

Engineering Ethics in the Age of Climate Crisis: Evaluating Big Oil's Responsibility

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Abstract—For over a century now, the reliance on fossil fuels has been a leading cause of global greenhouse gas emissions and subsequently, climate change along with extreme weather events. Research suggested major fossil fuel production companies had knowledge of the environmental risks. Extreme weather events like hurricanes and floods are only increasing, leaving communities devastated while fossil fuel companies profit. Our work highlights why accountability is essential for the oil industry so that less of these weather events will occur. As we continue to face the often extreme consequences of climate change, the societal costs of fossil fuel usage has become a focal point of legal and ethical debate. Many states have filed lawsuits against these companies alleging that they misled the public about the dangers of their products. This work focuses on examining climate accountability lawsuits against major oil companies through an ethical lens, evaluating whether claims of deception and harm are ethically justified and whether states have a legitimate basis for holding these corporations accountable. The methodology of this research involves a comparison of competing approaches to the utilitarian ethical framework. By analyzing the legal position of the Big Oil Companies against the plaintiff states and environmentalists, this study explores the extent to which each claim results in a net benefit to society. The National Society of Professional Engineers Code of Ethics was used to evaluate the decision making by major fossil fuel companies on the climate issue. We compared this case to the tactics and legal challenges of the tobacco industry over the danger of its products to society. We contrasted the oil industry's emphasis on energy security against the states' focus on safety revealing the ethical failings of Big Oil from utilitarian and virtue ethics perspectives. From the ethical perspective, climate accountability lawsuits challenge the fundamentals of these entities' corporate moral responsibility and obligation.

Keywords—*climate change, accountability, climate lawsuits, corporate responsibility, environmental harm, disinformation, engineering ethics, utilitarianism*

I. INTRODUCTION (MOTIVATION)

In today's world, catastrophic weather phenomena are becoming increasingly frequent. Even if one looks upon the last year, the Atlantic Ocean has seen three category 5 hurricanes, and one of them made landfall [1]. As more greenhouse gas emissions from big oil companies continue to affect the atmosphere, it provides a much more favorable

environment for weather events that otherwise would not appear as often or as strong [2]. According to the United Nations, fossil fuels are responsible for almost 90% of the world's carbon dioxide emissions and about 68% of the greenhouse gas emissions [3]. The longer we wait to hold these companies accountable, the worse this problem is going to be.

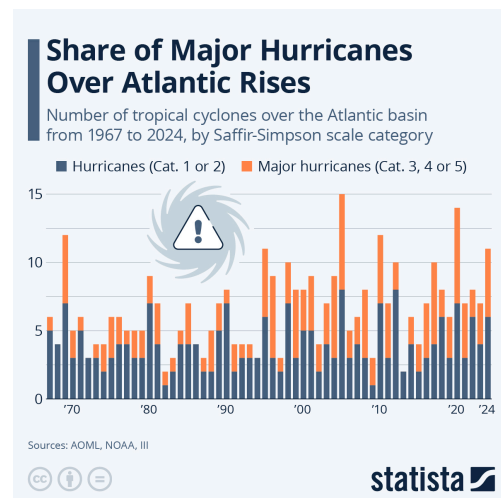


Fig 1. Number of Major Hurricanes Over Atlantic Rises [4]

Even though they are fully aware of the effect they are having on the planet, they are still prioritizing their monetary gains over human life [5]. Rather than prioritize the health and safety of everyone on the planet, they would rather downplay the environmental impacts. Exxon, for example, even conducted their own study in 1979 and concluded widespread impacts on the world's climate, just to push for more fossil fuel usage later [6]. As long as we continue to let these companies continue to contribute to climate change, these events will worsen and threaten more people, simply so that oil companies can unethically profit. This is why we need to hold them accountable, to prevent further calamities.

In the United States, there has been an influx in states, cities, tribal governments, and even private citizens filing suits against big oil companies for charges including Civil Conspiracy, Wrongful Death, and Misleading Advertisement and Environmental Marketing to name a few [2]. These legal

actions arise in response to the fossil fuel industry's documented history of early scientific knowledge and subsequent dissemination of disinformation, as outlined above.

To objectively determine accountability for climate change, the fossil fuel industry's actions will be compared against established, reputable frameworks. In engineering, there are several professional standards that define right action. The National Society of Professional Engineers, as one of the premier engineering societies, provides a Code of Ethics that will serve as our basis. Additionally, the utilitarianism theory of distributive justice has been used to justify the academic fairness principle "the polluter pays" which establishes fault with the fossil fuel industry. This includes a cost-benefit analysis [7]. These principles and frameworks will provide a structure for the evaluation of right action and accountability for the fossil fuel industry.

II. BACKGROUND

A. Industry Early Knowledge of the Risks of Greenhouse Gas Emissions

In 2016, the Paris Agreement was implemented, legally binding, by several countries including the United States, into an international treaty aimed at lowering global warming. This occurred during the increase of public awareness of the dangers of greenhouse gases. Although climate change advocacy has entered mainstream media and public discourse within the 21st century, the scientific understanding of the effects of fossil fuel usage is not as new. Evidence shows that the American Petroleum Institute (API), the largest trade association for the U.S oil and gas industry, was aware of scientific evidence warning of potential human-caused global warming as early as the 1950s [6]. This was decades before widespread public awareness; more than half a century before the 2016 Paris Agreement. Dating back to the 1960's there is evidence of the industry's awareness of early warnings. In 1968, an API commissioned report by the Stanford Research Institute predicted that there would be significant temperature changes by the year 2000 with the potential for severe environmental damages if fossil fuel production continued to grow [8].

Throughout the 1970's several fossil fuel companies held their own internal scientific consensus. Investigative journalists uncovered company documents stating that, as early as 1977, Exxon scientists were warning executives about "potential catastrophic" human caused global warming [6]. While some companies were ignoring the evidence presented by their scientific and technical experts, other companies employed them to conduct further investigation. In 1979, the API established an industry wide task-force to discreetly monitor climate change [8]. Noting that no significant decrease in fossil fuel production occurred during this time, it can be inferred that the findings of this task did not compel executives to consider the dire consequences of harmful emissions. Alternatively, these daunting scientific findings were omitted from any public communications [8].

The time period that these scientific investigations occurred should not be a factor in accountability. Though

many took place around 45 years ago, they have been found to be highly accurate. Starting in 1977, Exxon scientists accurately reported (or produced) global warming projections. A significant percentage, 63% -83%, correctly predicting subsequent warming trends. Additionally, internal reports from 1979-1985, correctly rejected the theory that carbon dioxide emissions would cause an ice age. Rather, they assessed that predicted that human-caused global warming would become discernible from natural variability [6]. This highlights the scientific and technical capabilities of these large corporations. Exxon's projected warming of $0.20^{\circ} \pm 0.04^{\circ}\text{C}$ per decade was similar to independent academic and government projections from the same era [6]. A clear ethical dilemma arises from the lack of meaningful, proactive modifications in fossil fuel production by these corporations with access to such a breadth of knowledge.

B. History of Industry Deceit and Disinformation

While having knowledge of the dangerous potential of a hazard raises one ethical dilemma, actively spreading disinformation on the hazard introduces a more complex dilemma with more severe consequences. Despite the clear, proficient awareness of climate change, the fossil fuel industry implemented public campaigns that minimized the hazards. The promulgation of disinformation promoted energy and environmental policies favored by the fossil fuel industry. Evidence suggests that the American Petroleum Institute began actively misrepresenting scientific findings as early as 1980 to support expanded fossil fuels production [8]. An industry - supported coal study, *Wilson, C.L., 1980. Coal: bridge to the future. Report of the World Coal Study, WOCOL*, was used to lobby former U.S President Carter into tripling coal production. Production increased not only in the U.S; Carter in turn recommended to the other advanced industrialized countries in the G7, that later adopted the policy [8]. Unfortunately, the conference that held the study concluded quite the opposite of what was lobbied to these leading nations. It was deemed "urgently necessary to for see and prevent potential man-made changes in climate that might be adverse to the well being of humanity" [8]. This is a large-scale example of the purposefully disinformation spread that has had global consequences. In 1980, the API published a booklet, *Two Energy Futures*, to promote public policies that were favorable to the fossil fuel industry. This booklet downplayed the negative impact of climate change; additionally, it falsely claimed scientists, like the renown Carl Sagan (Cornell University astronomer), were optimistic about the carbon dioxide buildup. Additionally, it was used to reassure and appease the public. Both of these publications omitted the industry's own internal knowledge of climate science and misrepresented the concerns of man-made changes to the climate from the 1979 World Climate Conference [8].

These oil and gas companies have made a significant financial investment in lobbying and advertising against climate activism and general awareness of the impact on fossil production on global warming. In 2016, it was found that several large oil companies spent \$114 M on obstructive lobbying, complaining, and advertising, along with other costs, against climate change policy and awareness. Shell,

Exxon Mobil, and American Petroleum Institute spent \$13M on direct lobbying in 2016 [9]. This highlights the intentional action the fossil fuel industry has taken to insure that impactful climate policy will not be made.

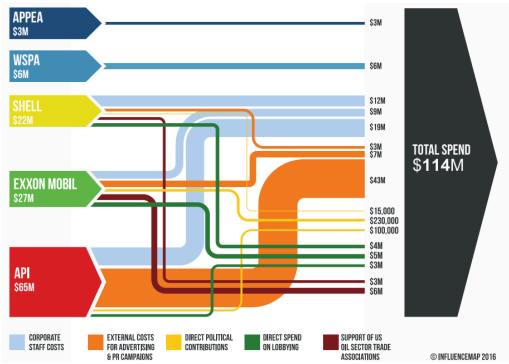


Fig. 2. How Much Oil Companies Spend on Obstructive Lobbying and Campaigning [9]

C. Similarities to the Tobacco Industry

This ethical dilemma in the fossil fuel industry mirrors the tobacco industry's actions, prioritizing profits and "sales over safety". Similarly, the tobacco companies understood the carcinogenic nature of their products as early as the 1950s [10]. This parallels the fossil fuel industry's internal knowledge of climate change. They employed a "demand for scientific proof" tactic as a justification for inaction all at the expense of public health and safety [10]. Fortunately, unlike the fossil fuel industry, this corporate deceit led to the landmark 1992 case, *Haines v Liggett Group*. In this historic trial, a U.S Judge found the tobacco manufacturers, described as the "king of concealment and disinformation," liable. Additionally, The Department of Justice brought charges under Racketeer Influenced and Corrupt Organizations (RICO) Act to the tobacco industry. Eventually, in 1997, Liggett and other major tobacco companies officially admitted that cigarettes are addictive carcinogens [10]. Hopefully, the transition from deceit and denial to legal liability can serve as a precedent for efforts to hold the fossil fuel industry accountable for the disastrous effect of climate changes.

III. STAKEHOLDER ANALYSIS

Stakeholders in climate accountability litigation extend beyond just fossil fuel companies and plaintiffs, as the impacts of climate change affect a wide range of groups with competing interests. The primary stakeholders are major fossil fuel producers and industry organizations such as the American Petroleum Institute (API), whose goal is to maintain profitability, energy production, and market stability. These companies often justify their actions by emphasizing global energy demand and economic dependence on fossil fuels, which has historically shaped U.S. energy policy decisions [11].

On the opposing side are plaintiffs, including state and local governments, communities, and individuals directly

affected by climate-related disasters. These groups seek compensation for damages such as infrastructure loss, public health impacts, and increased disaster response costs [8]. Future generations are also key stakeholders, as they will experience the long-term consequences of climate change despite having no role in its development.

Engineers and professionals working within the fossil fuel industry represent another important stakeholder group. They are bound by professional code of ethics, such as the NSPE Code, which emphasize prioritizing public welfare, honesty, and avoidance of deceptive practices [12]. This creates tension between corporate objectives and professional ethical obligations. Overall, the interaction between these stakeholders highlights the complexity of assigning responsibility while balancing economic, environmental, and ethical priorities.

IV. CURRENT LEGAL LANDSCAPE

The current legal landscape surrounding Big Oil is defined by the litigation that seeks to establish corporate accountability for climate-related harm. Across the world, plaintiffs are taking a variety of legal theory routes, ranging from public nuisance and fraud to human rights violations and wrongful deaths [2]. Their paramount goal being to confront fossil fuel companies' responsibility for the consequences of climate change. These cases collectively signal a shift toward using the judiciary to address gaps in regulatory enforcement and to define the ethical obligations of corporations and their engineers.

In the United States, there is a growing number of civil lawsuits filed by local and state governments against major oil companies. While many of these lawsuits are currently pending, it is important to understand that the effects of climate change are still affecting the plaintiffs and citizens in the present and future as well. These lawsuits are relying on claims of public nuisance, failure to warn, and consumer fraud. They are arguing that oil companies have long understood the ramifications of greenhouse gas emissions, one case alleging that the companies were actually actively funding misinformation campaigns. The plaintiffs seek compensation for the related damages, such as infrastructure damage from the rise in sea level and increased disaster response costs.

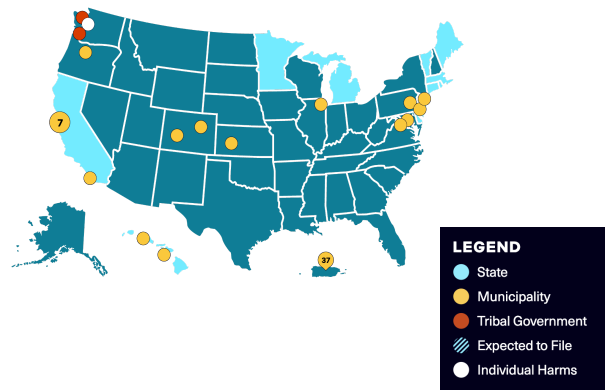


Fig. 3. Lawsuits, Mapped [2]

More recently, plaintiffs are exploring wrongful death and personal injury claims due to climate impacts. Although oil itself is a global commodity, the struggle for it on an international level more directly impacts the residents of the towns these plants are built in. In Figure 3, many of the lawsuits in the United States are filed locally. Their claims attempt to connect extreme weather events, such as hurricanes or heat waves, to fossil fuel emissions and claim the actions of the corporations contributed to the loss of life. Determining causation is a significant legal hurdle and is often hard to prove in court, but with advances in climate attribution science are strengthening these claims by finding ways to quantify the extent at which specific emissions contribute to extreme weather events. As a result, wrongful death litigation may be a crucial frontier in holding corporations accountable for human harm as well as environmental damage.

International courts are also confronting the legal responsibilities of oil companies. One landmark case is *Milieudefensie et al. v. Royal Dutch Shell* heard in the Hague Court of Appeal in the Netherlands. In *Milieudefensie et al. v. Royal Dutch Shell*, a Dutch court initially ruled that Royal Dutch Shell gas company had a legal duty to significantly reduce its global carbon emissions in line with climate goals, marking the first time a private corporation was ordered to align its business practices with international climate targets [13]. Although the 2024 appeal modified the ruling, the case established that companies can be held legally accountable for contributing to climate change under a broader duty of care and human rights framework, not just a regulatory issue. Similar cases across Europe and Canada continue to expand the scope of climate litigation, reinforcing the idea that corporate accountability for climate harm is also soon becoming a global legal norm [14].

Long before climate change became a global public concern, Big Oil already had clear evidence of fossil fuel impact on Earth's climate. This knowledge is what now plays a critical role in the legal claims brought against them. It establishes elements of fraud, negligence, and ill intent, especially the propaganda spread to keep the public uninformed and vulnerable [15].

It also begs the question whether or not these moral obligations to the public should serve as precedent to all corporations, more specifically the ones that produce harmful products for consumption. A company, for example, would be a cigarette manufacturing company. Although tobacco use is voluntary, tobacco is a well known carcinogen and kills almost half of a million people every year. Does the cigarette company bear some responsibility for the effects of the products they make? Does Big Oil need a moral framework for the future?

V. ETHICAL ANALYSIS

The ethical evaluation of Big Oil's role in climate change can be analyzed through multiple frameworks, including the NSPE Code of Ethics, utilitarianism, and virtue ethics. Each framework provides a different perspective on whether the actions of fossil fuel companies are ethically justified.

From the standpoint of the NSPE Code of Ethics, engineers are required to "hold paramount the safety, health, and welfare of the public" and to issue truthful and objective statements [12]. Evidence suggesting that fossil fuel companies were aware of climate risks but failed to adequately inform the public, or contributed to misleading communication, raises concerns about violations of these principles [6], [16]. If engineers or organizations knowingly allowed misinformation to persist, this would represent a direct conflict with professional ethical obligations.

Utilitarianism evaluates actions based on their overall consequences. While fossil fuels have historically provided significant societal benefits, including economic development and widespread energy access, the long-term impacts of climate change, such as environmental damage, public health risks, and economic losses, must also be considered. Research linking emissions from major carbon producers to increases in global temperature and sea level suggests that these long-term harms are substantial [17]. If the cumulative harm outweighs the benefits, then the continued actions of fossil fuel companies are difficult to justify under a utilitarian framework.

Virtue ethics focuses on the character and intentions behind actions. Historical evidence of disinformation campaigns and strategic communication framing raises concerns about honesty and integrity within the fossil fuel industry [16]. Rather than prioritizing transparency, some companies appear to have shifted responsibility onto consumers or downplayed the urgency of climate risks. A virtuous organization would instead act with accountability and openness, especially when its actions have global consequences.

Additionally, fairness principles such as the "polluter pays" concept reinforce the ethical argument for accountability. These principles suggest that those who contribute most significantly to environmental harm should bear the costs associated with it [7]. Given that a relatively small number of companies are responsible for a large portion of global emissions [18], this framework further supports assigning responsibility to major fossil fuel producers. Together, these frameworks indicate that while fossil fuel production has provided societal benefits, the way risks were managed, communicated, and acted upon raises significant ethical concerns.

VI. DISCUSSION AND RECOMMENDATION

The findings of this analysis suggest that addressing climate accountability requires both regulatory and ethical reforms. One key recommendation is the implementation of stricter transparency requirements for corporations, particularly regarding environmental risks. Companies should be required to clearly disclose known impacts of their products, aligning with professional ethical standards such as the NSPE Code of Ethics [12]. This is especially important given evidence that some fossil fuel companies had early knowledge of climate risks but failed to communicate them effectively to the public [6], [16]. Improving transparency would not only address ethical concerns but also help rebuild

public trust and allow consumers and policymakers to make more informed decisions.

Additionally, policies based on fairness principles such as the “polluter pays” approach could help distribute the costs of climate change more equitably. These principles provide a structured way to assign responsibility for mitigation, adaptation, and damages caused by emissions [7]. Given that a relatively small number of major fossil fuel producers contribute a large share of global emissions [18], applying this framework could help ensure that the burden of climate change does not fall disproportionately on vulnerable communities. Holding companies financially accountable may also incentivize greater investment in renewable energy and lower-emission technologies, supporting a transition toward more sustainable energy systems.

Another important recommendation is strengthening the role of engineers and professionals in ethical decision-making. Engineers should be empowered to raise concerns about public safety and environmental risks without fear of retaliation, reinforcing the ethical obligations outlined in professional codes. Because engineers often possess the technical knowledge needed to understand long-term risks, they play a critical role in preventing harm before it occurs. Encouraging a culture of ethical responsibility within organizations can help ensure that decisions are not driven solely by profit but also by consideration of societal impacts.

Finally, continued development of climate attribution science is essential for improving both legal and ethical accountability. As scientific methods become more precise in linking emissions to specific impacts, they provide stronger evidence for litigation and policy decisions [17]. This will play a critical role in overcoming challenges related to causation in climate lawsuits, which has historically been one of the largest barriers to holding companies accountable. As attribution science advances, it will likely strengthen both legal claims and ethical arguments regarding responsibility. Overall, addressing climate change is not only a technical challenge but also an ethical one. Ensuring accountability will require collaboration between policymakers, corporations, engineers, and the legal system.

VII. EVALUATION OF ALTERNATIVES

One major alternative viewpoint is that fossil fuel companies should not be held primarily responsible for climate change because they have provided immense benefits to modern society. Fossil fuels have supported industrial growth, transportation, electricity generation, and economic development for decades. This argument emphasizes that oil and gas companies supply an energy source on which societies have become heavily dependent, and that governments and consumers have also played a major role in sustaining that demand [11]. Similarly, these companies employ a utilitarian defense, often called the 'Fossil Fuel Savior' frame [16]. From this perspective, assigning responsibility only to producers oversimplifies a problem that has developed through shared dependence on fossil fuels.

Another alternative is that regulation and future policy reform may be more appropriate than litigation. Rather than

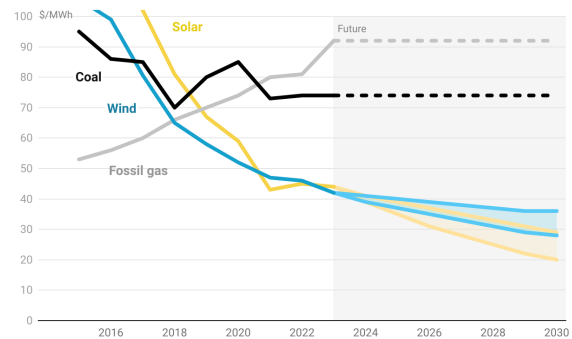
relying on lawsuits to assign blame for past harm, some may argue that governments should focus on emissions standards, investment in renewable energy, and long-term transition planning. This approach may be seen as more practical because it concentrates on preventing future damage instead of proving difficult lawsuits are expanding globally, but it also suggests that litigation is only one tool among many for climate governance [19].

A related argument is that holding fossil fuel companies fully accountable may be unfair because climate change results from cumulative emissions across many sectors and countries, not only a few firms. Even where evidence shows that major carbon producers contributed significantly to atmospheric CO₂ increase, sea level rise, and warming, climate harm still involves a long chain of production, regulation, consumption, and political decision making [6]. This makes direct legal and ethical blame more complex than in cases involving a single defective product or isolated act of negligence.

However, these alternatives do not completely remove responsibility from major fuel producers. Historical research suggests that some companies and trade groups possessed early knowledge of climate risks and in some cases contributed to misleading public communication about those risks [6], [16]. That distinction matters ethically. The issue is not simply that fossil fuel companies produced energy, but that evidence suggests some actors may have continued harmful practices while failing to communicate known dangers honestly. For that reason, although alternatives such as shared responsibility, policy reform, and energy necessity deserve consideration, they do not fully outweigh that argument that major fossil fuel companies can still bear substantial ethical responsibility for climate-related harm. Additionally, the current cost of traditional energy versus alternative, renewable energy combats the 'Fossil Fuel Savior' frame. Market predictions show that the cost associated with renewable energy sources will not only decline, but it will remain significantly below the cost of fossil fuel-based energy [20]. This undermines the industry's primary moral and economic justification for delaying the transition.

Renewables will keep beating fossil fuels on cost

Analysts project that wind and solar will continue to get cheaper, falling further below coal and gas costs globally this decade.



Note: Shown is the levelized cost of energy, or a power plant's lifetime costs divided by its energy production. (\$/MWh)

Chart: Canary Media • Source: BNEF, RMI X-Change: Electricity 2023

Fig. 4. Current and Projected Cost of Various Energy Forms [20]

VIII. Conclusion

This analysis examined whether major fossil fuel companies can be held ethically responsible for climate change through both legal and engineering ethics perspectives. While fossil fuels have undeniably contributed to economic development and modern energy systems, the evidence suggests that the issue is not solely about production, but about how risks were understood, communicated, and acted upon. Research indicates that some companies were aware of climate risks decades ago and, in certain cases, contributed to misleading public discourse [6], [16] This distinction plays a critical role in determining ethical responsibility.

From an engineering ethics standpoint, the NSPE Code emphasizes prioritizing public welfare and maintaining honesty in communication [12]. When evaluated through this framework, along with utilitarianism and virtue ethics, the actions of major fossil fuel and environmental harms associated with climate change, supported by attribution research linking emissions to measurable impacts, suggest that these benefits do not fully justify the consequences [17].

At the same time, this issue is not entirely one-sided. Climate change is a complex, cumulative problem involving governments, consumers, and global systems. Alternative perspectives highlight shared responsibility and the importance of forward-looking policy solutions. However, these arguments do not eliminate implications of documented knowledge and communication practices within the fossil fuel industry.

Ultimately, climate accountability represents more than a legal challenge; it is an ethical test for engineers, corporations, and society as a whole. As future engineers, there is a responsibility to prioritize transparency, public safety, and long-term societal impact in decision-making. Moving forward, addressing climate change will require not only technological innovation but also stronger ethical standards and accountability mechanisms to ensure that similar issues are handled more responsibly in the future.

ACKNOWLEDGMENT

Thanks to research funding from the University of Virginia for conference registration.

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