to local development. *Journal of World Energy Law & Business* 10 (2), 102-122.
- Shell, 2021. Powering progress together: Shell's social investment programme. Retrieved from <https://www.shell.com/sustainability/powering-progress-together/social-investment-programme.html>.
- Total, 2021. Social responsibility in Uganda. Retrieved from <https://www.total.ug/en/our-commitments/social-responsibility-uganda>.