

Special Issue, the Second GPDRL College of Law International Conference on Legal, Socio-economic Issues and Sustainability

THE CONSEQUENCES OF LEGAL CHALLENGES FOR OIL AND GAS INDUSTRY: GLOBAL TRENDS IN CLIMATE CHANGE LITIGATION AND MANAGEMENT

Shahad Ahmed Al-Nasser

Submitted on 11 Apr 2023 / Revised 1st 27 Apr 2023 / Revised 2nd 30 Apr 2023 /

Approved **21 May 2023** / Published online: **31 May 2023**

Summary: 1. Introduction – 2. The Oil and Gas Industry's Contribution to Greenhouse Gas Emissions. – 2.1 *Scope of Emissions: Statistics and Data.* – 2.2 *Environmental Impacts: Global and Local Effects.* – 3. Legal Challenges and Impact on the Industry: Disclosure, Regulation, and Transition to Sustainable Practices. – 4. Global Trends in Climate Change Litigation: Examples and Statistics. – 4.1. *Common Climate Change Litigation Examples.* – 4.2. *Statistics Regarding Climate Change Lawsuits.* – 5. Climate Change Opportunities. – 6. Conclusions.

Keywords: oil and gas industry, environment, international legal challenges, climate change, data collection methodology, legal framework, development opportunities.

Shahad Ahmed Al-Nasser

Legal Researcher, Prince Sultan University, College of Law, Riyadh, Saudi Arabia Shahadalnasser@hotmail.com
<https://orcid.org/0009-0008-0798-0247>

Corresponding author, responsible for writing and researching. **Competing interests:** Any competing interests were included. **Disclaimer:** The author declares that her opinion and views expressed in this manuscript are free of any impact of any organizations.

Managing editor – Mag Polina Siedova. **English Editor** – Dr. Sarah White.

Guest Editors of the Special Issue: Dr Mohammed Albakjaji, Prince Sultan University, and Dr Maya Khater, Al Yamamah University, Saudi Arabia.

Copyright: © 2023 Shahad Ahmed Al-Nasser. This is an open access article distributed under the terms of the Creative Commons Attribution License, (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

How to cite: S A Al-Nasser 'The Consequences of Legal Challenges for Oil and Gas Industry: Global Trends in Climate Change Litigation and Management' 2023 Special Issue Access to Justice in Eastern Europe 1-16. <https://doi.org/10.33327/AJEE-18-6S016>

ABSTRACT

Background: Globally, there is mounting concern regarding climate change, which scientific consensus confirms through the undeniable rise in global temperatures. The blame for this unwavering trend can be attributed to anthropogenic activities, specifically non-renewable resource combustion like oil and gas usage. Consequently, there is an urgent need to curb greenhouse gas emissions and make the transition towards more eco-friendly energy sources. In recent years, the oil and gas sector has come under scrutiny and faced numerous legal challenges due to its role in perpetuating greenhouse gas emissions. Climate change litigation has emerged as an effective instrument for enforcing corporate accountability and promoting the adoption of sustainable energy alternatives.

Methods: A thorough examination was carried out using a multi-faceted strategy that took into account legal, environmental, economic, and social aspects. The study encompassed an exhaustive assessment of both domestic and international laws and regulations relevant to climate change and the oil and gas sector. Moreover, various secondary sources concerning emission standards governing bodies, carbon pricing mechanisms, as well as other climate-related policies impacting the industry were also taken into consideration. Furthermore, pertinent case law records and dispute resolution systems were examined to evaluate the efficacy of existing legal frameworks.

Results and conclusion: It has been noted that there has been a notable escalation in the number of legal disputes regarding climate change worldwide in recent times. These legal actions are intended to determine corporate accountability and encourage the implementation of ecologically sustainable sources of energy. The petroleum and natural gas industry is a significant contributor to the emission of greenhouse gases, which causes detrimental ecological effects both locally and globally. The key cause of climate change is the release of greenhouse gases, and it is crucial for this sector to limit these emissions if it is to effectively tackle the challenges posed by climate change.

1 INTRODUCTION

The matter of climate change is an urgent concern that requires attention not only from individuals but also from institutions and governing bodies worldwide. The utilisation of fossil fuels, particularly by the oil and gas sector, is a major cause of the discharge of greenhouse gases, which have been implicated as a principal factor in the onset of global warming and climate change. Recent years have seen a marked increase in litigation cases filed globally regarding climate change-related issues. These legal actions are aimed at holding corporations responsible for their actions and accelerating the shift towards more sustainable sources of energy.¹

The current global trend towards carbon neutrality has created a demand for alternative sources to replace traditional fossil fuels. Investing in renewable energy technologies, such as wind and solar power, can help the oil and gas industry diversify its revenue streams while positioning itself to thrive in the future of the energy market.² Through the implementation of various measures, companies can significantly improve their environmental performance

and reduce carbon emissions produced during manufacturing operations. These measures may include the adoption of technology that captures and stores carbon, optimising energy consumption, and minimising flares. Additionally, organisations can pursue new business models suitable for a post-carbon era, invest in carbon offsetting initiatives, and take part in emissions trading programs. Moreover, exploring innovative technologies such as hydrogen fuel cells presents an eco-friendly alternative to conventional fossil fuels. Despite the challenges brought about by climate change on the oil and gas industry's legal front, companies that can innovate and adapt to this changing landscape will secure a more promising future in the energy market.³

The transition towards achieving carbon neutrality on a global scale has prompted the need for alternative sources of energy to substitute fossil fuels. The oil and gas industry can significantly contribute to this movement by allocating resources to support renewable energy solutions like wind and solar power. Incorporating clean energy options offers additional advantages, such as diversifying revenue streams and preparing for changes in the energy market's future. Companies can potentially improve their ecological efficiency by reducing carbon dioxide emissions from their production methods through carbon capture and storage technology, as well as optimising energy consumption and minimising flares. Organisations can explore new business models that are more suitable for a post-carbon era, invest in projects that offset carbon emissions, and engage in trading programs related to emissions. Hydrogen fuel cells provide an environment-friendly substitute for traditional fossil fuels that companies can pursue further. Even though climate change poses legal challenges for companies in the oil and gas sector, those who adapt according to changing environments will position themselves strategically for long-term success in the energy market. Businesses that embrace renewable energy transitions, enhance operational efficiency, and innovate new business models will ultimately prosper. The future of the energy market entails lower carbon emissions; therefore, firms that respond effectively to this reality by developing novel approaches will thrive over time.

In recent times, there has been a discernible surge in the aggregate number of instances associated with climate change. As of 2017, a report released by the United Nations Environment Programme revealed that over a thousand lawsuits pertaining to climate change had been filed across 24 nations.⁴ The preponderance of these legal actions was initiated within the jurisdiction of the United States.⁵ Furthermore, the survey findings indicate a steady rise in the number of legal cases filed on a yearly basis since 2014, with a notable surge observed in 2016 and 2017, correspondingly.⁶ The present piece will emphasise that climate change litigation is becoming an increasingly significant trend on a global basis, with the oil and gas industry facing significant legal challenges aimed at promoting accountability and decreasing greenhouse gas emissions. In this regard, this paper will highlight that climate change litigation is becoming an increasingly important trend on a global scale.

1 Keohane RO and Victor DG, 'The Regime Complex for Climate Change' (2011) 9 (1) Perspectives on Politics 7, doi: 10.1017/S1537592710004068.

2 Ilyssa O Gordon et al, 'Life Cycle Greenhouse Gas emissions of Gastrointestinal Biopsies in a Surgical Pathology Laboratory' (2021) 156 (4) American Journal of Clinical Pathology 540, doi: 10.1093/ajcp/aqab021.

3 RS Abate, *Climate change and the voiceless: protecting future generations, wildlife, and natural resources* (Cambridge University Press 2019).

4 Chiara Macchi, 'The Climate Change Dimension of Business and Human Rights: The Gradual Consolidation of a Concept of "Climate due Diligence"' (2021) 6 (1) Business and Human Rights Journal 93, doi:10.1017/bhj.2020.25.

5 F Biermann, N Kanie and RE Kim, 'Global governance by goal setting: the novel approach of the UN Sustainable Development Goals' (2017) 26 Current Opinion in Environmental Sustainability 26-31.

6 Nicolas Gaulin and Philippe Le Billon, 'Climate Change and Fossil Fuel Production Cuts: Assessing Global Supply-Side Constraints and Policy Implications' (2020) 20 (8), Climate Policy 888, doi: 10.1080/14693062.2020.1725409.

2 THE OIL AND GAS INDUSTRY'S CONTRIBUTION TO GREENHOUSE GAS EMISSIONS

Climate change is largely attributed to the discharge of substances such as greenhouse gases, and the oil and gas industry plays a significant role in this occurrence.⁷ The fossil fuel sector, involving various functions like exploration, retrieval, synthesis, conveyance, and usage of oil and gas products, exerts a significant influence on worldwide emissions of greenhouse gases.⁷ The subsequent segment aims to examine the scale of greenhouse gas discharges stemming from the oil and gas sector, the repercussions these discharges bring upon the nearby habitats, together with the challenges and impediments that hinder the mitigation of such emissions.

2.1 The Scope of Emissions: Statistics and Data

The oil and gas industry is a major contributor to the global production of greenhouse gases. According to the International Energy Agency, the industry was responsible for approximately 2,345 million metric tons of carbon dioxide equivalent (CO₂e) emissions in 2020.⁸ This constitutes approximately one-fourth of global emissions. The emissions primarily stem from producing, transporting, and consuming oil and gas-derived products.

The global shift towards renewable energy sources to meet energy demands has pressured the oil and gas sector to curtail their greenhouse gas (GHG) emissions. The challenge of oil production has been addressed by Saudi Arabia and Qatar, both of which are significant producers of oil, through the implementation of various policies. The National Renewable Energy Program and Vision 2030 initiative in Saudi Arabia aims to augment the utilisation of renewable energy sources and broaden the economy's scope beyond its reliance on oil. The government of Saudi Arabia has implemented carbon pricing mechanisms, such as a carbon tax on fossil fuels, in order to incentivise corporations to decrease their greenhouse gas emissions. Several challenges, such as inadequate infrastructure, restricted technical proficiency, and insufficient investment in clean energy, impede the transition to renewable energy sources in Saudi Arabia. Qatar has implemented the Qatar National Vision 2030 to diminish the nation's reliance on hydrocarbons and broaden its energy portfolio.⁹ The primary objective of the National Program for Conservation and Energy Efficiency in Qatar is to enhance energy efficiency and curtail emissions in the industrial and commercial domains, encompassing the oil and gas sector. Qatar encounters obstacles in its endeavour to shift towards a more sustainable energy portfolio owing to its dependence on the oil and gas sector and the absence of a designated mechanism for carbon pricing.

It can be said that the escalating worldwide energy demand, in conjunction with the imperative to tackle the pressing concern of climate change, has resulted in a proliferation of creativity and financial backing in the field of renewable energy technologies. Governments and corporations globally are currently investigating alternative energy sources, including

solar, wind, and geothermal energy, as a strategy to mitigate greenhouse gas emissions and limit environmental consequences. The renewable energy industry is experiencing swift growth, presenting novel prospects for employment and stimulating economic advancement while mitigating dependence on non-renewable energy sources. Achieving a successful shift towards renewable energy sources necessitates consistent endeavours and financial commitment, with the oil and gas sector assuming a crucial responsibility in facilitating this transition. In light of the global shift towards sustainable energy, it is crucial to ensure equitable access to clean and cost-effective energy for all individuals, without exception.

The production of natural gas and its use as fuel contributes to emissions of greenhouse gases. This is especially true of the release of methane, which can contribute to global warming that is 28 times higher than that of carbon dioxide over one hundred years.¹⁰ Leaks of the greenhouse gas methane can happen at several points along the supply chain for natural gas, including during drilling, extraction, transmission, and distribution of the gas.

Furthermore, a significant amount of greenhouse gases is generated as a result of the refining procedure that converts crude oil into various commodities, including but not limited to gasoline, diesel, and aviation fuel. According to the United States Environmental Protection Agency, the refining process accounts for 6% of the overall greenhouse gas emissions generated by the oil and gas sector.¹¹

The oil and gas industry has recently implemented several initiatives to lower greenhouse gas emissions. These measures include the utilisation of carbon capture and storage technology, the development of renewable energy sources, and the deployment of energy efficiency measures.¹² On the other hand, their initiatives have been criticised for being insufficient and constrained due to the scope of the problem they are attempting to solve. Many political and economic issues, including the policies of various governments and the competitive pressures of markets, significantly influence the sector's strategy to lower emissions. The oil and gas business is responsible for considerable greenhouse gas emissions, and a wealth of information is available to measure the industry's influence on the surrounding environment. The CO₂e metric is the one that is used to assess greenhouse gas emissions the most frequently.¹³ This metric accounts for all of the primary greenhouse gases, including carbon dioxide, methane, and nitrous oxide, and quantifies the climate impact of these gases in terms of CO₂.

In essence, although the oil and gas industry has made considerable efforts to mitigate its greenhouse gas emissions, there still needs to be a significant gap in achieving a state of net-zero emissions. Governments, corporations, and individuals must acknowledge the pressing nature of the issue and implement measures to mitigate emissions. A plausible resolution entails the implementation of a carbon pricing mechanism, such as a carbon tax or cap-and-trade system, that would provide inducements for corporations to curtail their carbon emissions and allocate resources towards renewable energy. Furthermore, it is

7 Yeye Liu et al, 'Life Cycle Assessment of Petroleum Refining Process: A Case Study in China' (2020) 256 *Journal of Cleaner Production* 120422, doi: 10.1016/j.jclepro.2020.120422.
 8 Mu-Hao Sung Wang, Lawrence K Wang and Nazih K Shamma, 'Glossary of Climate Change, Global Warming and Ozone Layer Protection' in Yung-Tse Hung, Lawrence K Wang and Nazih K Shamma (eds), *Handbook of Environment and Waste Management: Acid Rain and Greenhouse Gas Pollution Control* (vol 3, World Scientific 2020) 689, doi: 10.1142/11470.
 9 Sayeed Mohammed, Cheryl Desha and Ashantha Goonetilleke, 'Investigating Low-Carbon Pathways for Hydrocarbon-Dependent Rentier States: Economic Transition in Qatar' (2022) 185 *Technological Forecasting and Social Change* 122084, doi: 10.1016/j.techfore.2022.122084.

10 Kirsten Rosselot, David T Allen and Anthony Y Ku, 'Global Warming Breakeven Times for Infrastructure Construction Emissions are Underestimated' (2022) 10 (5) *ACS Sustainable Chemistry & Engineering* 1753, doi: 10.1021/acssuschemeng.1c08253.
 11 Sharaf AlKheder and Ali Almusalam, 'Forecasting of Carbon Dioxide Emissions from Power Plants in Kuwait Using United States Environmental Protection Agency, Intergovernmental Panel on Climate Change, and Machine Learning Methods' (2022) 191 *Renewable Energy* 819, doi: 10.1016/j.renene.2022.04.023; Maocai Shen et al, '(Micro) Plastic Crisis: Un-Ignorable Contribution to Global Greenhouse Gas Emissions and Climate Change' (2020) 254 *Journal of Cleaner Production* 120138, doi: 10.1016/j.jclepro.2020.120138.
 12 Gabriel David Oreggioni et al, 'Climate Change in a Changing World: Socio-Economic and Technological Transitions, Regulatory Frameworks and Trends on Global Greenhouse Gas Emissions from EDGAR v.5.0' (2021) 70 *Global Environmental Change* 102350, doi: 10.1016/j.gloenvcha.2021.102350.
 13 Gordon et al (n 4).

imperative to increase the allocation of resources towards the exploration and innovation of novel technologies aimed at mitigating emissions during the refining process, as well as augmenting energy efficiency in the domains of transportation and industry. The successful implementation of a low-carbon economy necessitates the collaborative endeavours and unwavering dedication of all parties involved to alleviate the consequences of climate change and ensure a viable future for posterity.

The International Energy Agency (IEA) has reported that the energy sector, which encompasses the production and consumption of coal, oil, and gas, is accountable for approximately 72% of the global emissions of greenhouse gases. Roughly 50% of the emissions can be attributed to the oil and gas sector. The total amount of global CO₂ emissions from energy consumption in 2020 was 33.1 gigatons (Gt). Among these emissions, those associated with the utilisation of oil and gas accounted for 20.5 Gt of the aforementioned total. Furthermore, the oil and gas sector bears accountability for the discharge of supplementary greenhouse gases, including methane, that exert a more substantial impact on the Earth's temperature rise than CO₂.

The industry is responsible for around 20 per cent of the world's total methane emissions, according to the Environmental Defense Fund (EDF).¹⁴ The activities of the main oil and gas businesses in the globe strongly impact the emissions of greenhouse gases. According to a report that the Carbon Majors Database published in 2017, 100 businesses, such as ExxonMobil, Shell, and BP, are accountable for 71% of the total greenhouse gas emissions worldwide since 1988.¹⁵ As an illustration, conventional oil produces around 18 kilograms of CO₂ per barrel, whereas oil from oil sands releases approximately 78 kg of CO₂ per barrel.¹⁶

Even though natural gas is frequently considered a more environmentally friendly alternative to coal and oil, the production of natural gas and usage of natural gas still result in considerable emissions of greenhouse gases. According to the information provided by the IEA, natural gas-related emissions, including methane leaks and flaring, accounted for around 20%¹⁷ of the total greenhouse gas emissions connected to energy in 2020.

The energy industry's significant role in greenhouse gas emissions highlights the urgent requirement for comprehensive and efficacious measures to alleviate the consequences of climate change. Collaboration between governmental and corporate entities is imperative in mitigating emissions stemming from the oil and gas industry. This can be achieved through the implementation of carbon pricing mechanisms and the allocation of resources toward the development of clean energy alternatives. The aforementioned situation necessitates a fundamental alteration in energy production and consumption methods, coupled with a heightened focus on energy efficiency and conservation. Ensuring transparency and accountability within the oil and gas sector is of utmost importance, particularly concerning the major corporations that bear the primary responsibility for the bulk of greenhouse gas emissions. In addition, implementing novel technologies, such as carbon capture, utilisation, and storage (CCUS), can substantially impact mitigating emissions from the oil and gas industry. Through collaborative efforts to tackle the obstacles presented by climate change, it is possible to establish a sustainable future that future generations can enjoy.

14 Ash and Scarbrough (n 5).

15 Marco Grasso, 'Oily Politics: A Critical Assessment of the Oil and Gas Industry's Contribution to Climate Change' (2019) 50 Energy Research & Social Science 106, doi: 10.1016/j.erss.2018.11.017.

16 Steve Griffiths et al, 'Decarbonizing the Oil Refining Industry: A Systematic Review of Sociotechnical Systems, Technological Innovations, and Policy Options' (2022) 89 Energy Research & Social Science 102542, doi: 10.1016/j.erss.2022.102542.

17 Robert L Kleinberg, 'Methane Emissions from the Fossil Fuel Industries of the Russian Federation' (*EarthArXiv*, 30 Oktober 2022) doi: 10.31223/X57D13 <<https://eartharxiv.org/repository/view/3342>> accessed 8 May 2023.

The release of methane into the atmosphere is another substantial source of emissions from the oil and gas industry. Over 100 years, the warming effect of methane has been 28 times larger than carbon dioxide, making it one of the most potent greenhouse gases.¹⁸ Leaks, venting, and flaring are three ways methane can escape from oil and gas production facilities, all contributing to climate change. According to research conducted by the Environmental Defense Fund in 2015, the oil and gas industry was responsible for the emission of around 80 million metric tons of methane, approximately equivalent to 1.6 billion metric tons of CO₂e.¹⁹

The oil and gas industry is responsible for much more than only carbon dioxide and methane emissions when it comes to greenhouse gases. The extraction of oil and gas results in the discharge of additional pollutants such as sulphur dioxide, nitrogen oxides, and particulate matter, all of which have the potential to have a considerable negative impact on both the environment and human health. The presence of said contaminants can result in the development of smog, acid rain, and air pollution, which can have adverse effects on both human well-being and the welfare of flora and fauna. The oil and gas sector bears a significant responsibility for generating colossal amounts of greenhouse gases that greatly affect the adjacent ecosystem.²⁰

2.2 Environmental Impacts: Global Consequences and Local Effects

The petroleum and natural gas sector is a significant contributor to the discharge of greenhouse gases, which possess substantial unfavourable impacts on the environment at both regional and global levels. The primary emissions, namely carbon dioxide and methane, envelop the atmosphere, leading to its retention of heat and augmenting climate variation and global warming. This situation results in widespread and severe repercussions on a worldwide basis as far as greenhouse gas emissions by this industry are concerned.²¹

At the community level, areas close to oil and gas operations may be subject to significant environmental impacts. Air pollution caused by emissions can contribute to various health concerns, including those affecting the respiratory system. The contamination of water sources, such as those caused by oil spills and fracking, can harm ecosystems and affect local water supplies. Noise pollution and light pollution caused by oil and gas operations can have an impact not only on human communities but also on the surrounding animals.

The government of the United Kingdom has instituted monetary incentives and subsidies in order to promote the development of renewable energy initiatives. Nevertheless, the pace of progress has faced criticism for its perceived sluggishness, and the nation remains heavily dependent on non-renewable energy sources. The Climate Change Act of 2008 is the predominant legislation that sets forth obligatory objectives for mitigating emissions

18 John L Black, Thomas M Davison and Ilona Box, 'Methane Emissions from Ruminants in Australia: Mitigation Potential and Applicability of Mitigation Strategies' (2021) 11 (4) *Animals* 951, doi: 10.3390/ani11040951.

19 William Cline, 'Carbon-Equivalent Taxes on US Meat' (2020) Economics International Inc Working Paper 20-03, doi: 10.2139/ssrn.3852166.

20 Jingjing Jiang et al, 'Two-Tier Synergic Governance of Greenhouse Gas Emissions and Air Pollution in China's Megacity, Shenzhen: Impact Evaluation and Policy Implication' (2021) 55 (11) *Environmental Science & Technology* 7225, doi: 10.1021/acs.est.0c06952.

21 Lin Zhang et al, 'Globalization, Green Economy and Environmental Challenges: State of the Art Review for Practical Implications' (2022) 10 *Frontiers in Environmental Science* 199, doi: 10.3389/fenvs.2022.870271.

of greenhouse gases.²² Saudi Arabia, Kuwait, and Qatar are currently working to tackle the challenges posed by climate change and its impact on the oil and gas industry.²³ These nations have implemented policies and programs to mitigate greenhouse gas (GHG) emissions, foster energy efficiency, and enhance the adoption of renewable energy sources. The oil and gas industry, including Saudi Arabia, faces an elevated risk of litigation as a result of climate change. This is attributable to the adverse effects of climate change, such as biodiversity loss, extreme weather events, and rising sea levels. The implementation of sustainable energy strategies and policies can serve as a means of mitigating these aforementioned risks. The passage provides an overview of the persistent obstacles the oil and gas sector encounters as it endeavours to shift toward sustainable energy alternatives.

In recent years, there has been a growing inclination towards holding the oil and gas industry accountable for its contribution to the worsening of climate change.²⁴ The noted occurrence can be ascribed to the dominant function fulfilled by non-renewable energy sources in propelling the phenomenon of climate alteration. The present predicament pertains to the lawful and administrative facets of climate change, wherein diverse interested parties, such as citizens, societal groups, and government entities, strive for legal remedies to tackle the detrimental outcomes of greenhouse gas emanations traced back to commercial activities. This event takes place within the territorial confines of the United States.

Possible legal obstacles faced by the oil and gas sector could potentially entail significant consequences for the industry.²⁵ They can potentially result in monetary penalties, a loss of reputation, and increasing pressure to adopt more environmentally friendly methods. Nevertheless, they have the potential to open up new avenues for creative problem-solving and collaborative work toward a more sustainable future. It can be said that the environmental impact of greenhouse gas emissions from the oil and gas industry is a massive problem with global and local repercussions.²⁶

The release of greenhouse gases is the primary driver of climate change, and one of the significant contributors to this problem is the oil and gas industry.²⁷ To effectively address the issues posed by climate change, it is essential to cut back on these emissions. However, the sector must overcome many scientific, economic, and political hurdles and constraints to accomplish this objective.

3 LEGAL CHALLENGES AND IMPACT ON THE INDUSTRY: DISCLOSURE, REGULATION, AND TRANSITION TO SUSTAINABLE PRACTICES

The oil and gas business has long been a significant contributor to global energy production, with many economies strongly relying on its revenue.²⁸ However, mounting worries about climate change and the need to shift to more sustainable practices present the business with increasing legal obstacles that force it to re-evaluate its operations.

Disclosure is one of the most significant obstacles facing the industry. Given the potential impact of these emissions on the environment and human health, numerous stakeholders, including investors, governments, and the general public, are advocating for greater transparency regarding the industry's carbon emissions.²⁹ Many businesses are now voluntarily declaring their greenhouse gas emissions in response to this demand, but there is still a need for increased uniformity and mandated reporting requirements.

In recent years, there have been several legal challenges in regulating business methods. The Dutch judiciary rendered a significant verdict in 2015, mandating that the government curtail its greenhouse gas emissions by a minimum of 25 per cent by 2020,³⁰ citing a sense of obligation to its residents. According to the International Energy Agency, the sector has made substantial progress in recent years in decreasing methane emissions, and many companies are investing in new technologies and infrastructure to help the transition to a low-carbon future.³¹

The activities of big firms like BP, which has vowed to attain net-zero emissions by 2050 and is investing extensively in renewable energy sources, illustrate this transformation in the business.³² Another example is Royal Dutch Shell, which has committed to investing up to \$2 billion per year in renewable energy projects and has set a goal of decreasing its carbon footprint by 20% by 2030.³³

22 T Ahmad, D Zhang, C Huang, H Zhang, N Dai, Y Song and H Chen, 'Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities' (2021) 289 *Journal of Cleaner Production* 125834.
 23 Osamah A Alsayegh, 'Barriers facing the transition toward sustainable energy system in Kuwait' (2021) 38 *Energy Strategy Reviews* 100779.
 24 Peter Newell et al, 'Toward Transformative Climate Justice: An Emerging Research Agenda' (2021) 12 (6) *WIREs Climate Change* e733, doi: 10.1002/wcc.733.
 25 Anirbid Sircar et al, 'Application of Machine Learning and Artificial Intelligence in Oil and Gas Industry' (2021) 6 (4) *Petroleum Research* 379, doi: 10.1016/j.ptlrs.2021.05.009.
 26 Mahesh Kumar, 'Social, Economic, and Environmental Impacts of Renewable Energy Resources' in Kenneth Eloghene Okedu, Ahmed Tahour and Abdel Ghani Aissaou (eds), *Wind Solar Hybrid Renewable Energy System* (IntechOpen 2020) ch 11, doi: 10.5772/intechopen.89494.
 27 Anna Maria Driga and Athanasios S Drigas, 'Climate Change 101: How Everyday Activities Contribute to the Ever-Growing Issue' (2019) 7 (1) *International Journal of Recent Contributions from Engineering, Science & IT* 22, doi: 10.3991/ijes.v7i1.10031.

28 Alamoush, Ölçer and Ballini (n 7); Michael Grubb et al, 'Consumption-Oriented Policy Instruments for Fostering Greenhouse Gas Mitigation' (2020) 20 (sup1) *Climate Policy* S58, doi: 10.1080/14693062.2020.1730151.
 29 Arthur A van Benthem et al, 'The Effect of Climate Risks on the Interactions Between Financial Markets and Energy Companies' (2022) 7 (8) *Nature Energy* 690, doi: 10.1038/s41560-022-01070-1.
 30 Margaretha Wewerinke-Singh and Ashleigh McCoach, 'The State of the Netherlands v Urgenda Foundation: Distilling best practice and lessons learnt for future rights-based climate litigation' (2021) 30 (2) *Review of European, Comparative & International Environmental Law* 275, doi: 10.1111/reel.12388.
 31 Elisa Asmelash and Ricardo Gorini, *International Oil Companies and the Energy Transition* (IRENA 2021). The International Renewable Energy Agency (IRENA) serves as the principal platform for international co-operation, a centre of excellence, a repository of policy, technology, resource and financial knowledge, and a driver of action on the ground to advance the transformation of the global energy system. An intergovernmental organisation established in 2011, IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.
 32 Mei Li, Gregory Trencher and Jusen Asuka, 'The Clean Energy Claims of BP, Chevron, ExxonMobil and Shell: A Mismatch Between Discourse, Actions and Investments' (2022) 17 (2) *PloS One* e0263596, doi: 10.1371/journal.pone.0263596.
 33 Ensieh Shojaeddini et al, 'Oil and Gas Company Strategies Regarding the Energy Transition' (2019) 1 (1) *Progress in Energy* 012001, doi: 10.1088/2516-1083/ab2503.

4 GLOBAL TRENDS IN CLIMATE CHANGE LITIGATION: EXAMPLES AND STATISTICS

Individuals and organisations have taken legal action against governments and corporations for their role in global warming, with the number of climate change-related lawsuits rising in recent years.³⁴ This trend has also affected the oil and gas industry, the subject of several legal challenges regarding its role in climate change. Here are some examples and global trends in climate change litigation statistics.

4.1 Common Climate Change Litigation Examples

Several lawsuits have been launched in the United States against oil and gas firms, such as Chevron and ExxonMobil, for their part in climate change.³⁵ These cases allege that the defendants were aware of the risks associated with climate change but misled the public and stockholders by downplaying the dangers. In the Netherlands, the Urgenda Foundation launched a lawsuit against the Dutch government for failing to reduce greenhouse gas emissions adequately.³⁶ In 2019, the Dutch Supreme Court favoured Urgenda and ordered the government to reduce emissions by 25 per cent compared to 1990 levels by the end of 2020.³⁷ Environmental Defenders Office New South Wales filed a lawsuit in Australia against Commonwealth Bank for neglecting to mention climate risks in its 2016 annual report.³⁸ The issue was resolved in 2018, with the bank agreeing to include climate risk information in future reports.

4.2 Statistics Regarding Climate Change Lawsuits

It has been found that since 1986, the Climate Change Litigation Database indicates that over 1,800 climate change cases have been filed in 36 countries.³⁹ More than 1,200 climate change-related lawsuits have been filed in federal and state courts in the United States.⁴⁰ Over fifty per cent of climate change-related lawsuits are filed against fossil fuel businesses in the oil and gas industry.⁴¹

- 34 Joana Setzer and Catherine Higham, 'Global Trends in Climate Change Litigation: 2022 Snapshot' (LSE, 30 June 2022) <<https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-change-litigation-2022>> accessed 8 May 2023.
- 35 Dario Kenner and Richard Heede, 'White Knights, or Horsemen of the Apocalypse? Prospects for Big Oil to Align Emissions With a 1.5°C Pathway' (2021) 79 *Energy Research & Social Science*, 102049, doi: 10.1016/j.erss.2021.102049.
- 36 'State of the Netherlands v. Urgenda Foundation: Hague Court of Appeal Requires Dutch Government to Meet Greenhouse Gas Emissions Reductions by 2020' (2019) 132 (7) *Harvard Law Review* 2090.
- 37 Douglas Maxwell, '(Not) Going Dutch: Compelling States to Reduce Greenhouse Gas Emissions Through Positive Human Rights' (2020) 4 *Public Law* 620.
- 38 Laura Melrose, 'Emerging Trends in Australian Climate Change Litigation: Bringing the Heat' (2022) 47 (3) *Alternative Law Journal* 187, doi: 10.1177/1037969X221112515.
- 39 Shaikh M Eskander, Sam Fankhauser and Joana Setzer, 'Global lessons from climate change legislation and litigation' (2021) 2 (1) *Environmental and Energy Policy and the Economy* 44, doi: 10.3386/w27365.
- 40 W Seth Cook, 'Standing for the Lorax: Augmenting an Ill-Suited Standing Doctrine to Allow for Justice in Novel Climate Change Litigation' (2022) 41 (3) *The Review of Litigation* 407.
- 41 Shradha Gupta, 'Oil Industry's Pro-Climate Agenda: Fifty Shades of Green' (2021) 20 (2) *Washington University Global Studies Law Review* 491.

Climate change lawsuits can potentially cause considerable financial and reputational harm to the oil and gas industry.⁴² In light of the growing number of climate change litigation, some oil and gas firms have developed measures to mitigate the related legal risks.⁴³ These techniques aim to minimise the legal risks connected with climate change. For instance, several businesses have upgraded their climate-related disclosure and reporting to improve the information they provide to shareholders and other stakeholders regarding the threats and possibilities posed by climate change. The growing number of lawsuits filed against oil and gas firms, which attribute responsibility for climate change to the operations of the companies, highlights the necessity of accountability. Different businesses have shown their dedication to reducing their impact on the environment by taking measures such as instituting carbon pricing mechanisms and establishing emission reduction objectives.

Despite these efforts, the oil and gas industry is still facing a substantial obstacle in the form of climate change litigation. The results of lawsuits related to climate change might be challenging to foresee, and the associated expenses can be high.⁴⁴ In recent years, the oil and gas sector has been increasingly impacted by legal disputes pertaining to climate change. Moreover, in the Netherlands, the Urgenda Foundation successfully sued the government to reduce emissions by at least 25% compared to 1990 levels. Similarly, in the United States, several cities have filed lawsuits against oil and gas companies, alleging that they knew about the risks of climate change but failed to disclose them to investors.

Various instances illustrate how such legal actions can significantly affect these corporations' financial and reputational standing. In 2018, the cities of San Francisco and Oakland initiated legal proceedings against BP, Chevron, ExxonMobil, and other entities involved in the petroleum industry, alleging that they had deliberate knowledge of their contribution towards the phenomenon of climate change.⁴⁵ The plaintiffs have requested that said corporations reimburse the costs associated with adjusting to the escalating sea levels. The present case has garnered substantial media coverage and has the potential to establish a legal precedent for forthcoming litigations on climate change.

Environmental organisations in Norway instigated a noteworthy legal action against their government for authorising oil exploration in the Arctic area, contending that their fundamental right to a sound environment was being infringed upon.⁴⁶ In the event of a favourable outcome, this case has the potential to yield significant implications within the Norwegian context and throughout the broader industry. In 2017, New York initiated legal proceedings against five prominent oil companies, contending that they were complicit in climate change and thus should assume accountability for mitigating its consequences.⁴⁷ Despite being dismissed by a federal judge in 2018, the city is contesting the ruling through an appeal process. This underscores the ongoing legal difficulties that oil and gas companies face concerning climate change concerns.

- 42 Climate change lawsuits can potentially cause considerable financial and reputational harm to the oil and gas industry.
- 43 K Pouikli, 'Editorial: A Short History of the Climate Change Litigation Boom Across Europe' (2021) 22 (4) *ERA Forum* 569, doi: 10.1007/s12027-022-00700-1.
- 44 Walter V Reid, Mariam K Ali and Christopher B Field, 'The Future of Bioenergy' (2020) 26 (1) *Global Change Biology* 274, doi: 10.1111/gcb.14883.
- 45 Albert Lin and Michael Burger, 'State Public Nuisance Claims and Climate Change Adaptation' (2018) 36 (1) *Pace Environmental Law Review* 49, doi: 10.58948/0738-6206.1821.
- 46 Christina Voigt, 'The First Climate Judgment Before the Norwegian Supreme Court: Aligning Law with Politics' (2021) 33 (3) *Journal of Environmental Law* 697, doi: 10.1093/jel/eqab019.
- 47 Brooke Jarvis, 'Climate change could destroy his home in Peru: So he sued an energy company in Germany' (*The New York Times*, April 9 2019) <<https://www.nytimes.com/interactive/2019/04/09/magazine/climate-change-peru-law.html>> accessed 8 May 2023.

5 CLIMATE CHANGE OPPORTUNITIES

Global trends in climate change litigation demonstrate that legal challenges are becoming increasingly important in promoting environmentally responsible growth and the transition to sustainable practices in the oil and gas industry. Many lawsuits focus on disclosure and regulation, demanding that companies provide more transparency regarding their greenhouse gas emissions and adopt measures to reduce them. The following are some of the possibilities presented by climate change.

Renewable Energy. Renewable energy sources, such as solar, wind, and hydro power, provide a huge possibility to decrease emissions of greenhouse gases while simultaneously satisfying the need for energy on a worldwide scale.⁴⁸ The use of renewable energy sources has seen tremendous expansion over the course of the last decade, and it is anticipated that this market will continue to see expansion in the years to come.⁴⁹ Because of this increase, possibilities for investment, innovation, and the creation of new jobs have arisen.

Efficiency in Energy Use. Measures that improve energy efficiency provide the possibility of lowering overall energy use while either preserving or enhancing the existing level of service. Upgrades to insulation, lighting, and heating systems, as well as the installation of intelligent building controls, are all examples of potential energy-saving improvements. Taking steps to improve energy efficiency may cut down on both energy expenses and emissions of greenhouse gases.

Agriculture that is Sustainable. While the changing climate poses substantial difficulties for agricultural operations, it also gives new potential for agriculture that is environmentally responsible. Sustainable agricultural techniques have the potential to enhance the health of the soil, decrease the amount of water used, and significantly cut down on the use of artificial fertilisers and pesticides. Food security and rural development are two more areas that might benefit from sustainable agriculture.

Reduced Emissions of Greenhouse Gases Through Transportation. The transportation industry is a major contributor to the emissions of greenhouse gases. The creation of alternative modes of transportation that produce less carbon dioxide provides an opportunity to lower emissions of greenhouse gases while still satisfying the requirements of the global transportation market. Electric automobiles, public transit, and cycling infrastructure are three examples of potential low-carbon modes of transportation.⁵⁰

The concept of a circular economy refers to a kind of economic model that works towards the elimination of waste and the establishment of a closed-loop system. With the elimination of waste and the encouragement of more environmentally responsible manufacturing and consumption methods, the circular economy offers a chance to cut down on emissions of greenhouse gases. Moreover, chances for innovation and the development of new jobs may be made available by the circular economy.

The term 'climate finance' refers to investments made in initiatives that aim to either adapt to or mitigate the effects of climate change. Climate financing gives an opportunity to fund development that is low in carbon emissions and climate-resilient while also giving

48 Norain Ismail et al, 'From Innovation to Market: Integrating University and Industry Perspectives Towards Commercialising Research Output' (2020) 8 (4) *Forum Scientiae Oeconomia* 99.

49 Jiang et al (n 25).

50 Thomas A Fox et al, 'A Review of Close-Range and Screening Technologies for Mitigating Fugitive Methane Emissions in Upstream Oil and Gas' (2019) 14 (5) *Environmental Research Letters* 053002, doi: 10.1088/1748-9326/ab0cc3.

opportunities for financial gains.⁵¹ Investments in renewable energy, energy efficiency, environmentally responsible agriculture, and low-carbon transportation are all potential areas of focus for climate financing.

The transition towards renewable energy sources such as wind and solar power is one of the most significant opportunities made available by climate change. Countries and corporations are progressively investing in the infrastructure for renewable energy sources as part of their efforts to decrease their respective carbon footprints. Because of this, there has been a considerable increase in the number of possibilities available to companies that are engaged in the conception, production, assembly, and upkeep of renewable energy systems.⁵²

Developing new technology and coming up with innovative solutions to the problem of climate change is yet another opportunity. This encompasses anything from methods of carbon capture and storage technology to methods of environmentally responsible agriculture. Several corporations, as well as scholars, are making investments in these fields, which is helping to create new markets and propel economic development.

In addition, there are several chances for companies to enhance their sustainability practices and lessen the negative effects they have on the environment. This may include a wide range of activities, from cutting down on waste and making use of environmentally friendly products to adopting energy-saving measures and lowering emissions. By doing so, companies have the opportunity to enhance their reputations and appeal to consumers who are becoming more aware of the influence they have on the environment.

Last but not least, the effects of climate change give an opening for cooperative endeavours and group efforts. Businesses, governments, and organisations that do not seek financial gain are collaborating with one another to share their expertise and resources as the global community tries to tackle climate change. This partnership has the potential to result in more efficient solutions and to contribute to the advancement of work towards a more sustainable future.

6 CONCLUSIONS

The oil and gas business must implement efficient legal procedures if it is going to traverse the legal obstacles presented by climate change successfully. As long as it obtains sufficient money and keeps its robust governance structure, the United Nations Framework Convention on Climate Change (UNFCCC) has the potential to become an efficient instrument for minimising the detrimental effects that climate change will have on the industry. The environmental impact of greenhouse gas emissions from the oil and gas industry is noteworthy and presents significant challenges to emission reduction. Recent legal hurdles related to disclosure, regulation, and transitioning towards sustainable practices have further emphasised the importance of accountability and energy sustainability. A worldwide increase in climate change litigation underlines the pressing necessity for establishing corporate responsibility and promoting environmentally friendly alternatives. To meaningfully address climate change challenges, it is imperative that the oil and gas industry initiates measures aimed at reducing greenhouse gas emissions while transitioning towards sustainable practices. The potential for liability claims, increased government regulation, and brand damage are some of the legal challenges that the industry is likely to face as a direct result of climate change.

51 Cook (n 45).

52 Joseph Curtin et al, 'Quantifying Stranding Risk for Fossil Fuel Assets and Implications for Renewable Energy Investment: A Review of the Literature' (2019) 116 (4) *Renewable and Sustainable Energy Reviews* 109402, doi: 10.1016/j.rser.2019.109402.

Establishing a World Climate Change Court or negotiating an international treaty on climate change is one of the solutions that might be considered. Either of these options could give a standardised approach to the resolution of legal disputes and consistency across the various countries. The most important thing to take away from this study is how important it is to tackle the issue of climate change using a strategy that draws from a variety of disciplines and involves legal procedures. Given the global scale of this problem, it is essential that all parties involved work together to build effective legal frameworks that can reduce the effects of climate change on the oil and gas business as well as on the world.

REFERENCES

- Abate RS, *Climate change and the voiceless: protecting future generations, wildlife, and natural resources* (Cambridge University Press 2019).
- Ahmad T, Zhang D, Huang C, Zhang H, Dai N, Song Y and Chen H, 'Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities' (2021) 289 *Journal of Cleaner Production* 125834.
- Alamouh AS, Ölçer AI and Ballini F, 'Ports' Role in Shipping Decarbonisation: A Common Port Incentive Scheme for Shipping Greenhouse Gas Emissions Reduction' (2022) 3 *Cleaner Logistics and Supply Chain* 100021, doi: 10.1016/j.clscn.2021.100021.
- Albrecht U et al, *Study on Hydrogen from Renewable Resources in the EU: final report* (EU Publications Office 2016) doi/10.2843/28276.
- AlKheder S and Almusalam A, 'Forecasting of Carbon Dioxide Emissions from Power Plants in Kuwait Using United States Environmental Protection Agency, Intergovernmental Panel on Climate Change, and Machine Learning Methods' (2022) 191 *Renewable Energy* 819, doi: 10.1016/j.renene.2022.04.023.
- Alsayegh OA, 'Barriers facing the transition toward sustainable energy system in Kuwait' (2021) 38 *Energy Strategy Reviews* 100779.
- Ash N and Scarbrough T, *Sailing on Solar: Could Green Ammonia Decarbonise International Shipping* (Environmental Defense Fund 2019).
- Asmelash E and Gorini R, *International Oil Companies and the Energy Transition* (IRENA 2021).
- Biermann F, Kanie N and Kim RE, 'Global governance by goal setting: the novel approach of the UN Sustainable Development Goals' (2017) 26 *Current Opinion in Environmental Sustainability* 26-31.
- Black JL, Davison TM and Box I, 'Methane Emissions from Ruminants in Australia: Mitigation Potential and Applicability of Mitigation Strategies' (2021) 11 (4) *Animals* 951, doi: 10.3390/ani11040951.
- Cline W, 'Carbon-Equivalent Taxes on US Meat' (2020) *Economics International Inc Working Paper* 20-03, doi: 10.2139/ssrn.3852166.
- Cook WS, 'Standing for the Lorax: Augmenting an Ill-Suited Standing Doctrine to Allow for Justice in Novel Climate Change Litigation' (2022) 41 (3) *The Review of Litigation* 407.
- Curtin J et al, 'Quantifying Stranding Risk for Fossil Fuel Assets and Implications for Renewable Energy Investment: A Review of the Literature' (2019) 116 (4) *Renewable and Sustainable Energy Reviews* 109402, doi: 10.1016/j.rser.2019.109402.
- Driga AM and Drigas AS, 'Climate Change 101: How Everyday Activities Contribute to the Ever-Growing Issue' (2019) 7 (1) *International Journal of Recent Contributions from Engineering, Science & IT* 22, doi: 10.3991/ijes.v7i1.10031.
- Eskander SM, Sam Fankhauser and Joana Setzer, 'Global lessons from climate change legislation and litigation' (2021) 2 (1) *Environmental and Energy Policy and the Economy* 44, doi: 10.3386/w27365.
- Fox TA et al, 'A Review of Close-Range and Screening Technologies for Mitigating Fugitive Methane Emissions in Upstream Oil and Gas' (2019) 14 (5) *Environmental Research Letters* 053002, doi: 10.1088/1748-9326/ab0cc3.
- Gaulin N and Le Billon P, 'Climate Change and Fossil Fuel Production Cuts: Assessing Global Supply-Side Constraints and Policy Implications' (2020) 20 (8), *Climate Policy* 888, doi: 10.1080/14693062.2020.1725409.
- Gordon IO et al, 'Life Cycle Greenhouse Gas emissions of Gastrointestinal Biopsies in a Surgical Pathology Laboratory' (2021) 156 (4) *American Journal of Clinical Pathology* 540, doi: 10.1093/ajcp/aqab021.
- Grasso M, 'Oily Politics: A Critical Assessment of the Oil and Gas Industry's Contribution to Climate Change' (2019) 50 *Energy Research & Social Science* 106, doi: 10.1016/j.erss.2018.11.017.
- Griffiths S et al, 'Decarbonizing the Oil Refining Industry: A Systematic Review of Sociotechnical Systems, Technological Innovations, and Policy Options' (2022) 89 *Energy Research & Social Science* 102542, doi: 10.1016/j.erss.2022.102542.
- Grubb M et al, 'Consumption-Oriented Policy Instruments for Fostering Greenhouse Gas Mitigation' (2020) 20 (sup1) *Climate Policy* S58, doi: 10.1080/14693062.2020.1730151.
- Gupta S, 'Oil Industry's Pro-Climate Agenda: Fifty Shades of Green' (2021) 20 (2) *Washington University Global Studies Law Review* 491.
- Ismail N et al, 'From Innovation to Market: Integrating University and Industry Perspectives Towards Commercialising Research Output' (2020) 8 (4) *Forum Scientiae Oeconomia* 99.
- Jarvis B, 'Climate change could destroy his home in Peru: So he sued an energy company in Germany' (*The New York Times*, April 9 2019) <<https://www.nytimes.com/interactive/2019/04/09/magazine/climate-change-peru-law.html>> accessed 8 May 2023.
- Jiang J et al, 'Two-Tier Synergic Governance of Greenhouse Gas Emissions and Air Pollution in China's Megacity, Shenzhen: Impact Evaluation and Policy Implication' (2021) 55 (11) *Environmental Science & Technology* 7225, doi: 10.1021/acs.est.0c06952.
- Kenner D and Heede R, 'White Knights, or Horsemen of the Apocalypse? Prospects for Big Oil to Align Emissions With a 1.5°C Pathway' (2021) 79 *Energy Research & Social Science*, 102049, doi: 10.1016/j.erss.2021.102049.
- Keohane RO and Victor DG, 'The Regime Complex for Climate Change' (2011) 9 (1) *Perspectives on Politics* 7, doi: 10.1017/S1537592710004068.
- Kleinberg RL, 'Methane Emissions from the Fossil Fuel Industries of the Russian Federation' (*EarthArXiv*, 30 October 2022) doi: 10.31223/X57D13 <<https://eartharxiv.org/repository/view/3342>> accessed 8 May 2023.
- Kumar M, 'Social, Economic, and Environmental Impacts of Renewable Energy Resources' in Okedu KE, Tahour A and Aissaou AG (eds), *Wind Solar Hybrid Renewable Energy System* (IntechOpen 2020) ch 11, doi: 10.5772/intechopen.89494.
- Li M, Trencher G and Asuka J, 'The Clean Energy Claims of BP, Chevron, ExxonMobil and Shell: A Mismatch Between Discourse, Actions and Investments' (2022) 17 (2) *PloS One* e0263596, doi: 10.1371/journal.pone.0263596.
- Lin A and Burger M, 'State Public Nuisance Claims and Climate Change Adaptation' (2018) 36 (1) *Pace Environmental Law Review* 49, doi: 10.58948/0738-6206.1821.
- Liu Y et al, 'Life Cycle Assessment of Petroleum Refining Process: A Case Study in China' (2020) 256 *Journal of Cleaner Production* 120422, doi: 10.1016/j.jclepro.2020.120422.
- Macchi C, 'The Climate Change Dimension of Business and Human Rights: The Gradual Consolidation of a Concept of "Climate due Diligence"' (2021) 6 (1) *Business and Human Rights Journal* 93, doi:10.1017/bhj.2020.25.
- Maxwell D, '(Not) Going Dutch: Compelling States to Reduce Greenhouse Gas Emissions Through Positive Human Rights' (2020) 4 *Public Law* 620.

35. Melrose L, 'Emerging Trends in Australian Climate Change Litigation: Bringing the Heat' (2022) 47 (3) *Alternative Law Journal* 187, doi: 10.1177/1037969X221112515.
36. Mohammed S, Desha C and Goonetilleke A, 'Investigating Low-Carbon Pathways for Hydrocarbon-Dependent Rentier States: Economic Transition in Qatar' (2022) 185 *Technological Forecasting and Social Change* 122084, doi: 10.1016/j.techfore.2022.122084.
37. Newell P et al, 'Toward Transformative Climate Justice: An Emerging Research Agenda' (2021) 12 (6) *WIREs Climate Change* e733, doi: 10.1002/wcc.733.
38. Oreggioni GD et al, 'Climate Change in a Changing World: Socio-Economic and Technological Transitions, Regulatory Frameworks and Trends on Global Greenhouse Gas Emissions from EDGAR v.5.0' (2021) 70 *Global Environmental Change* 102350, doi: 10.1016/j.gloenvcha.2021.102350.
39. Pouikli K, 'Editorial: A Short History of the Climate Change Litigation Boom Across Europe' (2021) 22 (4) *ERA Forum* 569, doi: 10.1007/s12027-022-00700-1.
40. Reid WV, Ali MK and Field CB, 'The Future of Bioenergy' (2020) 26 (1) *Global Change Biology* 274, doi: 10.1111/gcb.14883.
41. Rosselot K, Allen DT and Ku AY, 'Global Warming Breakeven Times for Infrastructure Construction Emissions are Underestimated' (2022) 10 (5) *ACS Sustainable Chemistry & Engineering* 1753, doi: 10.1021/acssuschemeng.1c08253.
42. Setzer J and Higham C, 'Global Trends in Climate Change Litigation: 2022 Snapshot' (*LSE*, 30 June 2022) <<https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-change-litigation-2022>> accessed 8 May 2023.
43. Shen M et al, '(Micro) Plastic Crisis: Un-Ignorable Contribution to Global Greenhouse Gas Emissions and Climate Change' (2020) 254 *Journal of Cleaner Production* 120138, doi: 10.1016/j.jclepro.2020.120138.
44. Shojaeddini E et al, 'Oil and Gas Company Strategies Regarding the Energy Transition' (2019) 1 (1) *Progress in Energy* 012001, doi: 10.1088/2516-1083/ab2503.
45. Sircar A et al, 'Application of Machine Learning and Artificial Intelligence in Oil and Gas Industry' (2021) 6 (4) *Petroleum Research* 379, doi: 10.1016/j.ptlrs.2021.05.009.
46. 'State of the Netherlands v. Urgenda Foundation: Hague Court of Appeal Requires Dutch Government to Meet Greenhouse Gas Emissions Reductions by 2020' (2019) 132 (7) *Harvard Law Review* 2090.
47. van Benthem AA et al, 'The Effect of Climate Risks on the Interactions Between Financial Markets and Energy Companies' (2022) 7 (8) *Nature Energy* 690, doi: 10.1038/s41560-022-01070-1.
48. Voigt C, 'The First Climate Judgment Before the Norwegian Supreme Court: Aligning Law with Politics' (2021) 33 (3) *Journal of Environmental Law* 697, doi: 10.1093/jel/eqab019.
49. Wang MHS, Wang LK and Shammass NK, 'Glossary of Climate Change, Global Warming and Ozone Layer Protection' in Hung YT, Wang LK and Shammass NK (eds), *Handbook of Environment and Waste Management: Acid Rain and Greenhouse Gas Pollution Control* (vol 3, World Scientific 2020) 689, doi: 10.1142/11470.
50. Wewerinke-Singh M and McCoach A, 'The State of the Netherlands v Urgenda Foundation: Distilling best practice and lessons learnt for future rights-based climate litigation' (2021) 30 (2) *Review of European, Comparative & International Environmental Law* 275, doi: 10.1111/reel.12388.
51. Yuan X et al, 'The Race to Zero Emissions: Can Renewable Energy be the Path to Carbon Neutrality?' (2022) 308 *Journal of Environmental Management* 114648, doi: 10.1016/j.jenvman.2022.114648.
52. Zhang L et al, 'Globalization, Green Economy and Environmental Challenges: State of the Art Review for Practical Implications' (2022) 10 *Frontiers in Environmental Science* 199, doi: 10.3389/fenvs.2022.870271.